

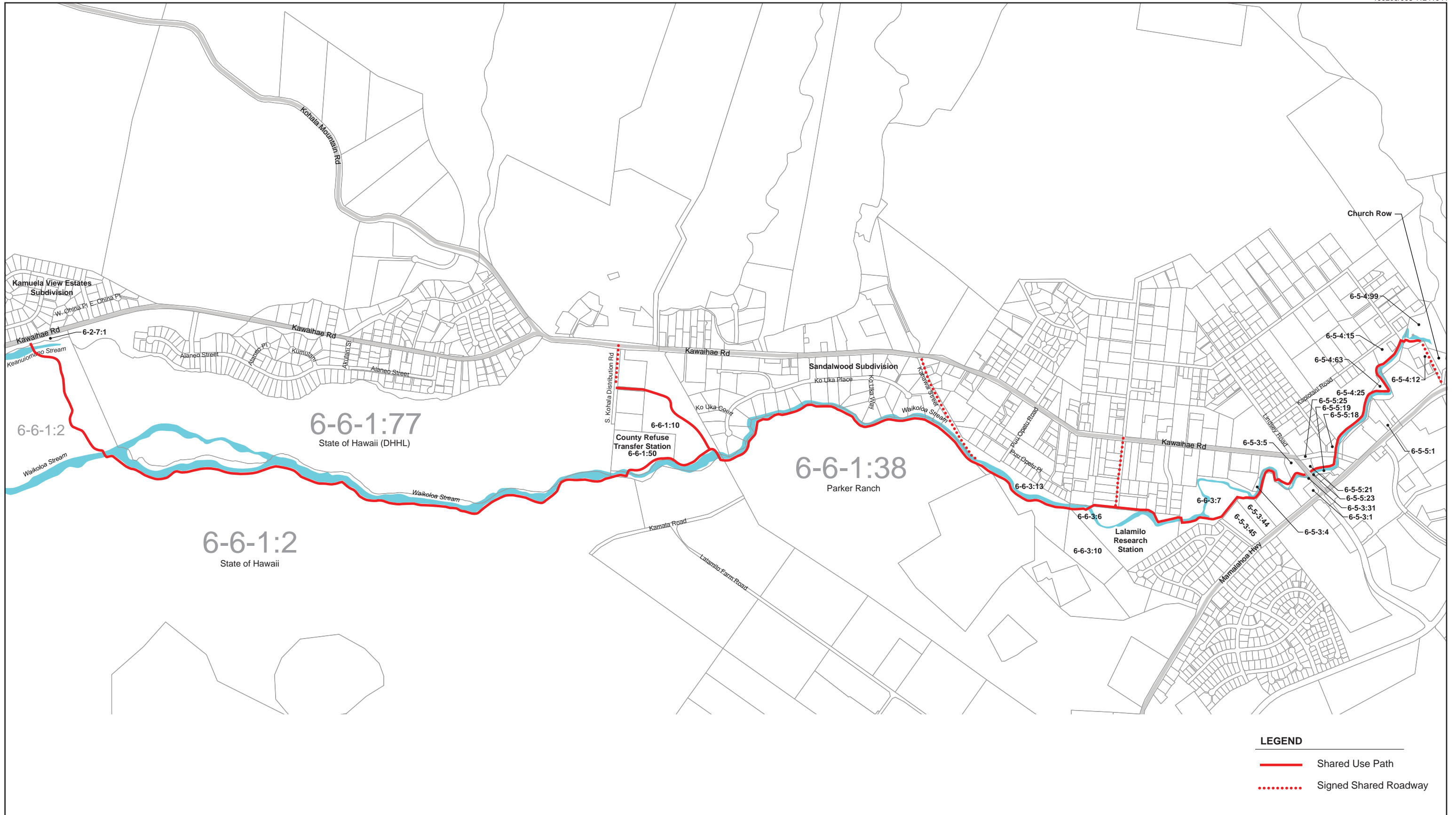
List of Landowners and TMKs

The following table lists parcels directly adjacent to the trail. Easements have been or will be obtained as needed.

TMK	Parcel	Owner(s)	Parcel Size
3 6 2 001 ---	002	State Of Hawaii	872 acs
3 6 2 007 ---	001	County of Hawaii	8.1 acs
3 6 5 003 ---	001	Bank Of Hawaii Trust	1.7 acs
	004	County Of Hawaii	1.149 acs
	005	Parker Land Trust	1.040 acs
	031	County Of Hawaii	1,046 sf
	044	Carter Professional Center	2.2701 acs
	045	Canada France Hawaii Telescope Corp.	3.22580 acs
3 6 5 004 ---	012	Hawaii Baptist Convention	72,378 sf
	015	State Of Hawaii	2.00 acs
	025	Parker School	12.166 acs
	063	Parker School	1.468 acs
	099	Parker Ranch Foundation Trust	243,239 sf
3 6 5 005 ---	001	Puna Plantation Hawaii, Ltd.	55,525 sf
	018	Parker School	1.205 acs
	019	Parker School	45,694 sf
	021	Bank of Hawaii Trust	18,512 sf
	023	County Of Hawaii	745 sf
	025	Parker School	37,052 sf
3 6 6 001 ---	002	State Of Hawaii Harold F Rice Jr	8573.733 acs
	010	State Of Hawaii	17.60 acs
	038	Parker Land Trust	215.380 acs
	050	State Of Hawaii (County Of Hawaii Kamuela Rubbish Dump)	8.896 acs
	077	Hawaiian Home Lands	219.713 acs
3 6 6 003 ---	006	State Of Hawaii	15.855 acs
	007	State Of Hawaii (The Outdoor Circle)	10.187 acs
	010	Parker Land Trust	8.109 acs
	013	Parker Land Trust	15.405 acs

* source: Hawaii County Real Property Tax Office

<http://www.hawaiipropertytax.com/Search/GenericSearch.aspx?mode=PARID>



NORTH

0 300 600 1200
SCALE IN FEET

LEGEND

- Shared Use Path
- ⋯ Signed Shared Roadway

LANDOWNERS AND TMK's
Ke Ala Kahawai O Waimea,
Waimea Trails and Greenways
Draft Environmental Assessment

Natural resources assessment update report for the Waimea Trails and Greenways Project, Kamuela Island of Hawai'i¹

June 22, 2001
Revised November 2, 2010

DRAFT

AECOS No. 920B

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Introduction

This revised report presents the results of field surveys conducted in late May 2000 along the route of the proposed Waimea Trails & Greenways (WTG) project in Waimea on the Island of Hawai'i (Figure 1) and repeated in September 2010. The purpose of the survey was to assess the presence of sensitive biota and habitat along a proposed route of a walking and bikeway trail from the east end of Waimea (Kamuela) Town to a point west of town near South Kohala Estates Subdivision. Although this route remains the preferred one, alternatives for some sections have been proposed and these were also assessed in general terms in 2010. For the most part, the proposed trail and bikeway follows Waikoloa Stream and incorporates a short, existing pedestrian walkway known as "Ke Ala Kahawai o Waimea" (The Stream Trail of Waimea) presently originating at the Waimea Outdoor Circle, native plant park and garden: "Ulu La'au" and ending at Puu Opelu Road. The intent of the project is to expand the existing Ke Ala Kahawai o Waimea (WTG, undated).

The focus of this report is on sensitive biological resources associated with Waikoloa Stream and riparian habitats. By sensitive biota is meant species listed (or candidate species) as threatened or endangered by the federal government (see USFWS, 1999a, 1999b), or by state administrative rules (DLNR, 1986), or species comprising a community of native plants and animals that may or may

¹ Report prepared for Kimura International, Honolulu and intended for use in environmental documents and permit submittals for the Waimea Trails & Greenways project.

not be under any specific threat of extirpation, but which would be regarded as special and worthy of preservation.

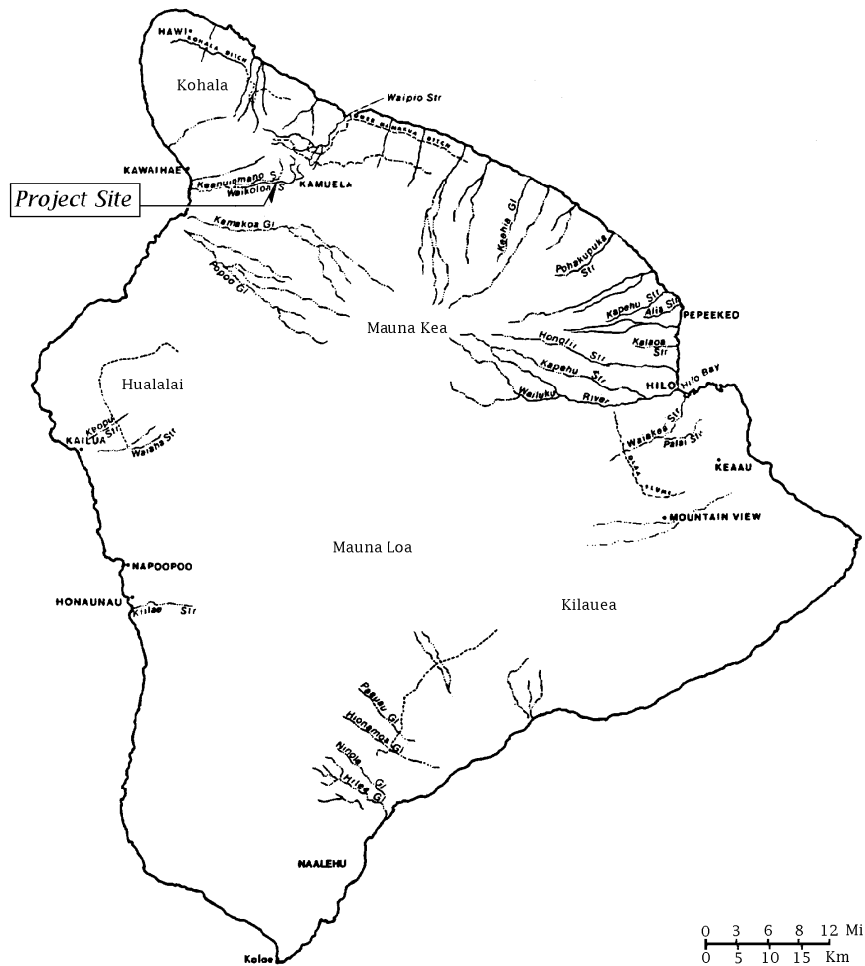


Figure 1. Map of streams on the Island of Hawai'i (Big Island) showing general WTG project location.

Methods

The original report (AECOS, 2001) was based on surveys conducted by Reginald David (vertebrate biologist), Dr. Derral Herbst (botanist), and Eric Guinther (aquatic biologist). For the recent revisit to the site, Reginald David covered vertebrates and Eric Guinther covered botanical resources.

Water Quality

Water quality data were collected in 2000 primarily for use in characterizing aquatic habitats encountered. These measurements, limited in both spatial and temporal coverage, are not intended to serve as a baseline of stream water quality, merely to contribute to such an effort. Water quality data collected for this survey are discussed in the report section on Aquatic Environments. The fact that one author was involved in a separate survey downstream from Waimea during the same general period of time was used to advantage to expand temporal coverage of water quality measurements. Some measurements were made *in situ*, while others were obtained from water samples collected and shipped to AECOS Inc. laboratory on O'ahu. Analytical methods used for these samples are listed in AECOS (2001).

Floristic Survey

Prior to conducting the field work, pertinent literature and maps were reviewed by the botanist. A walk-through survey method was used and conducted on May 22-23, 2000 (Herbst; assisted by Guinther). The area surveyed comprised the flagged Trails and Greenways corridor and a narrow buffer zone of about 3 m (10 ft) on either side of the corridor. Observations concerning the flora and vegetation were recorded and a species list was prepared. The nomenclature of the higher plants follows that of Wagner, Herbst, and Sohmer (1990, 1999) for the native and naturalized plants, Staples and Herbst (2005) for the cultivated plants, and Palmer (2003) for the ferns. Most of the same route was traversed in 2010 (Guinther) and the previous flora listing (AECOS, 2001) used as a checklist. Conditions were much drier in 2010 than in 2000, particularly in the pastureland west of town, and therefore many of the plants recorded in 2000 were not observed in 2010. Further, some sections of the proposed route (and alternative routes) were not surveyed in 2010; mostly these were in the middle of Waimea Town.

Stream Surveys

A survey of aquatic environments was conducted on May 22-23 and June 5, 2000. Conditions and aquatic inhabitants of the segment of Waikoloa Stream within the proposed Trails & Greenways corridor were determined by walking along the stream making visual observation and sampling selected features with a fine-mesh hand net. An insect net was used to capture flying insects along the survey route. Observations of aquatic biota were of an incidental nature. More intrusive methods (e.g., electroshocking or chemical treatments such as rotenone) might well reveal additional species not observed by our survey. In

general, the water was too shallow for snorkeling to be of any advantage, but it is nearly always the case that repeated visits will reveal species not observed during any single visit to an area. Only casual observations of selected parts of the stream were made in 2010; however, a detailed survey of the streams was completed in late 2001 (Englund, et al., 2002), following our initial survey in 2000.

Vertebrate Surveys

The original avian and mammalian surveys were conducted in May 2000. Seventeen avian count stations were placed approximately 400 m (1300 ft) apart along the length of the proposed corridor and the (then) one alternative alignment. Six-minute unlimited distance counts were made at each station. Count stations were counted once; additionally, a tally was made of birds detected during the census time on site. Field observations were made with the aid of Leica 10 X 42 binoculars and by listening for vocalizations. Counts were concentrated during the early morning hours between 0630 hrs and 1000 hrs, the peak of daily bird activity. An additional 2 hrs were spent one evening in an attempt to detect nocturnally flying seabirds and owls over-flying the area. Time not spent counting was used to search the corridor and the surrounding area for species, and habitats not detected during count sessions. Most of the same route was traversed in 2010. Conditions were much drier than in 2000, particularly in the pastureland west of town. Some sections of the proposed route (and alternative routes) were not surveyed in 2010; mostly these were in the middle of Waimea Town.

All observations of mammalian species were of an incidental nature. With the exception of the Hawaiian hoary bat (*Lasiurus cinereus semotus*), all other terrestrial mammals found on the Island of Hawai'i are alien species. Most are ubiquitous; no trapping program was proposed or undertaken to quantify the usage by alien mammalian species of the study site. A running tally was kept of all vertebrate species observed and heard while within the proposed right-of-ways. The survey of mammals was limited to visual and auditory detection, coupled with observation of scat, tracks and other animal sign. Visual scans were made for Hawaiian hoary bats, or 'ope'ape'a as they are locally known, during crepuscular periods on one evening and one morning for the 2000 survey.

Avian phylogenetic order and nomenclature presented in this report follows *The American Ornithologists' Union Check-list of North American Birds 7th Edition* (American Ornithologists' Union, 1998), and the 42nd through the 51st supplements to *Check-list of North American Birds* (American Ornithologists' Union, 2000; Banks et al., 2002, 2003, 2004, 2005, 2006, 2007, 2008, Chesser et

al., 2009, 2010). Mammal scientific names follow *Mammals in Hawaii* (Tomich, 1986).

General Site Description

Geology/Geography

Rainfall — There are few readily accessible places in the Hawaiian Islands where the rainfall gradient is steeper than at Waimea (Kamuela) on the Big Island. Rainfall just a mile east of town approaches 2000 mm (80 inches) annually and exceeds 3000 mm (100 in) on the slopes of Kohala Mountain above the saddle between Kohala and Mauna Kea, while a similar distance west of town the annual rainfall is closer to 500 mm (20 inches). This difference, as one passes from the windward slope of Mauna Kea to the leeward slope of Mauna Kea and adjacent Kohala has a profound effect on the natural vegetation and the streams of the area. While residents are well aware of the different experiences with respect to rains of their fellow citizens living in another part of town, the proposed Trails and Greenways will expose all who venture along a significant portion of its length to the varied climates of Hawai'i's Big Island. The project site and most of the South Kohala and North Kona Districts have been experiencing drought conditions over the past 3 years. The average rainfall for the western half of the project area is approximated 10 inches a year. Over the past 5 years, precipitation has been down approximately 22%; and over the past two years, by more than 52% (NCDC, 2000A).

At Lalamilo Field (Station 191.1 — located at 797 m or 2614 ft elevation near the Waimea-Kohala Airport south of Kamuela), for the period May 1 through June 6, 2000 (some 20 days prior to and including the period of field work), there was a total of 6 mm (0.24 in) of rain, with no single 24-hour period exceeding 1 mm (0.04 in). At a coastal station called Pu'u Kohala Heiau (Station 98.1 — located at 43 m or 141 ft elevation near Kawaihae), only one rainfall event was recorded for this period: 10 mm (0.4 in) on May 18 (NCDC, 2000b). This latter was a significant event (if it occurred), but is not correlated with any rainfall upslope at Lalamilo Field.

Conditions in September 2010 were far drier than those encountered in 2000 (Dicus, 2007; CWRM, 2010; see Fig. 2). At the best of times the area west of Waimea Town is extremely dry, averaging perhaps 15 in (38 cm) of rain or less a year; during 2010, the Kawaihae and 'Ouli areas were classified as suffering "D4" or exceptional drought conditions (Climate Prediction Center, National Weather Service, 2010).



Figure 2. Pastureland, photographed September 2010, near the western end of the project area illustrating impact of extreme drought conditions on vegetation.

Trails and Greenways Route — The proposed corridor surveyed in 2000 started directly north of the Imiola Church, wending its way west, following along Waikoloa Stream, crossing the Kawaihae Road (state Route 19) just north of the intersection with State Route 190 in downtown Waimea. The proposed trail would parallel Waikoloa Stream south of the existing residential development located off Kawaihae Road, passing south of the Kamuela refuse transfer station. The corridor then continues west for approximately another 2800 m (1.7 mi), crossing Keanu'i'omanō Stream before ending at the Kawaihae Road directly across from the South Kohala Estates Subdivision. An alternate alignment located within Waimea town passes close to the Canada France Telescope Company headquarters building. More recently suggested alternatives include a route that departs the preferred route along Waikoloa Stream going up Lindsay Road to the mauka (north side) of private property along Kawaihae Road and on to Keanu'i'omanō Stream, then following that stream to the intersection of state routes 19 and 250 (Waiaka Bridge), up Route 250 to pastureland behind developments off Kawaihae Road to 'Ohina Street in

South Kohala View Estates. Another suggested alternative follows Keanu'i'omanō Stream instead of Waikoloa Stream at the far western end of the project area.

The proposed corridor gently slopes from east to west from a maximum elevation of slightly more than 800 m (2600 ft) above sea level (ASL) down to approximately 450 m (1480 ft) ASL. The substrate is made up of a Mauna Kea lava flow dating from the Pleistocene age that is estimated to have been formed between 65,000 and 250,000 years ago. This flow is considered to be one of the oldest surface flows known from Mauna Kea (Wolfe and Morris, 1996). This flow is partially covered by alluvial and colluvial sand and gravel deposits, along the eastern end of the corridor close to the Imiola Church.

Vegetation

The most recent and complete classification of Hawaiian plant communities is that by Gagne and Cuddihy (1999). Their classification scheme is based upon three nesting regimes: elevation, moisture, and physiognomy; and includes only those communities that the authors considered “natural,” that is, plant communities that are not harvested nor maintained as monocultures of cultivated species such as is found in plantations, pastures, orchards or croplands; as well as those that have been altered or destroyed by development. The latter communities often are designated as “Anthropogenic” or “Alien” Communities as they are man-induced and consist of exotic or alien species, sometimes intermixed with a scattering of native plants. This vegetation type occurs in areas disturbed or altered by man.

Following the Gagne/Cuddihy classification scheme, the vegetation of the entire project site falls within the Anthropogenic or Alien Vegetation Community category. For convenience, several sub-types can be delineated for the area surveyed. These are:

1. Pasture
2. Riparian
3. Urban

A brief description of each of these vegetation subcommunities is given below.

1) Pasture — The eastern end of this grassland habitat has a dense ground cover consisting primarily of Kikuyu grass (*Pennisetum clandestinum*) with occasional weedy herbs intermixed. The composition of the vegetation gradually changes until, at the western end of the proposed project site, it consists of a sparse growth of 'akia (*Wikstroemia pulcherrima*), lantana (*Lantana camara*), fountain grass (*Pennisetum setaceum*), purslane (*Portulaca*

pilosa), *Polycarpon tetraphyllum* and other shrubs, grasses and forbs that favor a dry, sparsely vegetated habitat. Had 2000 been a more typical, wetter winter, the vegetation would be expected to be more lush and have more species diversity; more grasses and herbs, especially annuals would be present. As a consequence of low rainfall over a period of several years, many of the herbaceous species recorded on the 2000 surveys were not seen in 2010.

2) Riparian — This vegetation association includes the plants that live in and beside the stream. In more formal studies, these two communities (aquatic and riparian vegetation, respectively) are treated as two separate and distinct community types, but, for convenience, they have been combined in this informal survey. The vegetation of Waikoloa Stream is depauperate, comprising a few individuals of such species as the sedges ‘*aka’akai*, or great bulrush (*Schoenoplectus lacustris* ssp. *validus*) and umbrella plant or ‘*ahu’awa haole* (*Cyperus involucratus*); water smartweed (*Persicaria punctata*), *kamole* or primrose willow (*Ludwigia octovalvis*), and a moss.

The riparian vegetational community is much better developed, especially at its eastern end, and is dominated by such species as: wandering Jew (*Tradescantia fluminensis*), yellow ginger or ‘*awapuhi melmele* (*Hedychium flavescens*), Christmas berry (*Schinus terebinthifolius*), wattle (*Acacia parramattensis*), mock orange *Philadelphus inodorus* var. *grandiflorus*), swamp mahogany (*Eucalyptus robusta*), and garden nasturtium (*Tropaeolum majus*).

3) Urban — This vegetation association comprises the vegetables, flowers, lawn grasses, and ornamental trees and shrubs used to landscape houses, public buildings, parks, and streets; along with the weeds that normally grow in these inhabited areas. Examples of these species include eucalyptus (*Eucalyptus* spp.), snow bush (*Breynia nivosa*), tree fern (*Cyathea* sp.), cherry (*Prunus* sp.), lily-of-the-Nile (*Agapanthus praecox* subsp. *orientalis*), and Kikuyu grass (*Pennisetum clandestinum*). Native plants such as ‘*ohi’a* (*Metrosideros polymorpha* Gaud.) and ‘*akia* or *kauhi* (*Wikstroemia pulcherrima*), ‘*ilima* (*Sida fallax*) and *pohinahina* (*Vitex rotundfolia*) have been used to landscape part of the main street through town. Further, extensive plantings of native plants have been made at Ulu La’au Park (WOC, undated) that were not present in 2000. Only species located close to the existing Ke Ala Kahawai o Waimea (WTG trail) have been added to our updated list. The urban weeds are mostly the same as those found in the other vegetative communities in the project area.

No attempt has been made to compile a list of the species of this vegetative community as it is beyond the scope of the survey as it will not be directly impacted by the proposed project. It is mentioned here primarily for completeness as the trail will pass through part of the town, but will generally

follow established sidewalks and roads. The 2010 survey did not visit all of the urban environment traversed in 2000. However, a recent survey of trees located along the proposed WTG (Kraus, 2009) assesses impacts to these elements of the urban vegetation. Trees identified by the arborist have been added to the flora listing.

Vertebrates

Given the alien dominated vegetation along the entire corridor of the proposed project it is not surprising that the vast majority of the avian and mammalian species present within the project area are alien to the Hawaiian Islands. What few native avian species utilize resources within the general project area are all indigenous migratory species that spend the late fall and winter months in Hawaii and the Tropical Pacific, and returning to the high Arctic in the spring to breed and nest.

Waikoloa Stream System Description

Many of the streams draining the upper southern slope of Kohala Mountain, where median annual rainfall is 1270 mm (50 in) or more, flow towards the south or southwest until they encounter the interface between Kohala Mountain and Mauna Kea. The more easterly of these streams become tributary to Waiulaula Gulch, and the erosive power from these intermittent inputs have created a ravine that is, in places, 12 to 15 m deep. However, in many places, down-cutting has been considerably less, possibly reflecting highly resistant strata. The moderately steep slope of the mountain, flashy flows from infrequent heavy rains, and the nature of the geological formation (layers of highly porous and highly dense, non-porous rock) all contribute to a process of braiding of the stream channels. That is, water flows can diverge then reconnect further downslope. This process is more characteristic of the stream channels located below the project area (AECOS Consultants, 2000).

The two largest tributaries of Waiulaula Gulch are Waikoloa and Keanu'i'omanō Streams, which are perennial in their upper reaches. These two streams come together below the project area, and the proposed greenway route mostly follows the more southerly branch, Waikoloa, only crossing Keanu'i'omanō at the lower end of the proposed trail. The Hawaii Stream Assessment (Hawaii Cooperative Park Service Unit, 1990) lists Waikoloa Stream (state code No. 8-5-03) as a perennial stream in which the flow is interrupted (that is, not flowing year round at lower elevations). Presumably, the designation of "Waikoloa" in

much of that document is intended to encompass all of the watershed (Waiulaula Gulch, and both Waikoloa and Keanu'i'omanō streams).

The Park Service Unit report rates Hawaiian perennial streams on a number of characteristics using a four-point scale. Waikoloa Stream is rated “L” for limited (lowest ranking) under aquatic resources (it is ranked “W” for “without resources” in the section on Aquatic Resources) and “O” or outstanding for cultural resources. It is not ranked for either recreational or riparian resources. The stream is also indicated as having a palustrine wetland associated with it, but the location of this wetland is not indicated. No wetlands of any consequence or wetlands different from wet areas within the stream banks were observed in the project area.

The “limited” aquatic resources ranking is based upon various reports providing information on the biota in Waikoloa Stream. With respect to the lack of a rating for riparian resources, further detail is provided in the Hawaii Stream Assessment indicating that none of the stream flows through native forest and wild pig (*Sus scrofa*) is potentially a problem species (detrimental animal) in this environment. Although Waikoloa Stream is not given a recreational resources score because opportunities for camping, hiking, fishing, swimming, boating, hunting, and scenic views are presently few, future plans for Waikoloa Stream would significantly alter the relationships between residents and visitors to this unique part of the Hawai'i and the local water course.

A summary of information for the stream system in the project area and adjacent streams on this part of the Big Island is given as Table 2 in *AECOS* (2001). This table provides a systematic approach to listing multi-branched streams and gulches, stream resources, and stream survey information that can be somewhat difficult to interpret, and therefore is not included in this revised report. More recent stream surveys, particularly Englund, Preston, and Arakaki (2002), provide detailed references for assessing impacts of the WTG on stream resources in Waimea.

Field Survey Results

Flora

The vascular flora of the project site comprises a mix of native and introduced species of trees, shrubs, grasses, and forbs; consisting of 175 taxa in 62 families. Twelve of the 175 taxa (7%) are considered native (4 endemic, 8 indigenous), but are common, widely distributed species. The remaining 163 taxa (93%) are

naturalized, non-native species, including three that probably were brought to the islands by the early Polynesian emigrants and have since become naturalized (Table 1).

Table 1. Status of plant species in the project survey area.

	Native	Naturalized	Total
Pteridophyta	2 (33.3%)	4 (66.6%)	6
Gymnospermae	0 (0.00%)	2 (100%)	2
Dicotyledonae	8 (6.4%)	116 (93.5%)	124
Monocotyledonae	2 (4.6%)	41 (95.3%)	43
TOTAL	12 (6.8%)	163 (93.1%)	175

The following checklist (Table 2) was compiled from observations made by Herbst on May 22-23, 2000 and by Guinther on September 10, 2010 on the WTG corridor. The entries are arranged alphabetically under their family names and include the scientific name, the common name, and the status of the species (i.e., native or non-native). Synonyms which occur in recent Hawaiian literature are included under the currently accepted name. In addition, an arborist examined and tagged a total of 498 large trees in the project area. The vast majority of these trees were eucalyptus (*E. robusta* and *E. saligna*) and black wattle (Kraus, 2009).

Table 2. Annotated Checklist of the vascular plants of the Waimea Trails and Greenways Project Site, Kamuela, Island of Hawai'i; modified to reflect results from September 2010.

SCIENTIFIC NAME	(common name)	STATUS	Notes
PTERIDOPHYTA			
BLECHNACEAE (blechnum fern family)			
<i>Blechnum occidentale</i> L.	(hammock fern)	X	--
DRYOPTERIDACEAE (sword fern family)			
<i>Diplazium sandwichianum</i> (Presl) Diels	(ho'i'o)	E	--
LINDSAEACEAE (lace fern family)			
<i>Odontosoria chinensis</i> (L.) J. Sm.	(pala'a, lace fern)	I	--

Table 2 (continued).

SCIENTIFIC NAME	(common name)	STATUS	Notes
PTERIDACEAE (pteris fern family)			
<i>Adiantum raddianum</i> Presl.	('iwa'iwa, maidenhair fern)	X	--
<i>Adiantum hispidulum</i> Sw.	(five-finger maidenhair fern)	X	<1>
THELYPTERIDACEAE (maiden fern family)			
<i>Thelypteris dentata</i> (Forsk.) St. John	(downy wood fern)	X	<1>
GYMNOSPERMAE			
ARAUCARIACEAE			
<i>Araucaria columnaris</i> (G. Forster) J.D. Hook.	(Cook-pine)	X	<2, 3>
TAXODIACEAE			
<i>Taxodium</i> sp.	cypress	X	<2, 3>
ANGIOSPERMAE			
DICOTYLEDONAE			
ACANTHACEAE (acanthus family)			
<i>Asystasia gangetica</i> (L.) T. Anderson	(Chinese violet)	X	--
<i>Dicliptera chinensis</i> (L.) Juss.	---	X	<2>
AMARANTHACEAE (amaranth family)			
<i>Amaranthus spinosus</i> L.	(spiny amaranth)	X	--
<i>Amaranthus viridis</i> L.	(slender amaranth)	X	<1>
ANACARDIACEAE (mango family)			
<i>Schinus terebinthifolius</i> Raddi	(Christmas berry)	X	<1,3>
APIACEAE (parsley family)			
<i>Foeniculum vulgare</i> Mill.	(fennel)	X	--
<i>Petroselinum crispum</i> (Mill.) A.W.Hill	(parsley)	X	--
ASTERACEAE (sunflower family)			
<i>Ageratina adenophora</i> (Spreng.) R. King & H. Robinson	(Maui pamakani)	X	<1>
<i>Bidens pilosa</i> L.	(Spanish needle)	X	<1>
<i>Bidens alba</i> (L.) DC	---	X	<2>
<i>Centaurea melitensis</i> L.	(Napa or star thistle)	X	--
<i>Cirsium vulgare</i> (Savi) Ten.	(bull thistle)	X	<1>
<i>Conyza bonariensis</i> (L.) Cronq.	(hairy horseweed)	X	<1>
<i>Conyza canadensis</i> var. <i>pusilla</i> (Nutt.) Cronq.	(horseweed)	X	<1>

Table 2 (continued).

SCIENTIFIC NAME	(common name)	STATUS	Notes
ASTERACEAE (continued)			
<i>Crassocephalum crepidioides</i> (Benth.) S. Moore	---	X	<2>
<i>Delairea odorata</i> Lem.	(German or Italian ivy)	X	<1>
<i>Emilia fosbergii</i> Nicolson	(Flora's paintbrush)	X	--
<i>Erechtites valerianifolia</i> (Wolf) DC	(fireweed)	X	--
<i>Erigeron bellioides</i> DC	(fleabane)	X	--
<i>Galinsoga parviflora</i> Cav.	---	X	--
<i>Galinsoga quadriradiata</i> Ruiz & Pav.	(Peruvian daisy)	X	<1>
<i>Gamochaeta purpurea</i> (L.) Cabr.)	(purple cudweed)	X	<1>
<i>Hypochoeris radicata</i> L.	(hairy cat's ear, gosmore)	X	<1>
<i>Pluchea carolinensis</i> (Jacq.) G. Don	(sourbush)	X	<1>
<i>Senecio madagascariensis</i> Poir	---	X	<1>
<i>Sonchus oleraceus</i> L.	(sow thistle)	X	<1>
<i>Spagneticola trilobata</i> (L.) Pruski	wedelia	X	<2>
<i>Taraxacum officinale</i> W.W. Weber	(dandelion)	X	<1>
<i>Tridax procumbens</i> L.	(coat buttons)	X	--
<i>Verbesina encelioides</i> (Cav.) Benth. & Hook.	(golden crown-beard)	X	<1>
BALSAMINACEAE (touch-me-not family)			
<i>Impatiens wallerana</i> J.D. Hook.	(busy Lizzie, touch-me-not)	X	--
BASELLACEAE (basella family)			
<i>Anredera cordifolia</i> (Ten.) Steenis	(Madeira vine, 'uala hupe)	X	<1>
BRASSICACEAE (mustard family)			
<i>Capsella rubella</i> Reut.	(shepherd's purse)	X	--
<i>Cardamine flexuosa</i> With.	(bittercress)	X	<1>
<i>Lepidium virginicum</i> L.	(pepperwort)	X	<1>
<i>Lobularia maritima</i> (L.) Desv.	(sweet alyssum)	X	--
<i>Raphanus sativus</i> L.	(radish)	X	--
<i>Sisymbrium officinale</i> (L.) Scop	(hedge mustard)	X	--
BUDDLEIACEAE (butterfly bush family)			
<i>Buddleia asiatica</i> Lour.	(dog tail)	X	<1>
<i>Buddleia madagascariensis</i> Lam.	(smoke bush)	X	<1>
CACTACEAE (cactus family)			
<i>Opuntia ficusindica</i> (L.) Mill.	(panini, prickly pear, papipi)	X	<1>

Table 2 (continued).

SCIENTIFIC NAME	(common name)	STATUS	Notes
CAPRIFOLIACEAE (honeysuckle family)			
<i>Sambucus mexicana</i> K.Presl ex A.DC	(Mexican elder)	X	<1>
CARYOPHYLLACEAE (pink family)			
<i>Petrorhagia velutina</i> (Guss.) P.Ball & Heyw.	(Childing pink)	X	--
<i>Polycarpon tetraphyllum</i> (L.) L.	---	X	<1>
<i>Silene gallica</i> L.	(small-flowered catchfly)	X	--
CASUARINACEAE (she-oak family)			
<i>Casuarina equisetifolia</i> L.	(common ironwood)	X	<1,3>
CELASTRACEAE			
<i>Elaeodendron orientale</i> Jacq.	(false olive)	O	<4>
CHENOPODIACEAE (goosefoot family)			
<i>Atriplex semibaccata</i> R.Br.	(Australian saltbush)	X	--
<i>Chenopodium carinatum</i> R.Br.	---	X	<2>
<i>Chenopodium murale</i> L.	('aheahea, goosefoot)	X	<1>
<i>Salsola tragus</i> L.	(Russian thistle, tumbleweed)	X	--
CONVOLVULACEAE (morning-glory family)			
<i>Ipomoea indica</i> (J. Burm.) Merr.	(koali 'awa, koali 'awahia)	I	<1>
<i>Ipomoea obscura</i> (L.) Ker-Gawl.	---	X	<2>
CRASSULACEAE (orpine family)			
<i>Bryophyllum pinnatum</i> (Lam.) Oken	(air plant)	X	<1>
CUCURBITACEAE (gourd family)			
<i>Sechium edule</i> (Jacq.) Sw.	(pipinell, chayote)	X	--
EUPHORBIACEAE (spurge family)			
<i>Aleurites moluccana</i> (L.) Willd.	(kukuī)	P	<2>
<i>Chamaesyce hirta</i> (L.) Millsp.	(hairy spurge)	X	<1>
<i>Chamaesyce prostrata</i> (Aiton) Small	(prostrate spurge)	X	<1>
<i>Ricinus communis</i> L.	(castor bean)	X	<1>
FABACEAE (pea family)			
<i>Acacia parramattensis</i> Tind.	---	X	<1>
<i>Acacia mearnsii</i> De Wild.	(black wattle)	X	<3>

Table 2 (continued).

SCIENTIFIC NAME	(common name)	STATUS	Notes
FABACEAE (continued)			
<i>Acacia koa</i> A. Gray	(koa)	X	<3>
<i>Chamaecrista nictitans</i> (L.) Moench	(partridge pea)	X	<2>
<i>Desmodium sandwicense</i> E. Mey.	(Spanish clover, pua pilipili)	X	<1>
<i>Erythrina sandwicensis</i> Degener	(wiliwili)	E	<1>
<i>Neonotonia wightii</i> (Wight & Arnott) Lackey	(glycine vine)	X	<1>
<i>Indigofera suffruticosa</i> Mill.	('iniko, indigo)	X	<1>
<i>Macroptilium lathyroides</i> (L.) Urb.	(wild bean, cow pea)	X	<1>
<i>Melilotus alba</i> Medik.	(white sweet clover)	X	--
<i>Trifolium dubium</i> Sibth.	(small hop-clover)	X	<1>
<i>Trifolium repens</i> L. var. <i>repens</i>	(white clover)	X	<1>
GENTIANACEAE (gentian family)			
<i>Centaurium erythraea</i> Raf. ssp. <i>erythraea</i>	(bitter herb)	X	--
GERANIACEAE (geranium family)			
<i>Erodium cicutarium</i> (L.) L'Her.	(alfalaria, pin clover)	X	<1>
<i>Geranium homeanum</i> Turcz.	(cranesbill)	X	<1>
HYDRANGEACEAE (hydrangea family)			
<i>Philadelphus inodorus</i> var. <i>grandiflorus</i> (Willd.) A. Gray	(mock orange)	X	--
LABIACEAE (mint family)			
<i>Stachys arvensis</i> L.	(staggerweed)	X	--
LYTHRACEAE (loosestrife family)			
<i>Cuphea carthagenensis</i> (Jacq.) Macbr.	(tarweed)	X	<1>
<i>Lythrum maritimum</i> Kunth	(pukamole, ninika)	X	--
MALVACEAE (hibiscus family)			
<i>Abutilon grandifolium</i> (Willd.) Sweet	(hairy abutilon)	X	<2>
<i>Malva parviflora</i> L.	(cheese weed)	X	--
<i>Malvastrum coromandelianum</i> (L.) Garcke ssp. <i>coromandelianum</i>	(false mallow)	I	<1>
<i>Sida fallax</i> Walp.	('ilima)	I	<1>
<i>Sida rhombifolia</i> L.	---	X	<1>
<i>Sida spinosa</i> L.	(prickly sida)	X	<2>

Table 2 (continued).

SCIENTIFIC NAME	(common name)	STATUS	Notes
MYRTACEAE (myrtle family)			
<i>Eucalyptus camaldulensis</i> Dehnh.	(river red gum)	X	<1>
<i>Eucalyptus globulus</i> Labill.	(blue gum)	X	<1, 3>
<i>Eucalyptus pilularis</i> Sm.	(blackbutt)	X	<3>
<i>Eucalyptus robusta</i> Sm.	(swamp mahogany)	X	<1, 3>
<i>Eucalyptus saligna</i> Sm.	(Sydney blue gum)	X	<4>
<i>Psidium cattleianum</i> Sabine	(strawberry guava)	X	--
<i>Psidium guajava</i> L.	(common guava)	X	<1>
<i>Rhodomyrtus tomentosa</i> (Aiton) Hassk.	(downy myrtle)	X	<2>
NYCTAGINACEAE (four-o'clock family)			
<i>Bougainvillea spectabilis</i> Wild.	(Bougainvillea)	X	<2>
<i>Mirabilis jalapa</i> L.	(four-o'clock)	X	<1>
OLEACEAE (olive family)			
<i>Olea europaea</i> spp. <i>cuspidata</i> (Wall. ex G. Don) Ciferri	(olive, 'oliwa)	X	<1>
ONAGRACEAE (evening primrose family)			
<i>Ludwigia octovalvis</i> (Jacq.) Raven	(primrose willow, <i>kamole</i>)	P?	<1>
OXALIDACEAE (wood sorrel family)			
<i>Oxalis corniculata</i> L.	(yellow wood sorrel)	P?	<1>
<i>Oxalis debilis</i> var. <i>corymbosa</i> (DC) Lourt.	(pink wood sorrel)	X	--
PAPAVERACEAE (poppy family)			
<i>Argemone glauca</i> (Prain) Pope var. <i>glauca</i>	(pua kala)	E	--
PITTIOSPORACEAE (pittosporum family)			
<i>Pittosporum undulatum</i> Venten.	(Victorian box)	X	--
PLANTAGINACEAE (plantain family)			
<i>Plantago lanceolata</i> L.	(narrow-leaved plantain)	X	<1>
<i>Plantago major</i> L.	(common plantain)	X	<1>
POLYGONACEAE (buckwheat family)			
<i>Persicaria punctata</i> (Elliot) Small	(water smartweed)	X	<1>
Synonym = <i>Polygonum punctatum</i> Elliot			

Table 2 (continued).

SCIENTIFIC NAME	(common name)	STATUS	Notes
PORTULACACEAE (purslane family)			
<i>Portulaca oleracea</i> L.	(purslane, pigweed)	X	<1>
<i>Portulaca pilosa</i> L.	(purslane)	X	--
PROTEACEAE (protea family)			
<i>Grevillea robusta</i> R. Br.	(silk oak)	X	--
ROSACEAE (rose family)			
<i>Eriobotrya japonica</i> (Thunb.) Lindl.	(loquat)	X	
<i>Prunus serrulata</i> Lindl.	(Japanese flowering cherry)	X	
<i>Rubus argutus</i> Link	(prickly Florida blackberry)	X	--
<i>Rubus rosifolius</i> Sm.	(thimbleberry)	X	--
SCROPHULARIACEAE (figwort family)			
<i>Castilleja arvensis</i> Cham. & Schlechtend.	(Indian paintbrush)	X	--
<i>Lophospermum erubescens</i> D.Don	(larger roving sailor)	X	
SOLANACEAE (nightshade family)			
<i>Nicandra physalodes</i> (L.) Gaertn.	(apple of Peru)	X	--
<i>Physalis peruviana</i> L.	(<i>poha</i> , ground cherry)	X	<1>
<i>Solanum americanum</i> Mill.	(<i>popolo</i> , glossy nightshade)	I?	--
<i>Solanum linnaeanum</i> Hepper & P.Jaeger	(apple of Sodom)	X	<1>
STERCULIACEAE (cocoa family)			
<i>Waltheria indica</i> L.	(<i>uhaloa</i>)	I	<1>
THYMELAEACEAE ('akia family)			
<i>Wikstroemia pulcherrima</i> Skottsb.	(<i>'akia</i> , kauhi)	E	<1>
TROPAEOLACEAE (nasturtium family)			
<i>Tropaeolum majus</i> L.	(garden nasturtium)	X	<1>
TURNERACEAE (turnera family)			
<i>Turnera ulmifolia</i> L.	(yellow alder)	X	--
URTICAEAE (nettle family)			
<i>Pilea microphylla</i> (L.) Liebm.	(artillery plant)	X	<1>

Table 2 (continued).

SCIENTIFIC NAME	(common name)	STATUS	Notes
VERBENACEAE (verbena family)			
<i>Lantana camara</i> L.	(lantana)	X	<1>
<i>Stachytarpheta cayennensis</i> (Rich.) Vahl	(stachytarpheta)	X	--
<i>Verbena litoralis</i> Kunth	(<i>owi, oi</i>)	X	<1>
MONOCOTYLEDONEAE			
AGAVACEAE (agave family)			
<i>Phormium tenax</i> J.R.Forster & G.Forster	(New Zealand flax)	X	<1>
<i>Yucca gloriosa</i> L.	(Spanish bayonet, yucca)	X	<1>
ARACEAE (aroid family)			
<i>Monstera deliciosa</i> Lieb	(monstera)	X	--
<i>Xanthosoma roseum</i> Schott	---	X	<1>
CANNACEAE (canna family)			
<i>Canna indica</i> L.	(canna)	X	<1>
COMMELINACEAE (spiderwort family)			
<i>Commelina diffusa</i> N.L. Burm.	(honohono)	X	<1>
<i>Tradescantia fluminensis</i> Vellozo	(wandering Jew)	X	--
CYPERACEAE (sedge family)			
<i>Cyperus gracilis</i> R. Br.	(McCoy grass)	X	--
<i>Cyperus involucratus</i> Rottb.	(umbrella plant)	X	--
<i>Cyperus polystachyos</i> Rottb.	---	I	<1>
<i>Kyllinga brevifolia</i> Rottb.	(kili'o'opu)	X	<1>
<i>Schoenoplectus lacustris</i> ssp. <i>validus</i> (Vahl) T. Koyama	('aka'akai, great bulrush)	I	<1>
IRIDACEAE (iris family)			
<i>Crocasmia crocosmiiflora</i> (E. Morr.) N.E. Brown	(montbretia)	X	--
<i>Gladiolus dalenii</i> van Geel	(gladiolus)	X	--
LILIACEAE (lily family)			
<i>Asparagus densiflorus</i> (Kunth) Jessop	(asparagus fern)	X	<2>
<i>Zephyranthes grandiflora</i> Lindley	(wind lily)	X	--

Table 2 (continued).

SCIENTIFIC NAME	(common name)	STATUS	Notes
POACEAE (grass family)			
<i>Arundo donax</i> L.	(Spanish reed)	X	<1>
<i>Avena barbata</i> Pott ex Link	---	X	--
<i>Bothriochloa pertusa</i> (L.) A. Camus	(pitted beardgrass)	X	<2>
<i>Bromus catharticus</i> Vahl	(rescue grass)	X	<1>
<i>Chloris gayana</i> Kunth	(Rhodes grass)	X	<1>
<i>Cynodon dactylon</i> (L.) Pers.	(Bermuda grass)	X	<1>
<i>Digitaria ciliaris</i> (Retz.) Koeler	(Henry's crabgrass)	X	<1>
<i>Digitaria</i> sp.		X	<2>
<i>Eleusine indica</i> (L.) Gaertn.	(wire grass)	X	<1>
<i>Eragrostis tenuifolia</i> (A. Rich.) Steud.	---	X	<1>
<i>Lolium perenne</i> L.	(perennial ryegrass)	X	<1>
<i>Melinis minutiflora</i> P. Beauv.	(molasses grass)	X	<1>
<i>Melinis repens</i> (Willd.) Zizka	(Natal redtop)	X	<1>
<i>Panicum maximum</i> Jacq.	(Guinea grass)	X	<1>
<i>Paspalum conjugatum</i> Bergius	(Hilo grass)	X	--
<i>Paspalum urvillei</i> Steud.	(Vasey grass)	X	<1>
<i>Pennisetum clandestinum</i> Chiov.	(Kikuyu grass)	X	<1>
<i>Pennisetum purpureum</i> Schumach.	(Napier grass)	X	<1>
<i>Pennisetum setaceum</i> (Forssk.) Chiov.	(fountain grass)	X	<1>
<i>Poa annua</i> L.	(annual bluegrass)	X	<1>
<i>Saccharum officinarum</i> L.	(sugar cane)	P	--
<i>Setaria gracilis</i> Kunth	(yellow or perennial foxtail)	X	<1>
<i>Setaria palmifolia</i> (J. Koenig) Stapf	(palmgrass)	X	<1>
<i>Setaria verticillata</i> (L.) P. Beauv.	(bristly foxtail)	X	--
<i>Sporobolus africanus</i> (Poir.) Robyns & Tournay	(smutgrass)	X	--
<i>Vulpia myuros</i> (L.) C.C.Gmelin	(rat tail fescue)	X	--
ZINGIBERACEAE (ginger family)			
<i>Hedychium flavescens</i> Roscoe	(yellow ginger)	X	<1>

EXPLANATION OF TABLE 2 COLUMN HEADINGS AND SYMBOLS:

STATUS:

E = endemic (native to the Hawaiian Islands and not occurring naturally elsewhere).

I = indigenous (native to the Hawaiian Islands and elsewhere).

P = Polynesian introduction.

X = naturalized exotic (non-native species of accidental or deliberate introduction).

Table 2 (continued).

NOTES:

<1> = Observed in both 2000 and 2010 surveys.

<2> = Observed in 2010 survey, but not reported in 2000 survey.

<3> = Noted by the arborist (Kraus, 2009).

<4> = These reported species (Kraus, 2009) may be the same plants as reported previously (AECOS, 2001): *Elaeodendron orientale* = *Olea europaea* spp. *cuspidata*; *Eucalyptus saligna* = *E. globulus*; *Acacia mearnsii* = *A. paramattensis*; *Eucalyptus pilularis* = *E. camaldulensis*.

Stream Hydrology

Although Waikoloa is listed as a perennial stream (Hawaii Cooperative Park Service Unit. 1990), its flow characteristics are complex. Within the project area, the stream is interrupted, consisting of isolated pools that link together during rainy periods to form a more continuous aquatic feature. There are ample outcrops of bedrock that accumulate pooled water, and some large pools may be seep or spring fed. Even during periods when water is flowing within the stream bed in the project area, it is not often that this flow continues as surface flow all the way to the ocean. Freshet flows of such a magnitude occur very infrequently. Further complicating the situation, at least as observed during our 2000 surveys, was a leaking pipe located near Puu Opele Road (Fig. 3). This pipe appears to be used for moving irrigation water from storage reservoirs upslope on Kohala Mountain to Parker Ranch lands southeast of the stream, and turned on for intermittent periods each day. Water leaking from this pipe on 2000 was sufficient to establish flow much of the way to the lower end of the proposed Trails and Greenways corridor near South Kohala Estates Subdivision.

Water Quality

Water within Waikoloa Stream at the times of our field surveys consisted of either standing, isolated pools or flowing water clearly arising from a leak in a transmission pipe across the stream — the origin of this water was not investigated. Consequently, water samples representing the stream in the project area” were collected from Keanu’i’omanö Stream under the Route 19 highway bridge (Waiaka Bridge) on two separate occasions as indicated in Table 5. This location is upstream of the lower end of the proposed Trails and Greenways corridor.



Figure 3. Right bank of Waikoloa Stream near Puu Opelu Rd. Water transmission pipe that was the source of most of the flow observed in 2000 below this point appears in background. No flow was occurring at this time (June 5, 10:25 AM), although flow started sometime within the next 30 minutes.

The water quality results show stream water of exceptional quality. All of the values are close to or within the normal range for streams with minimal anthropogenic influences. Turbidity is very slightly elevated, as is the total nitrogen (TN). Hawaii Administrative Rules (HAR) §11-54-05.2 (State water quality regulations) establish that a dry season turbidity mean value should be under 2.0 and TN mean should be under 200 $\mu\text{g N/l}$ for compliance. Note that these are average values (geometric means, actually) and therefore the fact that our values are close to these “limits,” only suggest that the stream water quality may be just over or just under these specific standards if additional samples were collected over time. All other values measured are below the respective standards. Turbidity and total N standards are least often met by streams in the State of Hawai‘i.

Table 3. Some basic water quality characteristics of Keanu‘i‘omanō Stream, Island of Hawai‘i (2000).

	Time sampled	Location	pH (pH units)	Cond. (µmhos/cm)	Turb. (ntu)	TSS (mg/l)	
Sta. 1							
	5-23-00	14:30	Rte. 19	----	32.4	----	1.2
	6-06-00	13:45	“	7.36	35.6	2.46	1.4

	Time sampled	Location	Nitrate + nitrite (µg N/l)	Ammonia (µg N/l)	Total N (µg N/l)	Total P (µg P/l)	
Sta. 1							
	5-23-00	14:30	Rte. 19	----	----	199	17
	6-06-00	13:45	“	4	2	191	24

---- Analysis not done (sample for this analysis not collected at this date/time)

Considering the elevation (over 700 m or 2300 ft ASL) of the project area compared with most stream systems in the Hawaiian Islands, it was thought stream temperature recordings would be of some interest. Because small, natural streams typically reflect local air temperature with moderation of daytime extremes, the cooler climate of the Waimea area should result in cooler water temperatures, even during the “summer” months. Recording temperature probes were placed in Waikoloa Stream in a deep, isolated pool near the upper end of the project area and in flowing water under the highway bridge on Keanu‘i‘omanō Stream (Sta. 1). Results are summarized in Table 4.

Table 4. Summary of temperature (°C) recording probe setup in Waikoloa and Keanu‘i‘omanō streams, June 2000.

RECORDING PROBE	MEAN ± STD. DEV.	MIN	MAX	N ~ (DAYS)
Waikoloa Stream				
May 22-23, 2000	16.2 ± 0.14	16.0	16.3	96 (2)
Keanu‘i‘omanō Stream				
May 22-23, 2000	18.8 ± 2.22	16.6	24.4	84 (2)
June 5 - 6, 2000	19.0 ± 3.58	17.1	36.5	110 (2)

The difference in temperature between the recording made in Waikoloa Stream (at 815 m ASL) and that in Keanu'i'omanō Stream (a 735 m ASL) partly reflects the differences in elevation of the two sites and the minimal solar input at the Waikoloa site. The Waikoloa Stream site is a moderately deep, shaded pool that barely changed temperature over 24 hrs (Fig. 4), whereas the probe in flowing Keanu'i'omanō Stream, demonstrates a typical diurnal cycle of daytime warming of some 8 C° on May 22-23 (Table 4).

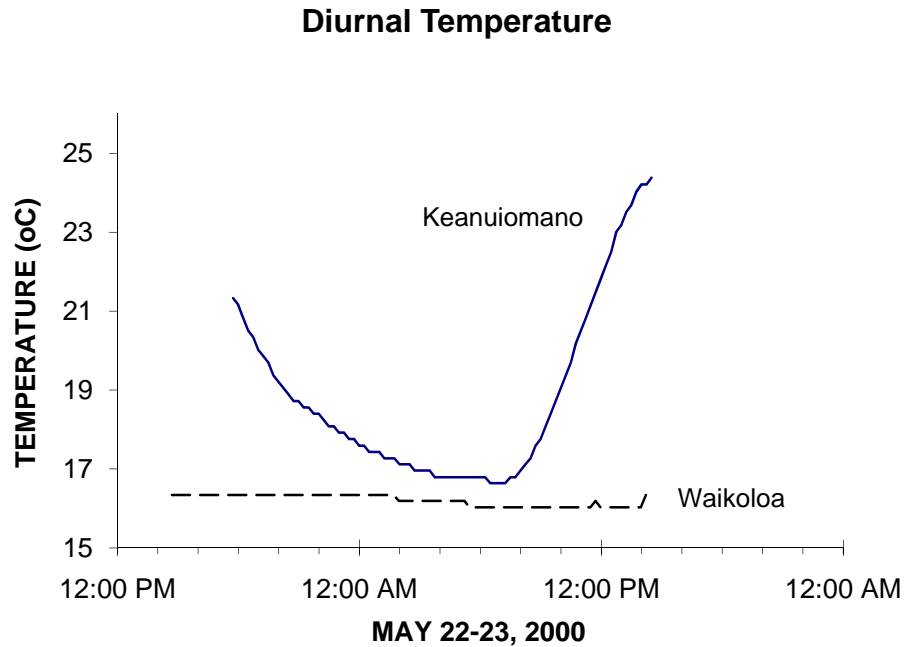


Figure 4. Temperature recordings for May 22-23, 2000 in Waikoloa and Keanu'i'omanō Streams near Kamuela.

The temperature recorded on June 5-6,2000 at the Keanu'i'omanō Stream location (Fig. 5) provided a curious mix, with June 5 showing minimal diurnal variation and June 6 temperature rising steeply through the day, even more steeply than was the case on May 23. Although variation in solar input (cloudy vs. cloudless day) might explain the difference, a more likely cause is variation in stream flow related to stream withdrawals or inputs further up slope. A USGS gaging station (No. 16756500) located on Keanu'i'omanō Stream just upstream of the Waiaka Bridge might provide a record of the variation.

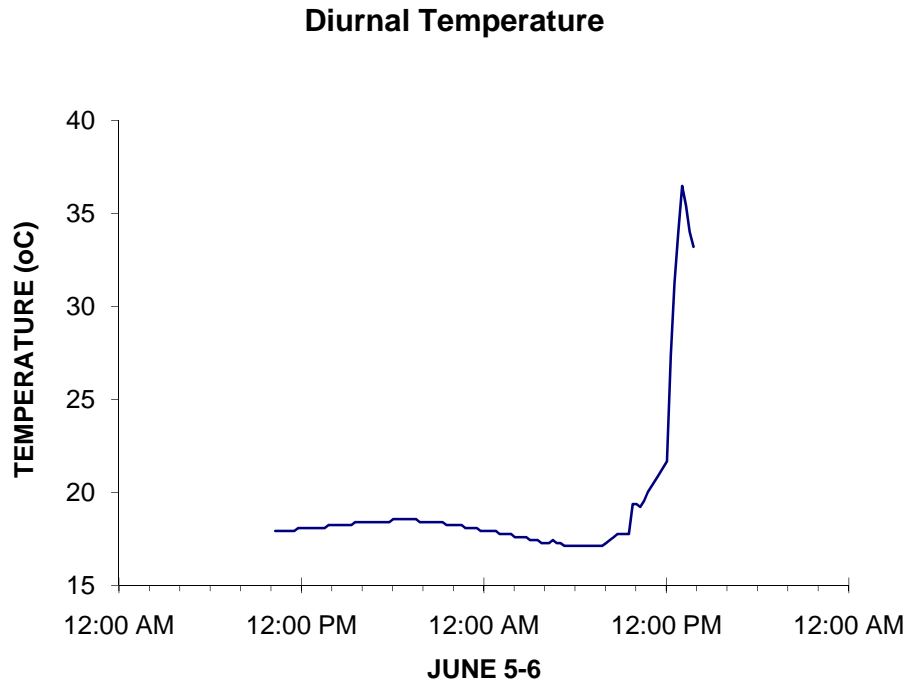


Figure 5. Temperature recording for June 5-6, 2000 in Keanu‘i‘omanō Stream near Kamuela.

Aquatic Biota

Although flowing water of good volume was present in Waikoloa Stream at times during the 2000 field survey, flow was limited to the stream segment below a water transmission pipe (Fig. 3, above) to a point not far downstream from the County landfill (at least 2 km or 1.2 mi along the stream bed). Most of the stream bed of Waikoloa Stream, however, is cutting downward through highly resistant basalt, and basins and potholes are plentiful, capturing the intermittent flow and/or water from rains in pools of various sizes and permanence all along the reach within the project area. Below Waimea Town, Waikoloa Stream becomes increasingly dry during all but major storm flows (freshets). That the stream loses considerable erosive power downstream is very evident by the stream bed becoming clogged with sediment and vegetation before it joins Keanu‘i‘omanō Stream (see AECOS Consultants, 2000).

A December 2001 survey was made of Waikoloa and Keanu‘i‘omanō streams by Englund, Preston, and Arakaki (2002) for the DHHL Lālāmilo Project, located at the west end of the WTG project. Stream areas surveyed extended upstream into Waimea Town, thus encompassing all of the WTG project area. At the time of this survey both streams were described as “fully flowing.” Aquatic insect sampling was emphasized, using the methodology described in Englund and Preston (1999).

Given the intermittent nature of the flowing water, the aquatic macrofauna of this stream system within the project area is rather sparse. Clearly, aquatic insects with their adult stage capable of long-distance dispersion, have the best opportunity to colonize the isolated bodies of water encountered, and a significant portion of the fauna listed in Table 5 is aquatic insects. Adult dragonflies, both green darner (*Anax junius*) and globe skimmer (*Pantala flavescens*), were regularly encountered flying along the stream bed. Much less often seen, perhaps because of strong winds during the field visits, were bluet damselflies (*Enallagma civile*). A native *Megalagrion* (*M. blackburni*) damselfly was encountered in 2000 along Waikoloa Stream at elevations near 760 m (2500 ft) ASL, within the project area. This species is a relatively strong flier, and adults are often observed far from breeding streams. Immatures of this species prefer swift stream waters (Polhemus and Asquith, 1996), and most of the population lives further upslope from the project area.

Sampling for damselflies (Odonata) was of particular interest in both the 2000 and 2001 stream surveys because two endemic Hawaiian species are now listed as endangered (USFWS, 2010a) and a number of others are under consideration for listing. The two species of *Megalagrion* listed as endangered are the Flying Earwig Hawaiian Damselfly (*M. nesiotetes*) and Pacific Hawaiian Damselfly (*M. pacificum*; USFWS, 2010a). Four species of *Megalagrion* are candidate species (USFWS, 2009): *M. leptodemus*, *M. nigrohamatum nigrolineatum*, *M. oceanicum*, and *M. xanthomelas*. The first three are O‘ahu endemics, only known from that island. *M. xanthomelas*, the orangeblack Hawaiian damselfly, is locally abundant on Moloka‘i, Lana‘i, and Hawai‘i. This species tends to breed in coastal wetlands fed by basal springs or in the lower reaches of perennial streams, although will opportunistically exploit temporary pools bordering flashy streams. Eggs are laid on aquatic vegetation (Polhemus and Asquith, 1996).

Historically, the flying earwig Hawaiian damselfly (*M. nesiotetes*) was known from the islands of Hawai‘i and Maui. The species has not been seen on Hawai‘i for over 80 years, although extensive surveys within apparently suitable habitat in the Ka‘u and Ola‘a areas were conducted from 1997 to 2008. The last observation of the species on Maui was in 2005, despite surveys from 1993 through 2008 at several of its historically occupied sites. The 2005 population

was associated with *uluhe* fern on a rocky talus slope (USFWS, 2009a). Not much is known about the breeding biology of *M. nesiotes*; what is known suggests this species breeds in “scattered pockets of water [in the forest] or in the bases [leaf axils] of leaves of tropical plants” (Perkins, related by Kennedy, 1934). Adults appear not to associate with streams, so an impact to this species from the trail project is very unlikely.

The Pacific Hawaiian damselfly (*M. pacificum*) is now believed to be extirpated from the islands of O‘ahu, Kaua‘i, and Lana‘i (Polhemus and Asquith, 1996). It was believed that the species had been extirpated from the Island of Hawai‘i when in 1998 a population was discovered within a small stream along the Hamakua Coast (Englund, 1998). *M. pacificum* breeds in seepage fed pools bordering the terminal reaches of perennial streams (Moore and Gagne, 1982; Polhemus and Asquith, 1996). They seem to prefer areas of dense vegetation, and seem not to stray far from breeding pools. This habitat is not present in the project area.

Aquatic snails, flatworms, and leeches are present in the stream in the project area, indicating some constancy of aquatic habitat, even if only as small, standing pools. The alga, *Spyrogyra* sp., is also prominent in some pools. No fishes of any kind were observed in the project area, although both guppies (*Poecilia reticulata*) and mosquitofish (*Gambusia affinis*) are reported from the streams here (Table 5). Further, surveys by DLNR-DAR (D. Kuamo‘o, Hawaii, pers. comm. cited in Englund et al., 2002) note that the endemic goby, ‘o‘opu ‘alamo‘o (*Lentipes concolor*) uses these stream channels to access the permanently flowing, upper reaches of Waikoloa and Keanu‘i‘omanō Streams. Apparently, ‘o‘opu ‘alamo‘ has been found in several permanent spring-fed pools downstream in Keanu‘i‘omanō Stream in or near the project area (D. Kuamo‘o, *ibid*).

Vertebrates

Birds — During the 2000 survey a total of 400 individual birds of 18 species, representing 11 separate families were detected during station counts (Table 8). An additional three species—Wild Turkey (*Meleagris gallopavo*), Barn Owl (*Tyto alba*), and Northern Mockingbird (*Mimus polyglottos*)—were recorded as incidental observations while transiting between station counts. During that survey two species, House Finch (*Carpodacus mexicanus*) and Sky Lark (*Alauda a. arvensis*), represented slightly more than 50% of the total number of birds detected. House Finch was the most common species detected during stations counts and accounting for 24% of the total number of birds recorded.

Table 5. Checklist of aquatic fauna observed or previously reported from Waiulaula Gulch, Waikoloa and Keanu'i'omanō streams.

Species	Common name	Status	QC Code	Abundance
ALGAE				
CHLOROPHYTA, ZYGNEMATALES	(green algae)			
ZYGNEMATACEAE				
<i>Spirogyra</i> sp.		?nat	10	A
INVERTEBRATES				
TURBELLARIA, TRICLADIDA	flatworms			
PLANARIIDAE				
indet.		nat	10	R
ANNELIDA, HIRUDINEA	leeches			
indet.		nat	10	C
MOLLUSCA, GASTROPODA	(mollusks)			
PHYSIDAE				
<i>Physa virgata</i>	pond snail	nat	10	U
ARTHROPODA, CRUSTACEA	(crustaceans)			
OSTRACODA				
indet.	clam shrimp		01	--
DECAPODA, ATYIDAE				
<i>Atyoida bisulcata</i> Randall	'opae kala'ole	end	01	--
ARTHROPODA, INSECTA	(insects)			
COLEOPTERA, DYTISCIDAE				
<i>Rhantus gutticollis</i>		nat	02	--
<i>Rhantus</i> cf. <i>pacificus</i> (Boisduval)	larvae	end	10	U
DIPTERA, CERATOPOGONIDAE				
<i>Forcipomyia hardyi</i>		end	02	--
DIPTERA, CHIRONOMIDAE				
<i>Chironomus</i> sp.		?end	02	--
<i>Cricotopus bicinctus</i> (Meigen)		nat	02	--
<i>Orthocladius grimshawi</i>		end	02	--
DIPTERA, EPHYDRIDAE				
<i>Scatella bryani</i>		end	02	--
<i>Scatella clavipes</i> (Wirth)		end	02	--
DIPTERA, MUSCIDAE				
<i>Lispe</i> sp.		end	02	--
ODONATA, AESHNIDAE				
<i>Anax junius</i> (Drury)	green darner	nat	10, 02	C
<i>Anax strenuous</i> Hagen	giant Hawaiian darner	end	02	--
ODONATA, LIBULELLIDAE				
<i>Crocothemis servilia</i> Drury	scarlet skimmer	nat	02	--
<i>Orthemis ferruginea</i> (Fabricius)		nat	02	--
<i>Pantala flavescens</i> (Fabricius)	globe skimmer, adult	ind	10	C

Table 5 (continued).

Species	Common name	Status	QC Code	Abundance
ODONATA, COENAGRIONIDAE				
<i>Enallagma civile</i> (Hagen)	bluet, adult	nat	10, 02	R
<i>Megalagrion blackburni</i> McLachlan	Blackburn's damselfly	end	21	R
VERTEBRATES				
(fishes)				
VERTEBRATA, PISCES				
POECILIIDAE				
<i>Poecilia reticulata</i> Peters	guppy, rainbow fish	nat	01	--
<i>Gambusia affinis</i> (Baird & Girard)	mosquitofish	nat	02	--
VERTEBRATA, AMPHIBIA				
BUFONIDAE				
<i>Rhinella marina</i> (L.)	cane toad, tadpole	nat	10	C
RANIDAE				
<i>Rana catesbeiana</i> Shaw	bullfrog, adult	nat	10	C

KEY TO SYMBOLS IN TABLE 5

Status:

- nat. - naturalized. An introduced or exotic species.
ind. - indigenous. A native species also found elsewhere in the Pacific.
end. - endemic - A native species found only in the Hawaiian Islands.

QC Code:

- 01 - Observed in the stream system and reported in *AECOS* Consultants (2000) or collected by Dr. S. Montgomery downstream of the project area (Montgomery, 2000).
02 - Reported from the survey of Englund, Preston, and Arakaki (2002).
10 - Observed in the field by the aquatic biologist on May 22-23 or June 5-6, 2000.
20 - Collected May 22-23 or June 5-6, identified in the laboratory; specimen(s) not saved.
21 - Collected May 22-23 or June 5-6; identified in the laboratory; voucher specimen(s) saved.

Abundance categories:

- R - Rare - only one or two individuals seen.
U - Uncommon - several to a dozen individuals observed.
C - Common - Seen everywhere, although generally not in large numbers.
A - Abundant - found in large numbers and widely distributed.
P - Present - noted as occurring, but quantitative information lacking.

Given the habitat conditions present on the site in 2010, it is not surprising that bird numbers and diversity were significantly lower during the 2010 survey than those recorded in 2002. During this latest survey, we only recorded 117

individual birds representing 16 separate species (Table 6). Two species House Finch and Common Myna (*Acridotheris tristis*) accounted for 47% of the total number of birds recorded during this latest survey, House Finch was once again the most frequently recorded species, representing slightly more than 27% of the total number of birds recorded.

Table 6. Avian Species Recorded Waimea Greenways 2000 & 2010

Common Name	Scientific Name	ST	2000	2010
GALLIFORMES				
PHASIANIDAE - Pheasants & Partridges				
Phasianinae - Pheasants & Allies				
Grey Francolin	<i>Francolinus pondicerianus</i>	A	0.94	0.18
Black Francolin	<i>Francolinus francolinus</i>	A	0.94	0.09
Erckel's Francolin	<i>Francolinus erkelii</i>	A	0.26	-
Chicken (domestic)	<i>Gallus Sp?</i>	AD	0.65	-
Common Peafowl	<i>Pavo cristatus</i>	A	0.06	-
Meleagridinae - Turkeys				
Wild Turkey	<i>Meleagris gallopavo</i>	A	I-1	
CHARADRIIFORMES				
CHARADRIIDAE - Lapwings & Plovers				
Charadriinae - Plovers				
Pacific Golden-Plover	<i>Pluvialis fulva</i>	IM	-	0.36
INCERTAE SEDIS				
PTEROCLIDIDAE - Sandgrouse				
Chestnut-bellied Sandgrouse	<i>Pterocles exustus</i>	A	0.35	0.18
COLUMBIFORMES				
COLUMBIDAE - Pigeons & Doves				
Rock Pigeon	<i>Columba livia</i>	A	0.12	0.18
Spotted Dove	<i>Streptopelia chinensis</i>	A	0.47	0.18
Zebra Dove	<i>Geopelia striata</i>	A	0.88	0.27
STRIGIFORMES				
TYTONIDAE - Barn Owls				
Barn Owl	<i>Tyto alba</i>	A	I-1	-
PASSERIFORMES				
ALAUDIDAE - Larks				
Sky Lark	<i>Alauda arvensis</i>	A	4.65	1.09
ZOSTEROPIDAE - White-eyes				
Japanese White-eye	<i>Zosterops japonicus</i>	A	2.45	0.91

Table 6 (continued).

Common Name	Scientific Name	ST	2000	2010
	TIMALIIDAE - Babblers			
Red-billed Leiothrix	<i>Leiothrix lutea</i>	A	0.41	-
	MIMIDAE - Mockingbirds & Thrashers			
Northern Mockingbird	<i>Mimus polyglottos</i>	A	I-1	0.18
	STURNIDAE - Starlings			
Common Myna	<i>Acridotheres tristis</i>	A	2.53	1.36
	CARDINALIDAE - Cardinals Saltators & Allies			
Northern Cardinal	<i>Cardinalis cardinalis</i>	A	0.82	0.36
	FRINGILLIDAE - Fringilline and Carduline Finches & Allies			
	Carduelinae - Carduline Finches			
House Finch	<i>Carpodacus mexicanus</i>	A	5.59	2.91
	PASSERIDAE - Old World Sparrows			
House Sparrow	<i>Passer domesticus</i>	A	2.18	0.45
	ESTRILDIDAE - Estrildid Finches			
African Silverbill	<i>Lonchura cantans</i>	A	0.24	0.36
Nutmeg Mannikin	<i>Lonchura punctulata</i>	A	0.35	0.36

Key to Table 6:

ST	Status
A	Alien Species – Introduced to Hawai'i by humans
AD	Alien Domestic Species – Not known to be established on the Island Hawai'i
IM	Indigenous Migratory Species – Native migratory species does not nest in Hawai'i
I -	Incidental Observation followed by number of individuals detected
2000	Relative Abundance - Number of individual birds recorded divided by stations (17)
2010	Relative Abundance - Number of individual birds recorded divided by stations (11)

Terrestrial Mammals — During the 2000 survey we recorded a total of six mammalian species. Domestic dogs (*Canis f. familiaris*) were heard or seen at every avian count station sampled. The near ubiquitous, small Indian mongoose (*Herpestes a. auropunctatus*) and cat (*Felis catus*), were seen within Waimea town, but were not seen in the pasture areas south of Pu'u Opleu Road. Numerous domestic cattle (*Bos taurus*) were encountered within the pasture areas along the corridor. Two groups of three goats (*Capra h. hircus*) were seen staked in separate locations along the upper corridor.

Scat and tracks of domestic dog, small Indian mongoose, cat, domestic cattle and horse (*Equus c. caballus*) were encountered along the bulk of the proposed main corridor. Additionally we found skeletal remains of dog, domestic cattle and European house mouse (*Mus musculus domesticus*) east of the Kamuela refuse

transfer station. The latter were found in several owl pellets. During the 2010 survey we saw one live cow, three live horses, and several feral goats. We also encountered 17 dead cows, one dead horse, and one dead mongoose, which graphically demonstrate the severity of the ongoing drought conditions.

Hawaii's sole endemic terrestrial mammalian species, the endangered Hawaiian hoary bat, or '*ope'ape'a*', was not detected during the course of either of the surveys conducted within the project corridor.

Discussion

Vegetation

During this survey, no plants which are candidate, proposed, or listed threatened or endangered species as set forth in the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543), were seen, and none have been documented historically from the proposed project site (although listed species are reported from this general part of the island). None of the trees on the site are, nor could be, considered candidates for the county exceptional tree program. The vegetation is neither pristine nor unique and is not considered worthy of preservation. The large non-native trees in the area have been examined by Kraus (2009). These trees have no particular botanical value, nor do they enjoy statutory protection. However, trees provide numerous amenities beneficial to the purposes of the project and these amenities will need to be weighed before removal of any large, healthy trees along the trail route.

Many native trees and shrubs, including at least one listed species, have been planted at Ula La'au (garden), some in close proximity to the trail. In particular, *hala pepe* or *Pleomele* sp (some species are listed or considered "candidates" for listing), *mau hau hele* or *Hibiscus brackenridgei* (endangered), and *koki'o ke'ike'o* (*Hibiscus arnottianus*; a subspecies is listed as endangered) were seen in the area where the trail is planned to connect to the existing WTG trail.

Aquatic Biota

While aquatic habitats in the project area are sometimes limited to isolated pools, these are present in moderate abundance, ranging from water-filled potholes to large ponds approaching (or in at least one case, apparently exceeding) 2 m (6 ft) in depth. A 2 km long segment between Puu Opelu Road and a point downslope of the County landfill on the other hand, had a very normal, perennial stream appearance, with a depauperate fauna (no fishes),

reflecting the fact that water flow is, in fact intermittent on a daily basis. Stream conditions continue to get drier downslope (AECOS Consultants, 2000), but presumably are wetter upslope of the project area. Some segments of the streams tributary to Waiulaula Gulch are perennially flowing. The ecology of these perennial segments is poorly known, although they are not particularly remote.

The proposed project to construct a trail system with scattered stream crossings should have no impact on this fauna, since opportunities for migrations up or down Waiulaula Gulch and Waikoloa Stream would be limited to times and conditions when runoff derived flows would be substantial and small bridge or culvert structures insignificant if properly designed. The project would include one crossing of Keanu‘i‘omanō Stream. Presumably this would require construction of a bridge or a substantial culvert. In all cases, bridges with minimal support within the stream bed would be the environmentally preferred. However, culverts that have either unlined bottom surfaces (i.e., the natural bed left exposed) or a surface that is not elevated above the natural stream bed should also avoid adverse impacts on native, anadromous stream fauna.

The native damselfly (*M. blackburni*), while rare in the project area, is one of the more commonly encountered native species of *Megalagrion*. This is a somewhat relative statement, however. Alien or introduced damselflies are far more common in developed areas and lowlands of the Hawaiian Islands than any of the native species.

No federally listed as Threatened or Endangered, or rare or imminently threatened species of aquatic animals were found in or around the areas of Waikoloa and Keanu‘i‘omanō Streams assessed during the surveys by AECOS (2001) and Englund et al. (2002). *Lentipes concolor*, reported from the area streams by DKNR-DAR, is considered a “species of concern” (SoC) by USFWS (2010b).

Vertebrates

Avian Resources — The findings of these surveys are consistent with at least five other avian surveys that I have conducted on various portions of the subject property (David, 1996, 2000, 2004, 2006; AECOS, 2001), as well as with several other surveys conducted within similar habitat in the South Kohala District, or on lands that are adjacent to the project site within the recent past (David, 2002, 2005, 2009, 2010a).

All but one of the avian species recorded within the project area during both the 2000 and 2010 surveys considered to be alien to the Hawaiian Islands (Table 8). The single native species recorded was Pacific Golden-Plover (*Pluvialis fulva*). The Pacific Golden-Plover is an indigenous, migratory, shorebird species that nests in the high Arctic during the late spring and summer months, returning to Hawai'i and the Tropical Pacific to spend the fall and winter months each year. This bird usually leaves Hawai'i for the flight back to the Arctic in late April or the very early part of May each year.

Although not detected during this survey, it is possible that small numbers of the endangered endemic Hawaiian Petrel (*Pterodroma sandwichensis*) and the threatened Newell's Shearwater (*Puffinus auricularis newelli*) over-fly the project site between the months of April and December (Banko, 1980a, 1980b; Harrison, 1990; Day et al., 2003a). Recent surveys using ornithological radar have recorded these species flying inland from Kawaihae (Day et al., 2003a).

Hawaiian Petrels were formerly common on the Island of Hawai'i (Wilson and Evans, 1890–1899). This pelagic seabird reportedly nested in large numbers on the slopes of Mauna Loa and in the saddle area between Mauna Loa and Mauna Kea (Henshaw, 1902), as well as at the mid-to-high elevations of Mount Hualālai. It has, within recent historic times, been reduced to relict breeding colonies located at high elevations on Mauna Loa and, possibly, Mount Hualālai (Banko, 1980a; Banko et al., 2001; Cooper and David, 1995; Cooper et al., 1995; Day et al., 2003a; Harrison, 1990; Simons and Hodges, 1998). Hawaiian Petrels were first listed as an endangered species by the USFWS in 1967 and by the State of Hawai'i in 1973 (USFWS, 1967; DLNR, 1998)

Newell's Shearwaters were formerly common on the Island of Hawai'i (Wilson and Evans, 1890–1899). This species breeds on Kaua'i, Hawai'i, and Moloka'i. Newell's Shearwater populations have dropped precipitously since the 1880s (Banko, 1980b; Day et al., 2003b). This pelagic species nests high in the mountains in burrows excavated under thick vegetation, especially *uluhe* (*Dicranopteris linearis*) fern. Newell's Shearwater was listed as a threatened species by the USFWS in 1975 and by the State of Hawai'i in 1973 (USFWS, 1975; DLNR, 1998).

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; Hue et al., 2001). Collision with man-made structures is considered to be the 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. When

disoriented, seabirds often collide with manmade structures and, if they are not killed outright, the dazed or injured birds are easy targets of opportunity for feral 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). No suitable nesting habitat occurs within or close to the proposed project site for either of these pelagic seabird species.

Mammalian Resources — The findings of the surveys are consistent with at least five other mammalian surveys conducted on various portions of the subject property (David, 1996, 2000, 2004, 2006; AECOS, 2001), as well as with several other surveys conducted within similar habitat in the South Kohala District, or on lands that are adjacent to the project site within the recent past (David, 2002, 2005, 2009, 2010a).

Just as the extreme drought has resulted in the loss of cover, feeding resources, and water for avian species, these same conditions have also radically altered the habitat from a terrestrial mammalian perspective. Currently there is very little vegetation on the site suitable to sustain anything but the hardiest of feral ungulates.

Although no rodents were detected during the course of the surveys, it is probable that at least a few of the four established alien Muridae known from the Island of Hawai'i: roof rat (*Rattus r. rattus*), Norway rat (*Rattus norvegicus*), Polynesian rat (*Rattus exulans hawaiiensis*), and European house mouse, use resources within the project area on occasion, as all are human commensal species. No species currently listed, or proposed for listing under either the federal or state endangered species programs were detected during the course of this survey (DLNR, 1998; USFWS, 2010).

Given the nature of the highly disturbed alien dominated grasslands present on the subject property, it is not expected that development and operation of the proposed Waimea Greenways project will result in significant impacts to native avian or mammalian species that may be present within the area. From a native avian and mammalian perspective, there is nothing special about this site, and in fact the current conditions on the site do not support any protected avian and mammalian species.

Hawaiian Petrel and Newell's Shearwater — The principal potential impact that construction and operation of the proposed project poses to Hawaiian Petrels and Newell's Shearwaters is the increased threat that birds will be downed after becoming disoriented by lights associated with the project. The two main areas that outdoor lighting could pose a threat to these nocturnally flying seabirds is if, 1) during construction if it is deemed expedient, or

necessary to conduct nighttime construction activities, 2) street lights and other outdoor lighting that may be necessary or desirable following build-out of the project.

Conclusions and Recommendations

The watershed within and around the WTG project area has been heavily disturbed by grazing and development for over 150 years. Aquatic habitats and biota contained within this area remain relatively pristine, albeit apparently intermittent (Englund, et al., 2002).

Efforts should be made to minimize impacts to the stream channels during construction as native, amphidromous stream animals, especially *Lentipes concolor*, use these stream channels to access the permanently flowing, upper reaches of Waikoloa Stream. If a culverts are required where the trail crosses the stream(s), these need to be constructed with the bottom of the structure completely flush with the natural streambed to avoid blocking upstream faunal migrations.

Best management practices should be employed during construction to prevent soil erosion into the stream channel that would eventually make its way to the ocean and potentially impacting coral bottom areas. If any work needs to be done in or around the stream channel during construction of the trail, it is recommended that this be conducted during the drier months when the streams are not flowing and runoff from construction areas would be minimal.

If nighttime construction activity, either actual construction activity or equipment maintenance, is proposed during the construction phase of the project, all associated lights should be shielded, and if large flood/work lights are used, they should be placed on poles that are high enough to allow the lights to be pointed directly towards the ground.

If streetlights are installed in conjunction with the project, it is recommended that lights be shielded to reduce the potential for interactions of nocturnally flying Hawaiian Petrels and Newell's Shearwaters with external lights and man-made structures (Reed et al., 1985; Telfer et al., 1987). This minimization measure would serve the dual purpose of minimizing the threat of disorientation and downing of Hawaiian Petrels and Newell's Shearwaters, while at the same time complying with the Hawaii County Code § 14 – 50 *et seq.* which requires the shielding of exterior lights so as to lower the ambient glare caused by unshielded lighting to the astronomical observatories located on Mauna Kea.

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In Reply Refer To:
2009-SL-0375

AUG 28 2009

#239

CH

Mr. Robert A. Fitzgerald
Director, Department of Parks and Recreation
101 Pauahi Street, Suite 6
Hilo, Hawaii, 96720

Subject: Species List for Waimea Trails and Greenways, Phase I, South Kohala District,
Island of Hawaii (Job No. P-3595)

Dear Mr. Fitzgerald:

We are in receipt of your letter dated July 27, 2009, requesting a list of federally endangered and threatened species that may be found in the vicinity of Phase 1 of the proposed Waimea Trails and Greenways project. The proposed activities include constructing a 10-foot (3-meter) wide reinforced concrete trail for shared pedestrian and bicycling use. Phase-I is approximately 1 mile (1.6 kilometers) in length and begins at Kahawai Street and ends near the Lindsey Road Bridge in the town of Kamuela, South Kohala District, Island of Hawaii. We received your letter on July 31, 2009.

Based on information in our files, including data compiled by the Hawaii Biodiversity and Mapping Program, and the Hawaii GAP Program, the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), and the Blackburn's sphinx moth (*Manduca blackburni*) may occur in the project vicinity. There is no federally designated critical habitat in the project area.

We offer the following information to assist you in avoiding and minimizing project impacts to Hawaiian hoary bats and Blackburn's sphinx moth:

- Hawaiian hoary bats roost and give birth in both exotic and native woody vegetation. Although use of the project area by Hawaiian hoary bats is currently unknown, to avoid potential impacts to this species, no woody plants suitable for bat roosting should be removed or trimmed during the bat birthing and pup rearing season (July through September). If you must clear the property during the Hawaiian hoary bat pupping season, we recommend conducting biological surveys to determine if bats are present. Please contact our office regarding survey methodology.
- There are no known occurrences of Blackburn's sphinx moth's preferred native host plants in the area of your proposed project; however, the moth is known to lay eggs on

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non-native tree tobacco (*Nicotiana glauca*) plants. To pupate, Blackburn's sphinx moth larvae burrow into the soil near their host plants and can remain in a state of torpor for up to a year before emerging from the soil. Because tree tobacco may occur within the vicinity of the proposed project site, we recommend the following:

- The project area should be surveyed for the presence of tree tobacco by a qualified botanist.
- If tree tobacco plants are found, these plants should be surveyed by a qualified entomologist for the presence of Blackburn's sphinx moth eggs and larvae. If

Thank you for the opportunity to assist you with your proposed project. If you have any questions regarding this letter, please contact Dr. Jeff Zimpfer, Fish and Wildlife Biologist, Consultation and Technical Assistance Program (phone: 808-792-9431; email: jeff_zimpfer@fws.gov).

Sincerely,



 Loyal Mehrhof
Field Supervisor

Michael M. Kraus
Consulting Arborist

April 30, 2009

Waimea Trails and Greenways

Tree Risk Assessment

Prepared by:
Michael M. Kraus ASCA

TREE WORKS, INC
P O Box 277
Hilo, HI 96721



Site Location

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Michael M. Kraus
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The section of the trail covered in this tree risk assessment begins near the end of Kahawai Street and follows the course of Waikoloa Stream to the bridge where the stream flows under Lindsay Road. The area the trail runs through is a largely unimproved corridor along the stream. Some parts of this trail pass through heavily wooded areas. The most heavily wooded areas with the largest trees are in the upper portion of the trail from the Nature Park to Lindsay road.

The primary large trees affecting the trail include several species of Eucalyptus: Tasmanian Blue Gum (*Eucalyptus globulus*), Blackbutt Eucalyptus (*Eucalyptus pilularis*), Robusta Eucalyptus (*Eucalyptus robusta*), and Saligna Eucalyptus (*Eucalyptus saligna*). There are some Eucalyptus trees that were not identified by species; these trees may be hybrid varieties. Other significant trees along the trail route are: Ironwood trees (*Cassuarina sp*), Cook pines (*Araucaria columnaris*), Black Wattle (*Acacia mearnsii*), False Olive (*Elaeodendron orientale*), and Christmas Berry trees (*Schinus terebinthifolius*).

The purpose of this report is to assess the risk posed by these trees to the trail, to users of the trail and to the neighboring properties. This report also addresses the impact the construction of the trail will have on the trees.

Management recommendations for all trees that are determined to pose a significant risk to the trail, its users and the neighboring properties within the next five years are included in this report. Small trees and brush that do not have the potential to pose a risk are not addressed in this report.

Tree Works, Inc. conducted a field review and assessment of 498 large trees that pose a potential risk to the trail, its users and the neighboring properties. This assessment was restricted to the defined large trees within the trail properties and did not assess large trees on nearby properties that may present potential hazards to people or property on or off this property.

Michael M. Kraus
Consulting Arborist

Tree Works, Inc. identified, located, measured, and assessed each of the trees in this report. A ground-based, visual inspection and assessment of each designated tree was conducted by Tree Works, Inc. ISA Certified Arborists Michael Kraus, Thomas Wuscher, Christian Kraus, John Mayfield and Kahana Itozaki.

All of the trees covered by this report are tagged with a numbered circular one and a quarter inch diameter aluminum disk attached to the tree with a stainless steel ring nail. The number the tree is tagged with is the number used to identify the tree in the report.

The trail site is a narrow strip of land and many of the 357 trees recommended for removal stand in or very close to the proposed trail. The size and shape of the site and the trail and the size of the trees determines that all of the large trees on the site pose a potential risk to the trail.

The tree and site criteria used to identify and evaluate the risk posed by the individual trees included:

Tree species: This is significant for identification and for the known strengths and weaknesses of the different species.

Tree size, DBH (diameter breast height), height and crown spread.

Potential targets; this includes the trail and its users and the surrounding properties and infrastructure.

Tree form and crown class: Many of the large trees along this trail are the remnants of a larger forest that was removed in the last ten years. Trees in large stands develop asymmetrical crowns due to competition from the surrounding trees. They also develop trunks that lack taper and root systems adapted to being supported and protected by the surrounding trees. Many of the trees possess a trunk lean; in some cases this lean is severe. The unbalanced weight distribution and trunk lean affect the direction a tree will fall. A tree will usually fall in the direction of the lean and crown weight.

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Tree health: Some of the trees that were assessed were dead and some were in declining health. This may be attributed to the age and species of tree, competition from the surrounding trees and the recent drought.

Adverse site conditions: The construction of the trail and the removal of the surrounding forest are the primary site condition affecting these trees.

Root defects: Most of the root defects observed was caused by the stream eroding the roots of the trees. There are many trees on this site that have fallen due to the stream eroding the soil around the roots.

Trunk defects: Some of the trees have evidence of decay in the trunk. Some trees have decayed to the point where they have failed; others appear to be close to the point of failure.

Scaffold limb defects: Many of the trees assessed have signs of past limb failure. Robusta eucalyptus is notorious for dropping large limbs. Some of the trees have broken limbs hanging in the trees.

Evidence of previous tree and limb failures: Many of the assessed trees show signs of previous major limb or top failure. There are also many whole trees on this site that have failed. The large number of stumps and logs on the ground in some parts of the site is evidence that many trees have been removed from this site.

The goal of the risk evaluation process is to assess the danger associated with a tree. By conducting a systematic, thorough evaluation trees and the parts of a tree that are likely to fail are identified so that they can be removed or treated to reduce the risk. The goal of the evaluation is fulfilled solely by performing the inspection and recording the observations.

The management recommendations made for the individual trees are just that; they are recommendations. If the trail is to be built where an as it is designed several hundred trees will have to be removed. For the trees that remain on the site after the trail is built some risk will remain. Some level of risk will always be present when people live among trees. The decision of how much risk is tolerable remains with the owner and manager of the trail.

Michael M. Kraus
Consulting Arborist

This report its observations and recommendations are submitted with the following understanding:

Arborists are specialists in tree management and care who use their education, knowledge, training and experience to inspect and assess tree health and condition, and to identify measures that reduce risk of personal injury and property damage from trees.

Arborists cannot detect every condition that could possibly lead to the structural failure or decline in the health of a tree. Trees are living, dynamic organisms and as such are constantly changing. Trees can fail in ways that we do not fully understand and cannot always predict. Conditions that can lead to failure can be hidden underground or within trees. Arborists cannot guarantee that a tree will be healthy or safe under all circumstances, or for a specified period of time.

Recommended pruning or removal of trees may involve considerations beyond the scope of the arborist's services such as cost, public sensitivity, and other issues.

Trees can be managed, but they cannot be controlled. The only way to eliminate all risk associated with trees is to eliminate all trees.

Clients may choose to accept or disregard the recommendation of the arborist, or to seek additional advice.

The following section of individual tree assessments begins at the upper end of this trail segment at Lindsay road and proceeds down to the lower end at Kahawai Street. This directional flow is broken from tree number 423 to tree number 439. These trees are at the upper end of the trail.

For any questions or for further information regarding this risk assessment and report please contact Michael Kraus at the numbers listed below or at Michael@treeworksinc.com.

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Waimea Trails and Greenways, Phase 1 Individual Tree Assessments

Tree number: 1

1. Species: Cypress
2. Size: DBH 35", Height 50', Crown spread 25'
3. Targets: Sidewalk, Lindsay Road & Trail
4. Form and Crown class: Asymmetrical, Dominant
5. Tree health: Good
6. Adverse site conditions: Some root pruning will be needed for the trail construction.
7. Defective root conditions: None
8. Trunk defects: None
9. Scaffold limb defects: None
10. Previous tree and limb failures: None

Management Recommendations: Root prune before trail construction begins, crown clean.

Tree number: 2

1. Species: Cypress
2. Size: DBH 27", Height 31', Crown spread 25'
3. Targets: Trail, Park walkway
4. Form and Crown class: Asymmetrical, heavy lean
5. Tree health: Good
6. Adverse site conditions: Located in the trail.

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7. Defective root conditions: None
8. Trunk defects: None
9. Scaffold limb defects: None
10. Previous tree and limb failures: Top is missing

Management Recommendations: Located within the trail, remove.



Tree 3

Tree 2

Tree 1

Tree number: 3

1. Species: Cypress
2. Size: DBH 17", Height 16', Crown spread 15'
3. Targets: Trail, Park walkway
4. Form and Crown class: Asymmetrical, heavy lean
5. Tree health: Poor

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6. Adverse site conditions: In the trail
7. Defective root conditions: None
8. Trunk defects: This tree has been topped in the past.
9. Scaffold limb defects: Large crack in the one major limb.
10. Previous tree and limb failures: Evidence of heavy pruning to remove dieback.

Management Recommendations: Located in the trail, remove.

Tree number: 4

1. Species: Koa
2. Size: DBH 5", Height 14', Crown spread 10'
3. Targets: trail
4. Form and Crown class: Symmetrical, solitary
5. Tree health: Poor
6. Adverse site conditions: Located in the trail
7. Defective root conditions: None
8. Trunk defects: Cavity in trunk base
9. Scaffold limb defects: Co-dominant structure ½ dead
10. Previous tree and limb failures: None

Management Recommendations: This tree is located in the trail, remove.

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Tree 4

Tree number: 5

1. Species: Christmas Berry
2. Size: DBH 18", Height 25', Crown spread 33'
3. Targets: Trail
4. Form and Crown class: Large clump with many trunks, The peripheral trunks most likely root sprouts off the main trunk. This clump is asymmetrical and understory, at the edge of the eucalyptus grove.
5. Tree health: Good with many small dead branches, a natural development for this species.
6. Adverse site conditions: This tree overhangs the trail.
7. Defective root conditions: None
8. Trunk defects: None
9. Scaffold limb defects: None
10. Previous tree and limb failures: Evidence of some pruning of lower limbs.

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Management Recommendations: Some portions of this clump are too close to the trail and will have to be removed, the remainder should be crown cleaned and the limbs over the trail should be pruned up to give 15' of clearance to the trail.



Tree 5

Tree number: 6

1. Species: Black Wattle
2. Size: DBH 20", Height 59', Crown spread 25'
3. Targets: None
4. Form and Crown class: Asymmetrical with a heavy lean away from the trail.
5. Tree health: Good
6. Adverse site conditions: Close to the side of the trail
7. Defective root conditions: None
8. Trunk defects: This tree has a crack near base of trunk with included bark.

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9. Scaffold limb defects: None
10. Previous tree and limb failures: None

Management recommendations: Remove, this tree leans heavily and will likely fall when the roots are cut for the trail construction.



Tree 6

Tree number: 7

1. Species: Blackbutt Eucalyptus
2. Size: DBH 30", Height 97', Crown spread 40'
3. Targets: Neighboring building, trail
4. Form and Crown class: Co-dominant, asymmetrical
5. Tree health: Good
6. Adverse site conditions: Located in the trail
7. Defective root conditions: None
8. Trunk defects: Double trunk with included bark
9. Scaffold limb defects: None

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10. Previous tree and limb failures: None

Management Recommendations: This tree is located in the trail, remove.



Tree 6

Tree 7

Tree number: 8

1. Species: Blackbutt Eucalyptus
2. Size: DBH 13", Height 20', Crown spread 0'
3. Targets: Trail
4. Form and Crown class: Dead stub
5. Tree health: Dead
6. Adverse site conditions: Dead
7. Defective root conditions: Dead
8. Trunk defects: Dead
9. Scaffold limb defects: Dead

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10. Previous tree and limb failures: Dead

Management Recommendations: Dead tree, remove



Tree 11

Tree 8

Tree number: 9

1. Species: Blackbutt Eucalyptus
2. Size: DBH 31", Height 115', Crown spread 55'
3. Targets: Trail and Church building
4. Form and Crown class: C0-dominant, asymmetrical
5. Tree health: Good
6. Adverse site conditions: None
7. Defective root conditions: None
8. Trunk defects: None
9. Scaffold limb defects: None
10. Previous tree and limb failures: None

Management Recommendations: Crown clean, root prune before trail construction.

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Tree number: 10

1. Species: Blackbutt Eucalyptus
2. Size: DBH 15", Height 101', Crown spread 37'
3. Targets: Trail
4. Form and Crown class: Co-dominant, asymmetrical.
5. Tree health: Good
6. Adverse site conditions: Near the edge of the trail
7. Defective root conditions: None
8. Trunk defects: None
9. Scaffold limb defects: None
10. Previous tree and limb failures: None

Management Recommendations: Crown clean, root prune before trail construction

Tree number: 11

1. Species: Blackbutt Eucalyptus
2. Size: DBH 28", Height 75', Crown spread 35'
3. Targets: Trail
4. Form and Crown class: Suppressed, asymmetrical
5. Tree health: Good
6. Adverse site conditions: Near edge of the trail
7. Defective root conditions: None
8. Trunk defects: Three trunks
9. Scaffold limb defects: Old limb stubs
10. Previous tree and limb failures: Stubs of failed limbs in the lower crown.

Management Recommendations: Crown Clean and root prune before trail construction.

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Tree 12

Tree 11

Tree number: 12

1. Species: Blackbutt Eucalyptus
2. Size: DBH 28", Height 62', Crown spread 42'
3. Targets: Trail
4. Form and Crown class: Asymmetrical, suppressed
5. Tree health: Good
6. Adverse site conditions: In the trail
7. Defective root conditions: None
8. Trunk defects: Major trunk failure at 6' above the ground.
9. Scaffold limb defects: None
10. Previous tree and limb failures: This tree had two trunks, the larger failed at 6' above ground level.

Management Recommendations: This tree is located in the trail, remove.

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Tree 12

Tree number: 13

1. Species: Blackbutt Eucalyptus
2. Size: DBH 19", Height 96', Crown spread 20'
3. Targets: Trail
4. Form and Crown class: Asymmetrical, suppressed
5. Tree health: Good
6. Adverse site conditions: None
7. Defective root conditions:
8. Trunk defects: Double trunk with included bark, some old fence wire in the trunk
9. Scaffold limb defects: Included bark
10. Previous tree and limb failures: None

Management Recommendations: Crown clean

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Tree number: 14

1. Species: Blackbutt Eucalyptus
2. Size: DBH 19", Height 107', Crown spread 30'
3. Targets: Trail
4. Form and Crown class: Asymmetrical, Suppressed
5. Tree health: Good
6. Adverse site conditions: In the trail
7. Defective root conditions: None
8. Trunk defects: None
9. Scaffold limb defects: None
10. Previous tree and limb failures: None

Management Recommendations: This tree is located in the trail, remove

Tree number: 15

1. Species: Blackbutt Eucalyptus
2. Size: DBH 19", Height 99', Crown spread 35'
3. Targets: Overhanging the trail
4. Form and Crown class: Asymmetrical with a heavy lean,
5. Tree health: Good
6. Adverse site conditions: Over the trail
7. Defective root conditions: None
8. Trunk defects: None
9. Scaffold limb defects: Large dead limb
10. Previous tree and limb failures: None

Management Recommendations: Crown clean, prune to reduce the heavy lean.

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Tree number: 16

1. Species: Blackbutt Eucalyptus
2. Size: DBH 7", Height 38', Crown spread 14'
3. Targets: Trail
4. Form and Crown class: Asymmetrical, Suppressed
5. Tree health: Declining
6. Adverse site conditions: Overhanging trail
7. Defective root conditions: None
8. Trunk defects: None
9. Scaffold limb defects: None
10. Previous tree and limb failures: None

Management Recommendations: Crown clean, root prune before trail construction. This tree is suppressed and should do better after the trail is constructed when many of the surrounding trees are removed.

Tree number: 17

1. Species: Blackbutt Eucalyptus
2. Size: DBH 9", Height 45', Crown spread 12'
3. Targets: Trail
4. Form and Crown class: Asymmetrical, Suppressed
5. Tree health: Good
6. Adverse site conditions: In the trail
7. Defective root conditions: None
8. Trunk defects: None
9. Scaffold limb defects: None
10. Previous tree and limb failures: None

Management Recommendations: this tree is located in the trail, remove.

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Tree number: 18

1. Species: Blackbutt Eucalyptus
2. Size: DBH 19", Height 117', Crown spread 25'
3. Targets: Trail
4. Form and Crown class: Asymmetrical, co-dominant
5. Tree health: Good
6. Adverse site conditions: In the trail
7. Defective root conditions: None
8. Trunk defects: None
9. Scaffold limb defects: None
10. Previous tree and limb failures: None

Management Recommendations: This tree is located in the trail, remove

Tree number: 19

1. Species: Blackbutt Eucalyptus
2. Size: DBH 17", Height 38', Crown spread 8'
3. Targets: Trail
4. Form and Crown class: Asymmetrical, suppressed
5. Tree health: Poor
6. Adverse site conditions: In the trail
7. Defective root conditions: None
8. Trunk defects: Fallen tree is leaning on this tree
9. Scaffold limb defects: broken large limb is hanging in the tree
10. Previous tree and limb failures: Broken limb

Management Recommendations: This tree is located in the trail, remove

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Tree 19

Tree number: 20

1. Species: Black Butt Eucalyptus
2. Size: DBH 25", Height 93', Crown spread 38'
3. Targets: Trail
4. Form and Crown class: Asymmetrical
5. Tree health: Good
6. Adverse site conditions: Tree is in the trail
7. Defective root conditions: None
8. Trunk defects: None
9. Scaffold limb defects: None
10. Previous tree and limb failures: None

Management Recommendations: This tree is growing in the trail, remove.

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Tree 20

Tree 25

Tree 26

Tree 27

Tree number: 21

1. Species: Blackbutt Eucalyptus
2. Size: DBH 9", Height 48', Crown spread 20'
3. Targets: Trail
4. Form and Crown class: Symmetrical, suppressed
5. Tree health: Good
6. Adverse site conditions: Growing near the trail
7. Defective root conditions: None
8. Trunk defects: None
9. Scaffold limb defects: None
10. Previous tree and limb failures: None

Management Recommendations: root prune before trail construction, safety prune, crown clean.

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Tree number: 22

1. Species: Blackbutt Eucalyptus
2. Size: DBH 9", Height 48', Crown spread 16'
3. Targets: Trail
4. Form and Crown class: Asymmetrical, suppressed
5. Tree health: Fair
6. Adverse site conditions: Leans toward the trail
7. Defective root conditions: None
8. Trunk defects: Barbed wire fence nailed to the trunk. some discoloration at fencing nails.
9. Scaffold limb defects: None
10. Previous tree and limb failures: None

Management Recommendations: Prune roots before trail construction, safety prune, crown clean.



Tree 22

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Tree number: 23

1. Species: Blackbutt Eucalyptus
2. Size: DBH 19", Height 113', Crown spread 35'
3. Targets: Trail
4. Form and Crown class: Symmetrical and Co-dominant
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: wound near trunk base and barb wire from an old fence in the trunk.
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Crown clean and safety prune.



Tree 23

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Tree number: 24

1. Species: Blackbutt Eucalyptus
2. Size: DBH 9", Height 63', Crown spread 9'
3. Targets: none
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: wound near trunk base.
9. Scaffold limb defects: some dead limbs
10. Previous tree and limb failures: limb stubs present.

Management Recommendations: Crown clean.

Tree number: 25

1. Species: Blackbutt Eucalyptus
2. Size: DBH 13", Height 33', Crown spread 15'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: In trail.
7. Defective root conditions: none.
8. Trunk defects: none.
9. Scaffold limb defects: Broken top hanging in the tree.
10. Previous tree and limb failures: none

Management Recommendations: this tree is growing in trail... remove.

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Tree number: 26

1. Species: Blackbutt Eucalyptus
2. Size: DBH 42", Height 123', Crown spread 63'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: Bark damage near the base.
9. Scaffold limb defects: Several broken limbs.
10. Previous tree and limb failures: Limb stubs present.

Management Recommendations: This tree is growing in the trail..., remove.

Tree number: 27

1. Species: Blackbutt Eucalyptus
2. Size: DBH 18", Height 80', Crown spread 30'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: Large vertical bark wound near base.
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Tree is growing in the trail..., remove.

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Tree number: 28

1. Species: Blackbutt Eucalyptus
2. Size: DBH 8", Height 35', Crown spread 10'
3. Targets: none
4. Form and Crown class: Symmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Crown Clean.

Tree number: 29

1. Species: Blackbutt Eucalyptus
2. Size: DBH 27", Height 85', Crown spread 22'
3. Targets: Church buildings
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: Double trunk with included bark. There is old barbed wire in the lower trunk and a wound near the trunk base.
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove smaller trunk, crown clean.

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Tree 29



Tree 29

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Tree number: 30

1. Species: Blackbutt Eucalyptus
2. Size: DBH 15", Height 75', Crown spread 12'
3. Targets: Trail
4. Form and Crown class: A symmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Crown Clean.

Tree number: 31

1. Species: Blackbutt Eucalyptus
2. Size: DBH 25", Height 93', Crown spread 25'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Root prune prior to trail construction; crown clean.

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Tree number: 32

1. Species: Blackbutt Eucalyptus
2. Size: DBH 10", Height 30', Crown spread 9'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Intersecting limbs
10. Previous tree and limb failures: none

Management Recommendations: Tree is growing in trail..., remove.

Tree number: 33

1. Species: Blackbutt Eucalyptus
2. Size: DBH 19", Height 89', Crown spread 30'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; with a heavy lean toward the stream and it is suppressed.
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: This tree is on the edge of the trail, remove.

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Tree number: 34

1. Species: Blackbutt Eucalyptus
2. Size: DBH 31", Height 80', Crown spread 50'
3. Targets: Trail
4. Form and Crown class: asymmetrical; Co-dominant
5. Tree health: good
6. Adverse site conditions: in trail.
7. Defective root conditions: none
8. Trunk defects: Sap flux, double trunk, heavy lean
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: This tree is growing in the trail..., remove.



Tree 34

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Tree number: 35

1. Species: Blackbutt Eucalyptus
2. Size: DBH 13", Height 84', Crown spread 25'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: This tree overhangs the trail..., crown clean.

Tree number: 36

1. Species: Blackbutt Eucalyptus
2. Size: DBH 23", Height 105', Crown spread 47'
3. Targets: Church buildings
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood in crown, limb stubs.
10. Previous tree and limb failures: limb stubs

Management Recommendations: Crown clean

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Tree number: 37

1. Species: Blackbutt Eucalyptus
2. Size: DBH 15", Height 72', Crown spread 30'
3. Targets: Church buildings
4. Form and Crown class: Symmetrical; suppressed
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Crown clean.

Tree number: 38

1. Species: Blackbutt Eucalyptus
2. Size: DBH 19", Height 92', Crown spread 27'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: included bark and dead wood
10. Previous tree and limb failures: none

Management Recommendations: This tree is growing in the trail..., remove.

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Tree number: 39

1. Species: Blackbutt Eucalyptus
2. Size: DBH 25, Height 115, Crown spread 52
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: This tree is growing in the trail..., remove



Tree 39

Tree 34

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Tree number: 40

1. Species: Blackbutt Eucalyptus
2. Size: DBH 9", Height 40', Crown spread 15'
3. Targets: trail
4. Form and Crown class: Asymmetrical with a heavy lean; suppressed
5. Tree health: Fair
6. Adverse site conditions: edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Tree at the edge of the trail, remove.

Tree number: 41

1. Species: Blackbutt Eucalyptus
2. Size: DBH 28", Height 88', Crown spread 60'
3. Targets: none
4. Form and Crown class: Asymmetrical with a heavy lean; Co-dominant
5. Tree health: good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead branches
10. Previous tree and limb failures: Fallen tree is resting on this tree.

Management Recommendations: Crown clean and remove fallen tree.

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Tree number: 42

1. Species: Eucalyptus Saligna
2. Size: DBH 21", Height 42', Crown spread 13'
3. Targets: none
4. Form and Crown class: Asymmetrical with a heavy lean; Suppressed
5. Tree health: Fair
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Crown clean.

Tree number: 43

1. Species: Blackbutt Eucalyptus
2. Size: DBH 26", Height 95', Crown spread 45'
3. Targets: none
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: large vertical wound with bark separation near the base
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Crown clean.

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Tree 43

Tree number: 44

1. Species: Blackbutt Eucalyptus
2. Size: DBH 24", Height 100', Crown spread 55'
3. Targets: Trail
4. Form and Crown class: A symmetrical; co-dominant
5. Tree health: Good
6. Adverse site conditions: near the edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Near the edge of trail recommend root pruning or possible removal depending on the size of the roots cut in the root pruning.

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Tree number: 45

1. Species: Blackbutt Eucalyptus
2. Size: DBH 9", Height 25', Crown spread 9'
3. Targets: In trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: poor
6. Adverse site conditions: this tree is located in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: tree has a broken top
10. Previous tree and limb failures:

Management Recommendations: Tree is located in the trail, remove.

Tree number: 46

1. Species: Blackbutt Eucalyptus
2. Size: DBH 28", Height 120', Crown spread 50'
3. Targets: trail and church
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near the edge of the trail
7. Defective root conditions: none
8. Trunk defects: barbed wire in lower trunk
9. Scaffold limb defects: large dead wood
10. Previous tree and limb failures:

Management Recommendations: Located to close to the edge of the trail – remove.

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Tree 46

Tree number: 47

1. Species: Blackbutt Eucalyptus
2. Size: DBH 34", Height 18', Crown spread 52'
3. Targets: trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Fair
6. Adverse site conditions: in trail
7. Defective root conditions:
8. Trunk defects: double trunk
9. Scaffold limb defects: included bark
10. Previous tree and limb failures: none

Management Recommendations: tree is located in the trail - remove

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Tree number: 48

1. Species: Blackbutt Eucalyptus
2. Size: DBH 19", Height 80', Crown spread 60'
3. Targets: none
4. Form and Crown class: Asymmetrical with a very heavy lean; Suppressed
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures:

Management Recommendations: very heavy leaning tree with poor structural stability, recommend removal

Tree number: 49

1. Species: Blackbutt Eucalyptus
2. Size: DBH 33", Height 110', Crown spread 60'
3. Targets: trail
4. Form and Crown class: Asymmetrical with a triple trunk from approximately 20' above ground level; Co-dominant
5. Tree health: Fair
6. Adverse site conditions: in trail
7. Defective root conditions:
8. Trunk defects: Cavity at the base
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures:

Management Recommendations: Tree is located in the trail – remove.

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Tree 49

Tree number: 50

1. Species: Blackbutt Eucalyptus
2. Size: DBH 28", Height 75', Crown spread 45'
3. Targets: trail
4. Form and Crown class: Asymmetrical with a double trunk at approximately 14' above ground level; Co-dominant.
5. Tree health: Fair
6. Adverse site conditions: Near the edge of the trail.
7. Defective root conditions: none
8. Trunk defects: Cavity at the base of trunk.
9. Scaffold limb defects: dead wood.
10. Previous tree and limb failures:

Management Recommendations: Tree is very close to the edge of the trail – remove.

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Tree 50



Tree 50

Tree49

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Tree number: 51

1. Species: Black Wattle
2. Size: DBH 10", Height 25', Crown spread 14'
3. Targets: none
4. Form and Crown class: A symmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: This tree has a dead tree that has fallen in to it.
9. Scaffold limb defects: numerous broken limbs.
10. Previous tree and limb failures: none

Management Recommendations: Remove the dead tree that is leaning into this tree and safety prune.

Tree number: 52

1. Species: Montezuma Cypress
2. Size: DBH 10", Height 30', Crown spread 12'
3. Targets: none
4. Form and Crown class: Symmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: some stream erosion in the root area.
7. Defective root conditions: some eroded roots
8. Trunk defects: none
9. Scaffold limb defects: some dead wood
10. Previous tree and limb failures: none

Management Recommendations: None.

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Tree number: 53

1. Species: Black Wattle (2 trees growing together)
2. Size: DBH 11", Height 41', Crown spread 16'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: some stream erosion in the root area.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: some dead wood
10. Previous tree and limb failures:

Management Recommendations: Crown clean.

Tree number: 54

1. Species: Eucalyptus robusta
2. Size: DBH 23", Height 79', Crown spread 30'
3. Targets: Trail
4. Form and Crown class: Asymmetrical with a heavy lean over the bridge; Co-dominant
5. Tree health: Good
6. Adverse site conditions: some erosion on the stream side, leaning over bridge.
7. Defective root conditions: erosion on stream side.
8. Trunk defects: none.
9. Scaffold limb defects: none.
10. Previous tree and limb failures: none

Management Recommendations: This tree is very close to the end of the bridge – remove.

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Tree number: 55

1. Species: Eucalyptus robusta
2. Size: DBH 60", Height 148', Crown spread 50'
3. Targets: Trail and bridge.
4. Form and Crown class: a Symmetrical; Co-dominant
5. Tree health: Fair
6. Adverse site conditions: Some erosion on stream side.
7. Defective root conditions: Erosion on stream side.
8. Trunk defects: Multiple trunks with included bark.
9. Scaffold limb defects: Weak crotches, included bark.
10. Previous tree and limb failures: none

Management Recommendations: Tree is located at the end of the bridge – remove.



Tree 55

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Tree 55 Tree54

Tree number: 56

1. Species: Eucalyptus robusta
2. Size: DBH 55", Height 138', Crown spread 46'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: in trail.
7. Defective root conditions: none
8. Trunk defects: Large double trunks with included bark.
9. Scaffold limb defects: Included bark.
10. Previous tree and limb failures: none

Management Recommendations: Tree is located in the trail – remove.

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Tree number: 57

1. Species: Eucalyptus robusta
2. Size: DBH 34", Height 133', Crown spread 47'
3. Targets: trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: good
6. Adverse site conditions: in trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Tree is located in the trail, remove.

Tree number: 58

1. Species: Eucalyptus robusta
2. Size: DBH 25", Height 85', Crown spread 38'
3. Targets: Trail
4. Form and Crown class: Asymmetrical with a heavy lean; Suppressed
5. Tree health: Fair
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: This tree is located in the trail, remove.

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Tree 58 60 57 56

Tree number: 59

1. Species: *Eucalyptus robusta*
2. Size: DBH 24", Height 98', Crown spread 50'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood with large stubs.
10. Previous tree and limb failures: none

Management Recommendations: Tree is located in the trail recommend removal.

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Tree number: 60

1. Species: Eucalyptus robusta
2. Size: DBH 59", Height 107', Crown spread 75'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Dominant
5. Tree health: Fair
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Large broken branches and stubs
10. Previous tree and limb failures: none

Management Recommendations: Tree is located in the trail recommend removal.



Tree 60 Tree 58

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Tree number: 61

1. Species: Eucalyptus robusta
2. Size: DBH 16", Height 35', Crown spread 30'
3. Targets: Church parking lot
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: base of trunk and root crown extends into stream..., some erosion.
7. Defective root conditions: some erosion
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Crown clean and reduce lean.

Tree number: 62

1. Species: Eucalyptus robusta
2. Size: DBH 25", Height 58', Crown spread 45'
3. Targets: Church parking lot
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: Trunk base and root crown extend into stream area..., some erosion.
7. Defective root conditions: some erosion
8. Trunk defects: none
9. Scaffold limb defects: some dead wood
10. Previous tree and limb failures: none

Management Recommendations: Crown clean, reduce lean towards the parking lot.

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Tree number: 63

1. Species: Eucalyptus robusta
2. Size: DBH 18", Height 53', Crown spread 27'
3. Targets: Church parking lot
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: Trunk base and root crown extend into stream area..., some erosion.
7. Defective root conditions: some erosion
8. Trunk defects: Girdling root at trunk base
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Remove girdling root and crown clean.



Tree 63

Michael M. Kraus Consulting Arborist

Tree number: 64

1. Species: Eucalyptus robusta
2. Size: DBH 27", Height 83 ', Crown spread 49'
3. Targets: Church parking lot.
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: Trunk base extends into stream area, some erosion.
7. Defective root conditions: some erosion
8. Trunk defects: Double trunk with included bark.
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Remove smaller of the two trunks and crown clean



Tree 64 upper side

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Consulting Arborist



Tree 64 stream side

Tree number: 65

1. Species: Black Wattle
2. Size: DBH 13", Height 35', Crown spread 28'
3. Targets: trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in the trail.
7. Defective root conditions: none
8. Trunk defects: Bark damage near trunk base.
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Tree is in the trail, remove.

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Tree 65

Tree number: 66

1. Species: Eucalyptus robusta
2. Size: DBH 13", Height 30', Crown spread 15'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: eroded roots on stream side
7. Defective root conditions: some erosion
8. Trunk defects: Major trunk is dead
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: This tree is declining remove.

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Tree number: 67

1. Species: Eucalyptus robusta
2. Size: DBH 19", Height 49', Crown spread 20'
3. Targets: Church parking lot
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: Erosion in root area.
7. Defective root conditions: some erosion
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Crown clean, prune top to reduce lean toward parking lot.



Tree 67 stream side

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Tree number: 68

1. Species: Eucalyptus robusta
2. Size: DBH 13", Height 53', Crown spread 15'
3. Targets: Church parking lot.
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: Trunk base extends into stream area some erosion.
7. Defective root conditions: some erosion.
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Crown clean.

Tree number: 69

1. Species: Eucalyptus robusta
2. Size: DBH 11", Height 45', Crown spread 10'
3. Targets: Church parking lot
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: good
6. Adverse site conditions: Base of trunk extends into stream, some erosion.
7. Defective root conditions: some erosion.
8. Trunk defects: Double trunk, one trunk has a crack near the base.
9. Scaffold limb defects: Large broken limb resting on cracked trunk.
10. Previous tree and limb failures: none

Management Recommendations: Removed cracked trunk and broken limb, crown clean.

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Tree 69

Tree number: 70

1. Species: Eucalyptus robusta
2. Size: DBH 33", Height 91', Crown spread 40'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Included bark at first branch near base.
10. Previous tree and limb failures: none

Management Recommendations: Tree is located in the trail recommend removal.

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Tree 70

Tree number: 71

1. Species: Eucalyptus robusta
2. Size: DBH 11", Height 49', Crown spread 12'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: some dead wood
10. Previous tree and limb failures: none

Management Recommendations: Tree is located in the trail recommend removal.

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Consulting Arborist

Tree number: 72

1. Species: Eucalyptus robusta
2. Size: DBH 13", Height 49', Crown spread 15'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: Near edge of trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Tree is located too close to the edge of the trail recommend removal.

Tree number: 73

1. Species: Eucalyptus robusta
2. Size: DBH 28", Height 75', Crown spread 30'
3. Targets: Neighboring property.
4. Form and Crown class: Asymmetrical with a heavy lean; Co-dominant
5. Tree health: Good
6. Adverse site conditions: Near edge of trail with a heavy lean away from the trail.
7. Defective root conditions: none.
8. Trunk defects: Included bark
9. Scaffold limb defects: Large stubs and dead wood.
10. Previous tree and limb failures: none

Management Recommendations: Tree is located too close to the edge of the trail – remove.

Michael M. Kraus
Consulting Arborist



Tree 73

Tree number: 74

1. Species: Eucalyptus robusta
2. Size: DBH 15", Height 50', Crown spread 12'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: in trail.
7. Defective root conditions: none
8. Trunk defects: Top of trunk grown into #75
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: This tree is growing in the trail – remove.

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Tree number: 75

1. Species: Eucalyptus robusta
2. Size: DBH 39", Height 135', Crown spread 45'
3. Targets: Trail
4. Form and Crown class: Asymmetrical with a heavy lean; Dominant
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: some dead wood
10. Previous tree and limb failures: none

Management Recommendations: Tree is located in the trail recommend removal.

Tree number: 76

1. Species: Eucalyptus robusta
2. Size: DBH 13", Height 49', Crown spread 17'
3. Targets: Church parking lot
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: Some erosion of root area.
7. Defective root conditions: some erosion
8. Trunk defects: none
9. Scaffold limb defects: Included bark
10. Previous tree and limb failures: none

Management Recommendations: Crown clean and remove first branch.

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Tree number: 77

1. Species: Eucalyptus robusta
2. Size: DBH 10", Height 49', Crown spread 22'
3. Targets: Church parking lot
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: Erosion in root area
7. Defective root conditions: some erosion.
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Crown clean

Tree number: 78

1. Species: Eucalyptus robusta
2. Size: DBH 25", Height 92', Crown spread 35'
3. Targets: Church parking lot and the trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: Some erosion of root crown area
7. Defective root conditions: some erosion
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Crown clean.

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Tree number: 79

1. Species: Eucalyptus robusta
2. Size: DBH 17", Height 30', Crown spread 20'
3. Targets: Church parking lot
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: some erosion in root area
7. Defective root conditions: some erosion
8. Trunk defects: none
9. Scaffold limb defects: Broken branches with excessive sprout growth
10. Previous tree and limb failures: none

Management Recommendations: Crown clean.

Tree number: 80

1. Species: Eucalyptus robusta
2. Size: DBH 23", Height 61', Crown spread 18'
3. Targets: Church parking lot and the trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: Some erosion of root crown area
7. Defective root conditions: some erosion
8. Trunk defects: Healed wound at trunk base
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: None

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Trees: 78 & 79 Tree 80 stream side

Tree number: 81

1. Species: Eucalyptus robusta
2. Size: DBH 19", Height 35', Crown spread 23'
3. Targets: Trial
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: decay in the lower trunk with fungus conks approx. 8' from base.
9. Scaffold limb defects: Broken branches.
10. Previous tree and limb failures: none

Management Recommendations: This tree is near the edge of the trail – remove.

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Tree number: 82

1. Species: Eucalyptus robusta
2. Size: DBH 14", Height 54', Crown spread 12'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken branches
10. Previous tree and limb failures: branch stubs

Management Recommendations: this tree is near the edge of the trail – remove.



Tree 81

Tree 82

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Tree number: 83

1. Species: Eucalyptus robust
2. Size: DBH 23", Height 70', Crown spread 26'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Tree is located in the trail – remove.

Tree number: 84

1. Species: Eucalyptus robusta
2. Size: DBH 34", Height 86', Crown spread 45'
3. Targets: Church parking lot and trail.
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood and stubs.
10. Previous tree and limb failures: none

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Management Recommendations: Root prune before trail construction crown clean and safety prune.



Tree 84

Tree number: 85

1. Species: Eucalyptus robusta
2. Size: DBH 14", Height 37', Crown spread 16'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: near edge of trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Root prune before construction, crown clean.

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Tree number: 86

1. Species: Eucalyptus robusta
2. Size: DBH 14", Height 78', Crown spread 41'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: This tree is located in the trail – remove.

Tree number: 87

1. Species: Eucalyptus robusta
2. Size: DBH 8", Height 27', Crown spread 10'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: in trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken top with new sprout growth.
10. Previous tree and limb failures: none

Management Recommendations: Tree is located in the trail – remove.

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Tree 86

Tree 87

Tree 93

Tree number: 88

1. Species: Eucalyptus robusta
2. Size: DBH 12", Height 42', Crown spread 14'
3. Targets: Church parking lot
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Crown clean.

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Tree 88

Tree number: 89

1. Species: *Eucalyptus robusta*
2. Size: DBH 51", Height 86', Crown spread 65'
3. Targets: Church parking lot and trail.
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: near edge of trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood, broken branches
10. Previous tree and limb failures: none

Management Recommendations: Very large tree at the edge of the trail – remove.

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Tree 89

Tree number: 90

1. Species: Eucalyptus robusta
2. Size: DBH 10", Height 44', Crown spread 17'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: near edge of trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Tree is on the edge of the trail – remove.

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Tree 90

Tree number: 91

1. Species: Eucalyptus robusta
2. Size: DBH 17", Height 45', Crown spread 8'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken top
10. Previous tree and limb failures: none

Management Recommendations: This tree is in the trail – remove.

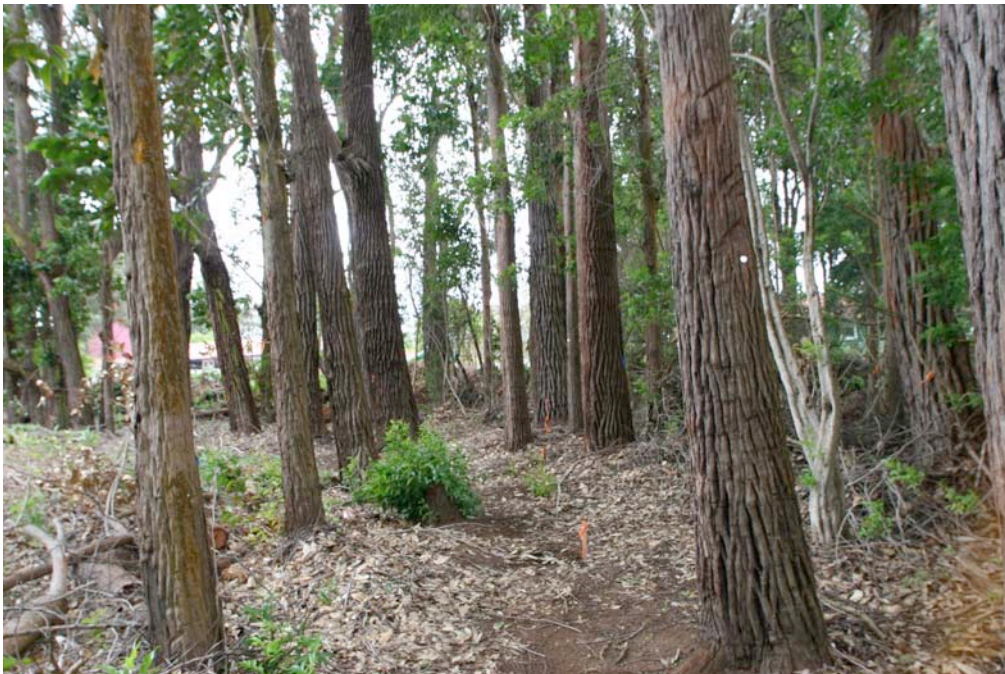
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Tree number: 92

1. Species: Eucalyptus robusta
2. Size: DBH 18", Height 72', Crown spread 16'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Some dead wood
10. Previous tree and limb failures: none

Management Recommendations: This tree is in the trail – remove.



Trees: 93 94 96 92

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Tree number: 93

1. Species: Eucalyptus robusta
2. Size: DBH 12", Height 51', Crown spread 7'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: near edge of trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Tree is growing at the edge of the trail – remove.

Tree number: 94

1. Species: Eucalyptus robusta
2. Size: DBH 12", Height 44', Crown spread 6'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: Tree is growing near the edge of the trail.
7. Defective root conditions: none
8. Trunk defects: broken ½ way up
9. Scaffold limb defects: Approximately one half of the tree has broken off.
10. Previous tree and limb failures: trunk failure

Management Recommendations: Tree is growing at the edge of the tree – remove.

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Tree number: 95

1. Species: Eucalyptus robusta
2. Size: DBH 24", Height 54', Crown spread 20'
3. Targets: Church parking lot
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Fair
6. Adverse site conditions: Growing near the edge of the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken branches and dead wood.
10. Previous tree and limb failures: branch stubs

Management Recommendations: Recommend root pruning before trail construction, crown clean and safety pruning.



Tree 95

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Tree number: 96

1. Species: Eucalyptus robusta
2. Size: DBH 23", Height 135', Crown spread 50'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near edge of trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: This is a very tall tree at the edge of the trail – remove.



Tree 96

Michael M. Kraus Consulting Arborist

Tree number: 97

1. Species: Eucalyptus robusta
2. Size: DBH 16", Height 58', Crown spread 16'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: near edge of trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Multiple of dead leaders at top, extensive dead wood.
10. Previous tree and limb failures: broken limbs

Management Recommendations: Tree is in very poor health – remove.



Tree 97

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Tree number: 98

1. Species: Eucalyptus robusta
2. Size: DBH 10", Height 60', Crown spread 10'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: near edge of trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Numerous sprouts growing along trunk.
10. Previous tree and limb failures: stub

Management Recommendations: Tree is at the edge of the trail recommend removal.



Tree 98

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Tree number: 99

1. Species: Eucalyptus robusta
2. Size: DBH 26", Height 139', Crown spread 60'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Tree is growing in the trail – remove



Tree 98

Tree 99

Michael M. Kraus
Consulting Arborist

Tree number: 100

1. Species: Eucalyptus robusta
2. Size: DBH 10", Height 72', Crown spread '
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead Wood
10. Previous tree and limb failures: branch stub

Management Recommendations: Tree is growing in the trail – remove.



Tree 100

Michael M. Kraus
Consulting Arborist

Tree number: 101

1. Species: Eucalyptus robusta
2. Size: DBH 16", Height 86', Crown spread 12'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures:

Management Recommendations: This tree is in the trail – remove.

Tree number: 102

1. Species: Eucalyptus robusta
2. Size: DBH 11", Height 58', Crown spread 10'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Tree is in the trail – remove.

Michael M. Kraus
Consulting Arborist



Tree 103

Tree 102

Tree 101

Tree number: 103

1. Species: Eucalyptus robusta
2. Size: DBH 28", Height 124', Crown spread 37'
3. Targets: Trail and school
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: This tree is located on the edge or in the trail –remove.

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Tree number: 104

1. Species: Eucalyptus robusta
2. Size: DBH 37", Height 129', Crown spread 50'
3. Targets: School and trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: This tree is in the trail – remove.

Tree number: 105

1. Species: Eucalyptus robusta
2. Size: DBH 9", Height 56', Crown spread 12'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: near edge of trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Numerous sprouts.
10. Previous tree and limb failures: none

Management Recommendations: This tree is near the edge of the trail – remove.

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Tree number: 106

1. Species: Eucalyptus robusta
2. Size: DBH 12", Height 40', Crown spread 8'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: in trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Top is broken off, has large multiple tops either dead or declining.
10. Previous tree and limb failures: Broken top

Management Recommendations: Tree is in poor health recommend removal.



Tree 106

Tree 105

Tree 103

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Tree number: 107

1. Species: Eucalyptus robusta
2. Size: DBH 27", Height 61', Crown spread 30'
3. Targets: School
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: On edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Prune roots before trail construction, crown clean



Tree 107

Tree 106

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Tree number: 108

1. Species: Eucalyptus robusta
2. Size: DBH 19", Height 70', Crown spread 20'
3. Targets: School
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: None

Tree number: 109

1. Species: Eucalyptus robusta
2. Size: DBH 5", Height 31', Crown spread 8'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood, olive branches rubbing on tree.
10. Previous tree and limb failures: none

Management Recommendations: This tree in the trail - remove

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Tree number: 110

1. Species: Eucalyptus robusta
2. Size: DBH 10", Height 15', Crown spread 13'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: one edge of trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: This tree is on the edge of the trail – remove.

Tree number: 111

1. Species: Eucalyptus robusta
2. Size: DBH 22", Height 83', Crown spread 38'
3. Targets: Trail
4. Form and Crown class: Asymmetrical with a heavy lean towards the trail;
Suppressed
5. Tree health: Good
6. Adverse site conditions: in trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: dead stubs

Management Recommendations: Tree is in the trail recommend removal.

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Tree 110

Tree 111

Tree 112

Tree number: 112

1. Species: *Eucalyptus robusta*
2. Size: DBH 31", Height 133', Crown spread 50'
3. Targets: Trail
4. Form and Crown class: A Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: None

Management Recommendations: This tree is in the trail – remove.

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Tree 112

Tree 111

Tree number: 113

1. Species: *Eucalyptus robusta*
2. Size: DBH 15", Height 25', Crown spread 8'
3. Targets: none
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: This tree has grafted on to tree number 114
7. Defective root conditions: none
8. Trunk defects: Grafted to number 114
9. Scaffold limb defects: Top is broken out
10. Previous tree and limb failures: Broken top

Management Recommendations: Tree is near the trail – remove.

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Tree number: 114

1. Species: Eucalyptus robusta
2. Size: DBH 26", Height 61', Crown spread 25'
3. Targets: Trail and school
4. Form and Crown class: Asymmetrical with a heavy lean; Suppressed
5. Tree health: Fair
6. Adverse site conditions: near edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken top
10. Previous tree and limb failures: Broken top

Management Recommendations: This tree leans heavily towards the school and located near the edge of the trail – remove.

Tree number: 115

1. Species: Eucalyptus robusta
2. Size: DBH 29", Height 97', Crown spread 50'
3. Targets: School and trail
4. Form and Crown class: Asymmetrical with a heavy lean towards the school; Suppressed
5. Tree health: Good
6. Adverse site conditions: near edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: None

Management Recommendations: Tree is located near the edge of the trail – remove.

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Tree 115

Tree number: 116

1. Species: Eucalyptus robusta
2. Size: DBH 26", Height _', Crown spread 0'
3. Targets: none
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: majority of this tree has broken out
9. Scaffold limb defects: broken top on ground approximately 9' from the base
10. Previous tree and limb failures: trunk failure

Management Recommendations: Remove the remainder of the tree.

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Tree115

Tree 116 with broken top on the ground.

Tree number: 117

1. Species: Eucalyptus robusta
2. Size: DBH 16", Height 12', Crown spread 0'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: dead
6. Adverse site conditions: near edge of trail
7. Defective root conditions: none
8. Trunk defects: majority of the a tree is missing
9. Scaffold limb defects: Broken top on ground approximately 6' from the base.
10. Previous tree and limb failures: trunk failure

Management Recommendations: Remove the remainder of the tree.

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Tree 117

Tree number: 118

1. Species: Montezuma Cypress
2. Size: DBH 12", Height 43', Crown spread 16'
3. Targets: none
4. Form and Crown class: Asymmetrical with a heavy lean; Suppressed
5. Tree health: Fair
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken branches
10. Previous tree and limb failures: none

Management Recommendations: Crown clean

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Tree 116 Tree 118

Tree number: 119

1. Species: Eucalyptus robusta
2. Size: DBH 28", Height 98', Crown spread 58'
3. Targets: Trail
4. Form and Crown class: Asymmetrical with a heavy lean; Co-dominant
5. Tree health: Good
6. Adverse site conditions: edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken branches and dead wood.
10. Previous tree and limb failures: Branch stub

Management Recommendations: Tree is on the edge of the trail - remove.

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Tree number: 120

1. Species: Eucalyptus robusta
2. Size: DBH 19", Height 57', Crown spread 20'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: on edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken top, numerous sprouts along the trunk.
10. Previous tree and limb failures: broken top and branches

Management Recommendations: Tree is on the edge of the trail – remove.

Tree number: 121

1. Species: Eucalyptus robusta
2. Size: DBH 17", Height 91', Crown spread 13'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: on edge of trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: None

Management Recommendations: Tree is close to the edge of trail – remove.

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Tree number: 122

1. Species: Eucalyptus robusta
2. Size: DBH 10", Height 53', Crown spread 6'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: on the edge of the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Upper half of tree appears dead.
10. Previous tree and limb failures: Crown dieback

Management Recommendations: Tree is near the trail recommend removal.

Tree number: 123

1. Species: Eucalyptus robusta
2. Size: DBH 26", Height 98', Crown spread 44'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: None

Management Recommendations: Tree is growing close to the edge of the trail – remove.

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Tree number: 124

1. Species: Eucalyptus robusta
2. Size: DBH 12", Height 27', Crown spread 4'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken branches, dead wood
10. Previous tree and limb failures: Branch stubs

Management Recommendations: Tree is growing on the edge of trail – remove.

Tree number: 125

1. Species: Eucalyptus robusta
2. Size: DBH 17", Height 91', Crown spread 18'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken branches and dead wood
10. Previous tree and limb failures: Branch stub

Management Recommendations: Tree is on the edge of trail – remove.

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Tree 123

Tree 124

Tree 125

Tree number: 126

1. Species: Eucalyptus robusta
2. Size: DBH 15", Height 70', Crown spread 12'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken top and dead wood.
10. Previous tree and limb failures: Broken tops

Management Recommendations: Tree is on the edge of the trail – remove.

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Tree number: 127

1. Species: Eucalyptus robusta
2. Size: DBH 25", Height 94', Crown spread 53'
3. Targets: Trail
4. Form and Crown class: Asymmetrical with a heavy lean; Co-dominant
5. Tree health: Good
6. Adverse site conditions: edge of trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Large broken branch
10. Previous tree and limb failures: Limb stub

Management Recommendations: Tree is on the edge of trail – remove.

Tree number: 128

1. Species: Eucalyptus robusta
2. Size: DBH 17", Height 123', Crown spread 30'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: None

Management Recommendations: Tree is in the trail – remove.

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Tree number: 129

1. Species: Eucalyptus robusta
2. Size: DBH 30", Height 139', Crown spread 72'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: None

Management Recommendations: Tree is in the trail – remove.

Tree number: 130

1. Species: Eucalyptus robusta
2. Size: DBH 39", Height 137', Crown spread 57'
3. Targets: School and trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: Limb stub

Management Recommendations: Root pruning before trail construction and crown clean

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Tree 130 stream side

Tree number: 131

1. Species: Eucalyptus robusta
2. Size: DBH 26", Height 121', Crown spread 46'
3. Targets: Trail
4. Form and Crown class: Asymmetrical with a heavy lean; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: None

Management Recommendations: Tree is located in the trail -remove

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Tree number: 132

1. Species: Eucalyptus robusta
2. Size: DBH 13", Height 70', Crown spread 0'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: On the edge of the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Majority of the crown is dead
10. Previous tree and limb failures: Crown dieback

Management Recommendations: Tree is failing - remove

Tree number: 133

1. Species: Eucalyptus robusta
2. Size: DBH 40", Height 138', Crown spread 48'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Included bark, dead branches
10. Previous tree and limb failures: none

Management Recommendations: This tree is in the trail – remove.

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Tree number: 134

1. Species: Eucalyptus robusta
2. Size: DBH 14", Height 26', Crown spread 8'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: Large section of top missing at approximately 7' from the ground, most of the remaining trunk is dead.
9. Scaffold limb defects: Dead wood, weak branch connections
10. Previous tree and limb failures: Trunk failure

Management Recommendations: This tree is in the trail –remove



Tree 133

Tree 134

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Tree number: 135

1. Species: Eucalyptus robusta
2. Size: DBH 12", Height 96', Crown spread 16'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: None

Management Recommendations: On edge of trail remove.

Tree number: 136

1. Species: Eucalyptus robusta
2. Size: DBH 16", Height 69', Crown spread 36'
3. Targets: Trail
4. Form and Crown class: Asymmetrical with a heavy lean; Suppressed
5. Tree health: Good
6. Adverse site conditions: on edge of trail, leaning over trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: None

Management Recommendations: Tree is at the edge of the trail – remove.

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Tree number: 137

1. Species: Eucalyptus robusta
2. Size: DBH 17", Height 42', Crown spread 25'
3. Targets: Trail
4. Form and Crown class: Asymmetrical with a heavy lean; Suppressed
5. Tree health: Fair
6. Adverse site conditions: edge of trail
7. Defective root conditions: none
8. Trunk defects: Double trunk, included bark
9. Scaffold limb defects: Dead wood and broken branches
10. Previous tree and limb failures: branch stub

Management Recommendations: Tree is at the edge of the trail – remove.



Tree 135

Tree 136

Tree 137

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Tree number: 138

1. Species: Eucalyptus robusta
2. Size: DBH 26", Height 52', Crown spread 68'
3. Targets: School
4. Form and Crown class: Asymmetrical with a heavy lean; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near the edge of the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood, broken branches, and large branch rubbing against tree number 130
10. Previous tree and limb failures: branch stubs

Management Recommendations: This tree is near the edge of the trail, leans heavily towards the school – remove.

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Tree 138

Tree number: 139

1. Species: *Eucalyptus robusta*
2. Size: DBH 16", Height 30', Crown spread 10'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Multiple broken leaders with new growth, broken branches and dead wood.
10. Previous tree and limb failures: broken leaders

Management Recommendations: Edge of trail recommend removal

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Tree number: 140

1. Species: Eucalyptus robusta
2. Size: DBH 22", Height 55', Crown spread 20'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken branches and dead wood
10. Previous tree and limb failures: Broken branches

Management Recommendations: Tree is on the edge of the trail - remove.

Tree number: 141

1. Species: Eucalyptus robusta
2. Size: DBH 14", Height 27', Crown spread 0'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Dead
6. Adverse site conditions: edge of trail
7. Defective root conditions: none
8. Trunk defects: dead
9. Scaffold limb defects: Broken top
10. Previous tree and limb failures: Broken top

Management Recommendations: Tree is located at the edge of the trail is dead remove

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Tree 139

Tree 140

Tree 141

Tree number: 142

1. Species: *Eucalyptus robusta*
2. Size: DBH 31", Height 94', Crown spread 45'
3. Targets: School and Utility lines
4. Form and Crown class: Asymmetrical with a heavy lean towards the school; Co-dominant
5. Tree health: good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Large to medium broken branches
10. Previous tree and limb failures: Dead stubs

Management Recommendations: This is a large tree that leans very heavily towards the school – remove.

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Tree number: 143

1. Species: Eucalyptus robusta
2. Size: DBH 32", Height 129', Crown spread 40'
3. Targets: Trail and School
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: Dead stubs

Management Recommendations: Edge of trail – remove



Tree 143

Tree 142

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Tree number: 144

1. Species: Eucalyptus robusta
2. Size: DBH 17", Height 57', Crown spread 15'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: edge of trail; leaning over trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Edge of trail – remove.

Tree number: 145

1. Species: Eucalyptus robusta
2. Size: DBH 20", Height 90', Crown spread 22'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Fair
6. Adverse site conditions: edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: None

Management Recommendations: Edge of trail – remove.

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Tree number: 146

1. Species: Eucalyptus robusta
2. Size: DBH 18", Height 15', Crown spread 0'
3. Targets: Trail
4. Form and Crown class: No top; Suppressed
5. Tree health: Dead
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: dead
9. Scaffold limb defects: Dead tree
10. Previous tree and limb failures: Dead

Management Recommendations: Dead tree in the trail – remove.



Tree 145 Tree 148 Tree146

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Tree number: 147

1. Species: Eucalyptus robusta
2. Size: DBH 36", Height 139', Crown spread 48'
3. Targets: School and trail
4. Form and Crown class: Asymmetrical with a heavy lean; Dominant
5. Tree health: Good
6. Adverse site conditions: near the trail with a heavy lean towards the school
7. Defective root conditions: none
8. Trunk defects: Bark damage at base
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: None

Management Recommendations: This tall tree is located near the trail and leans heavily towards the school - remove

Tree number: 148

1. Species: Eucalyptus robusta
2. Size: DBH 9", Height 18', Crown spread 0'
3. Targets: trail
4. Form and Crown class: No top; Suppressed
5. Tree health: Dead
6. Adverse site conditions: on the edge of the trail
7. Defective root conditions: none
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: Dead

Management Recommendations: Remove

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Tree number: 149

1. Species: Eucalyptus robusta
2. Size: DBH 12", Height 60', Crown spread 4'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: on the edge of the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Crown is poor health
10. Previous tree and limb failures: Dead stubs and branches

Management Recommendations: Tree is located at the edge of the trail in declining health – remove.



Tree 148

Tree 149

Tree 150

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Tree number: 150

1. Species: Eucalyptus robusta
2. Size: DBH 22", Height 40', Crown spread 14'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Major limbs with broken branches
10. Previous tree and limb failures: Dead limb stubs

Management Recommendations: This is a declining tree that leans toward the trail recommend removal

Tree number: 151

1. Species: Eucalyptus robusta
2. Size: DBH 32", Height 141', Crown spread 45'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: edge of trail
7. Defective root conditions: none
8. Trunk defects: Large wound
9. Scaffold limb defects: Broken branches and dead wood
10. Previous tree and limb failures: Dead stub

Management Recommendations: Tree is on the edge of trail recommend removal

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Tree number: 152

1. Species: Eucalyptus robusta
2. Size: DBH 13", Height 40', Crown spread 20'
3. Targets: School yard
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken branches and dead wood
10. Previous tree and limb failures: Dead Branches

Management Recommendations: Crown clean

Tree number: 153

1. Species: Eucalyptus robusta
2. Size: DBH 19", Height 51', Crown spread 37'
3. Targets: School yard
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: Heavy lean towards school
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken branches and dead wood
10. Previous tree and limb failures: Dead stub

Management Recommendations: Tree leans heavily towards the school yard – remove.

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Consulting Arborist



Tree 153

Tree 152

Tree number: 154

1. Species: Eucalyptus robusta
2. Size: DBH 16", Height 75', Crown spread 12'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken branches and dead wood
10. Previous tree and limb failures: None

Management Recommendations: Tree is on the edge of the trail - remove

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Tree number: 155

1. Species: Eucalyptus robusta
2. Size: DBH 25", Height 45', Crown spread 16'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken branches and dead wood
10. Previous tree and limb failures: Dead branches

Management Recommendations: Edge of trail - remove

Tree number: 156

1. Species: Eucalyptus robusta
2. Size: DBH 34", Height 13', Crown spread 50'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: None

Management Recommendations: This tree is in the trail – remove

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Tree 156

Tree number: 157 NO TREE TAGGED 157

Tree number: 158

1. Species: *Eucalyptus robusta*
2. Size: DBH 26", Height 60', Crown spread 36'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; suppressed
5. Tree health: Good
6. Adverse site conditions: edge of trail
7. Defective root conditions: none
8. Trunk defects: Double trunk with included bark
9. Scaffold limb defects: Broken branches and dead wood, one trunk top broken out, branch leaning against tree number 153
10. Previous tree and limb failures: Broken top

Management Recommendations: This tree is on the edge of the trail - remove

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Tree number: 159

1. Species: Eucalyptus robusta
2. Size: DBH 24", Height 68', Crown spread 20'
3. Targets: School yard
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken top and dead wood
10. Previous tree and limb failures: Broken top

Management Recommendations: Crown clean

Tree number: 160

1. Species: Eucalyptus robusta
2. Size: DBH 12", Height 40', Crown spread 12'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken tops and dead wood
10. Previous tree and limb failures: Broken tops

Management Recommendations: Tree is near the edge of the trail – remove

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Tree 164 Tree 160

Tree 156

Tree number: 161

1. Species: Eucalyptus robusta
2. Size: DBH 17", Height 50', Crown spread 20'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: Dead stub

Management Recommendations: This tree is in the trail – remove

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Tree 161

Tree 162

Tree number: 162

1. Species: Eucalyptus robusta
2. Size: DBH 22", Height 58', Crown spread 20'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken branches
10. Previous tree and limb failures: None

Management Recommendations: Tree is on the edge of the trail - removal

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Tree number: 163

1. Species: Eucalyptus robusta
2. Size: DBH 16", Height 30', Crown spread 5'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken branches and dead wood
10. Previous tree and limb failures: Dead stub

Management Recommendations: Tree is at the edge of the trail remove.

Tree number: 164

1. Species: Eucalyptus robusta
2. Size: DBH 44", Height 95', Crown spread 60'
3. Targets: School
4. Form and Crown class: Asymmetrical with a heavy lean; Co-dominant
5. Tree health: Good
6. Adverse site conditions: edge of trail
7. Defective root conditions: none
8. Trunk defects: numerous sprouts at base of trunk
9. Scaffold limb defects: Large broken branches and dead wood
10. Previous tree and limb failures: Dead branches

Management Recommendations: This is a large tree that leans heavily towards the school yard - remove

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Tree number: 165

1. Species: Eucalyptus robusta
2. Size: DBH 7", Height 20', Crown spread 0'
3. Targets: Trail
4. Form and Crown class: No top; Suppressed
5. Tree health: Dead
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: Dead

Management Recommendations: Tree is dead – remove



Tree 165

Tree 166

Tree 170

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Tree number: 166

1. Species: Eucalyptus robusta
2. Size: DBH 20", Height 90', Crown spread 20'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead Wood
10. Previous tree and limb failures: Dead branches

Management Recommendations: Tree is in the trail - remove

Tree number: 167

1. Species: Eucalyptus robusta
2. Size: DBH 10", Height 40', Crown spread 16'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: near edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Majority of crown is dead
10. Previous tree and limb failures: Crown dieback

Management Recommendations: This tree is near the edge of the trail and in poor health
- remove

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Tree number: 168

1. Species: Eucalyptus robusta
2. Size: DBH 18", Height 16', Crown spread 5'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Most of the crown is dead
10. Previous tree and limb failures: Crown dieback

Management Recommendations: Tree is in the trail - remove.

Tree number: 169

1. Species: Eucalyptus robusta
2. Size: DBH 16", Height 55', Crown spread 14'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: Dead limbs

Management Recommendations: Tree is in the trail - remove

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Tree number: 170

1. Species: Eucalyptus robusta
2. Size: DBH 27", Height 87', Crown spread 22'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Large broken and dead branches, hanging limbs in the tree
10. Previous tree and limb failures: broken limbs

Management Recommendations: This tree is in the trail - remove

Tree number: 171

1. Species: Eucalyptus robusta
2. Size: DBH 54", Height 149', Crown spread 68'
3. Targets: School and trail
4. Form and Crown class: Symmetrical and Dominant
5. Tree health: Good
6. Adverse site conditions: near the edge of the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken branches and dead wood
10. Previous tree and limb failures: Branch stub

Management Recommendations: Crown clean and safety prune

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Tree 171

Tree number: 172

1. Species: *Eucalyptus robusta*
2. Size: DBH 14", Height 36', Crown spread 7'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken branches and dead wood
10. Previous tree and limb failures: Branch stubs

Management Recommendations: Tree is in the trail - remove

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Tree number: 173

1. Species: Eucalyptus robusta
2. Size: DBH 22", Height 75', Crown spread 25'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken branches and dead wood
10. Previous tree and limb failures: Limb scar

Management Recommendations: Tree is located in the tree - remove

Tree number: 174

1. Species: Eucalyptus robusta
2. Size: DBH 15", Height 42', Crown spread 16'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken branches and dead wood
10. Previous tree and limb failures: Limb stub

Management Recommendations: Tree is in the trail – remove

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Tree 172

Tree 173

Tree 174

Tree number: 175

1. Species: *Eucalyptus robusta*
2. Size: DBH 20", Height 52', Crown spread 15'
3. Targets: Trail
4. Form and Crown class: Asymmetrical with a heavy lean; Suppressed
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken branches
10. Previous tree and limb failures: Limb stub

Management Recommendations: Tree is in the trail – remove.

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Tree 174

Tree 175

Tree 176

Tree number: 176

1. Species: *Eucalyptus robusta*
2. Size: DBH 13", Height 50', Crown spread 12'
3. Targets: Trail
4. Form and Crown class: Asymmetrical with a heavy lean; Suppressed
5. Tree health: Good
6. Adverse site conditions: edge of the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken branches
10. Previous tree and limb failures: None

Management Recommendations: Tree is located at the edge of the trail - remove

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Tree number: 177

1. Species: Eucalyptus robusta
2. Size: DBH 17", Height 50', Crown spread 18'
3. Targets: Trail
4. Form and Crown class: Asymmetrical with a heavy lean; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken branches and dead wood
10. Previous tree and limb failures: Limb stubs

Management Recommendations: This tree is located in the trail – remove



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Tree number: 178

1. Species: Eucalyptus robusta
2. Size: DBH 9", Height 26', Crown spread 4'
3. Targets: none
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Branch from number 179 is rubbing against trunk.
10. Previous tree and limb failures: None

Management Recommendations: Prune limb from 179 that rubs on the trunk



Tree 178

Tree 179

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Tree number: 179

1. Species: Eucalyptus robusta
2. Size: DBH 8", Height 20', Crown spread 10'
3. Targets: none
4. Form and Crown class: Asymmetrical Suppressed
5. Tree health: good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: Sprouts from an old stump
9. Scaffold limb defects: none
10. Previous tree and limb failures: None

Management Recommendations: Crown clean and remove limb that rubs against 178

Tree number: 180

1. Species: Eucalyptus robusta
2. Size: DBH 12", Height 47', Crown spread 13'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken top
10. Previous tree and limb failures: Broken top

Management Recommendations: Tree is in the trail - remove

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Tree number: 181

1. Species: Eucalyptus robusta
2. Size: DBH 28", Height 75', Crown spread 30'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: None

Management Recommendations: Tree is in the trail – remove



Tree 180

Tree 181

Tree 182 185

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Tree number: 182

1. Species: Eucalyptus robusta
2. Size: DBH 15", Height 59', Crown spread 14'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: None

Management Recommendations: This tree is in the trail - remove

Tree number: 183

1. Species: Eucalyptus robusta
2. Size: DBH 14", Height 35', Crown spread 18'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken top
10. Previous tree and limb failures: Broken top

Management Recommendations: This tree is in the trail – remove.

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Tree number: 184

1. Species: Eucalyptus robusta
2. Size: DBH 23", Height 20', Crown spread 0'
3. Targets: none
4. Form and Crown class: Dead trunk; Suppressed
5. Tree health: dead
6. Adverse site conditions: none
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: Dead

Management Recommendations: Tree is dead - remove

Tree number: 185

1. Species: Eucalyptus robusta
2. Size: DBH 14", Height 51', Crown spread 12'
3. Targets: trail
4. Form and Crown class: Symmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken top
10. Previous tree and limb failures: Broken tops

Management Recommendations: Tree is growing in the trail - remove

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Tree number: 186

1. Species: Eucalyptus robusta
2. Size: DBH 13", Height 62', Crown spread 12'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: None

Management Recommendations: Growing close to the edge of the trail – remove



Tree 186

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Tree number: 187

1. Species: Eucalyptus robusta
2. Size: DBH 20", Height 60', Crown spread 20'
3. Targets: Trail
4. Form and Crown class: Asymmetrical with a lean; Suppressed
5. Tree health: Good
6. Adverse site conditions: edge of trail, leaning over trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: None

Management Recommendations: Tree is growing at the edge of the trail - remove

Tree number: 188

1. Species: Eucalyptus robusta
2. Size: DBH 10", Height 25', Crown spread 10'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: Large vertical crack in trunk
9. Scaffold limb defects: Broken top
10. Previous tree and limb failures: Broken top

Management Recommendations: tree is growing in trail – remove.

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Tree number: 189

1. Species: Eucalyptus robust
2. Size: DBH 17", Height 63', Crown spread 15'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Tree is growing in the trail – remove



Tree 188 Tree 191 Tree 189 Tree 190

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Tree number: 190

1. Species: Eucalyptus robusta
2. Size: DBH 30", Height 75', Crown spread 22'
3. Targets: trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: limb stub

Management Recommendations: Tree is growing near the edge of the trail – remove.

Tree number: 191

1. Species: Eucalyptus robusta
2. Size: DBH 19", Height 70', Crown spread 12'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: None

Management Recommendations: Tree is growing in trail – remove.

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Tree number: 192

1. Species: Eucalyptus robusta
2. Size: DBH 16", Height 50', Crown spread 10'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Tree is in the trail – remove.



Tree 191

Tree 192

Tree 193

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Tree number: 193

1. Species: Eucalyptus robusta
2. Size: DBH 14", Height 35', Crown spread 12'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken top
10. Previous tree and limb failures: broken top

Management Recommendations: Tree is in the trail – remove.

Tree number: 194

1. Species: Eucalyptus robusta
2. Size: DBH 24", Height 52', Crown spread 39'
3. Targets: Trail
4. Form and Crown class: Asymmetrical with a heavy lean over the river;
Suppressed
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Major limb rubbing against tree number 193
10. Previous tree and limb failures: none

Management Recommendations: Tree is growing in the trail – remove.

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Tree 194

Tree 196

Tree 197

Tree number: 195

1. Species: *Eucalyptus robusta*
2. Size: DBH 9", Height 30', Crown spread 16'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: Vertical trunk wound.
9. Scaffold limb defects: Broken top.
10. Previous tree and limb failures: broken top

Management Recommendations: Tree is growing in the trail – remove.

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Tree number: 196

1. Species: Eucalyptus robusta
2. Size: DBH 29", Height 70', Crown spread 40'
3. Targets: Trail and School yard
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Tree is growing in the trail – remove.

Tree number: 197

1. Species: Eucalyptus robusta
2. Size: DBH 21", Height 58', Crown spread 20'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Tree is growing in the trail – remove.

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Tree 197

Tree number: 198

1. Species: *Eucalyptus robusta*
2. Size: DBH 10", Height 30', Crown spread 0'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Dead
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken top.
10. Previous tree and limb failures: Broken top

Management Recommendations: Tree is growing in the trail – remove.

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Tree number: 199

1. Species: Eucalyptus robusta
2. Size: DBH 17", Height 64', Crown spread 7'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor; new sprouts near base the rest of tree appears dead.
6. Adverse site conditions: on edge of trail
7. Defective root conditions: none
8. Trunk defects: Upper portion appears dead.
9. Scaffold limb defects: Broken top.
10. Previous tree and limb failures: none

Management Recommendations: Tree is growing at the edge of trail – remove.



Tree 199

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Tree number: 200

1. Species: Eucalyptus robusta
2. Size: DBH 13", Height 70', Crown spread 12'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood, broken branches.
10. Previous tree and limb failures: none

Management Recommendations: Tree is growing in the trail – remove.



Tree 197

Tree 199 Tree 198

Tree 200

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Tree number: 201

1. Species: Eucalyptus robusta
2. Size: DBH 36", Height 115', Crown spread 25'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: dead stub

Management Recommendations: Tree is in the trail – remove.

Tree number: 202

1. Species: Eucalyptus robusta
2. Size: DBH 49", Height 112', Crown spread 70'
3. Targets: School yard
4. Form and Crown class: Asymmetrical with a heavy lean; Co-dominant
5. Tree health: Good
6. Adverse site conditions: Tree is growing at the end of the trail with erosion of the roots on the stream side.
7. Defective root conditions: erosion on the stream side.
8. Trunk defects: Double trunk with included bark at the joint.
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: Dead stubs

Management Recommendations: Tree is close to the edge of the trail, erosion on the side of tree towards the school – remove.

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Tree 202

Tree number: 203

1. Species: Eucalyptus robusta
2. Size: DBH 17", Height 70', Crown spread 16'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: located at the edge of the trail.
7. Defective root conditions: none
8. Trunk defects: none, with a heavy lean towards the trail.
9. Scaffold limb defects: Some dead wood.
10. Previous tree and limb failures: none

Management Recommendations: At the edge of the trail – remove.

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Tree 203

Tree number: 204

1. Species: *Eucalyptus robusta*
2. Size: DBH 23", Height 73', Crown spread 15'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken top.
10. Previous tree and limb failures: none

Management Recommendations: Tree is in the trail – remove.

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Tree 200

Tree 201

Tree 204

Tree 205

Tree number: 205

1. Species: *Eucalyptus robusta*
2. Size: DBH 19", Height 78', Crown spread 15'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: Limb stub

Management Recommendations: Trail is in the trail – remove.

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Tree number: 206

1. Species: Eucalyptus robusta
2. Size: DBH 20", Height 102', Crown spread 25'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in the trail.
7. Defective root conditions: none
8. Trunk defects: Missing nine to ten feet of bark; possibly due to rubbing from tree number 205.
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Tree is in the trail – remove.

Tree number: 207

1. Species: Eucalyptus robusta
2. Size: DBH 39", Height 120', Crown spread 45'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Some dead wood.
10. Previous tree and limb failures: none

Management Recommendations: Tree is in the trail – remove.

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Tree 207

Tree 206

Tree number: 208

1. Species: Eucalyptus robusta
2. Size: DBH 37", Height 118', Crown spread 70'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: in the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Tree is in the trail – remove.

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Tree 208

Tree 210

Tree number: 209

1. Species: Eucalyptus robusta
2. Size: DBH 23", Height 50', Crown spread 35'
3. Targets: Parking lot
4. Form and Crown class: Asymmetrical with a heavy lean; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Tree is in the trail – remove.

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Tree number: 210

1. Species: Eucalyptus robusta
2. Size: DBH 35", Height 122', Crown spread 65'
3. Targets: Parking lot
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood.
10. Previous tree and limb failures: none

Management Recommendations: Tree is in the trail – remove.

Tree number: 211

1. Species: Eucalyptus robusta
2. Size: DBH 38", Height 124', Crown spread 55'
3. Targets: School yard
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in the trail.
7. Defective root conditions: Erosion of roots on the stream side.
8. Trunk defects: none
9. Scaffold limb defects: Dead wood and some broken limbs.
10. Previous tree and limb failures: limb stubs

Management Recommendations: Tree is in the trail – remove.

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Tree 211

Tree number: 212

1. Species: *Eucalyptus robusta*
2. Size: DBH 27", Height 45', Crown spread 32'
3. Targets: Trail and parking lot
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in the trail.
7. Defective root conditions: none
8. Trunk defects: Trunk has a cavity approximately 5' up from the base.
9. Scaffold limb defects: Large broken limb hanging in the tree.
10. Previous tree and limb failures: large limb near base broke or was removed.

Management Recommendations: Tree is in the trail – remove.

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Tree 212

Tree number: 213

1. Species: Eucalyptus robusta
2. Size: DBH 13", Height 22', Crown spread 8'
3. Targets: Parking lot
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: at the edge of parking lot.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: tree has broken top and poor branch attachments.
10. Previous tree and limb failures: none

Management Recommendations: Tree is leaning towards the parking lot - remove

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Trees: 217 214 213 210 209

Tree number: 214

1. Species: Eucalyptus robusta
2. Size: DBH 28", Height 70', Crown spread 20'
3. Targets: Parking lot
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: on the edge of the Parking lot.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Tree has broken top and branches.
10. Previous tree and limb failures: broken top

Management Recommendations: Tree is leaning towards the parking lot – remove.

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Tree number: 215

1. Species: Eucalyptus robusta
2. Size: DBH 17", Height 18', Crown spread 5'
3. Targets: Parking lot and trail.
4. Form and Crown class: Dead
5. Tree health: Dead
6. Adverse site conditions: on edge of trail
7. Defective root conditions: Dead
8. Trunk defects: Dead
9. Scaffold limb defects: Broken top.
10. Previous tree and limb failures: broken top

Management Recommendations: Dead tree – remove.

Tree number: 216

1. Species: Eucalyptus robusta
2. Size: DBH 24", Height 109', Crown spread 30'
3. Targets: Parking lot and trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Limb from tree number 212 is leaning against this tree.
10. Previous tree and limb failures: limb stub

Management Recommendations: Tree is located in the trail – remove.

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Tree 216

Tree number: 217

1. Species: *Eucalyptus robusta*
2. Size: DBH 31", Height 79', Crown spread 47'
3. Targets: Parking lot and trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: on the edge of the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: This tree is on the edge of the trail and overhangs the parking lot – remove.

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Tree number: 218

1. Species: Eucalyptus robusta
2. Size: DBH 7", Height 33', Crown spread 13'
3. Targets: Parking lot and trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: located on the edge of trail.
7. Defective root conditions: none
8. Trunk defects: Appears to be re-growth from a cut sump.
9. Scaffold limb defects: none
10. Previous tree and limb failures: This tree was cut to a low stump and sprouted.

Management Recommendations: On the edge of the trail – remove



Tree 218

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Tree number: 219

1. Species: Eucalyptus robusta
2. Size: DBH 27", Height 103', Crown spread 39'
3. Targets: Parking lot and trail.
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood.
10. Previous tree and limb failures: none

Management Recommendations: Tree is in the trail – remove.

Tree number: 220

1. Species: Eucalyptus robusta
2. Size: DBH 25", Height 94', Crown spread 29'
3. Targets: Parking lot and trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Tree is located in the trail – remove.

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Tree number: 221

1. Species: Black Waddle
2. Size: DBH 4", Height 18', Crown spread 13'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: near edge of trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: limbs are rubbing against tree number 222.
10. Previous tree and limb failures: none

Management Recommendations: Tree is at the edge of the trail – remove.



Tree 221

Tree 220

Tree 219

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Tree number: 222

1. Species: Christmas berry
2. Size: DBH 7", Height 18', Crown spread 14'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: Tree has been heavily pruned.

Management Recommendations: Tree is in the trail – remove.

Tree number: 223

1. Species: Eucalyptus robusta
2. Size: DBH 25", Height 63', Crown spread 30'
3. Targets: Parking lot and trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken branches and dead wood.
10. Previous tree and limb failures: Branch stubs

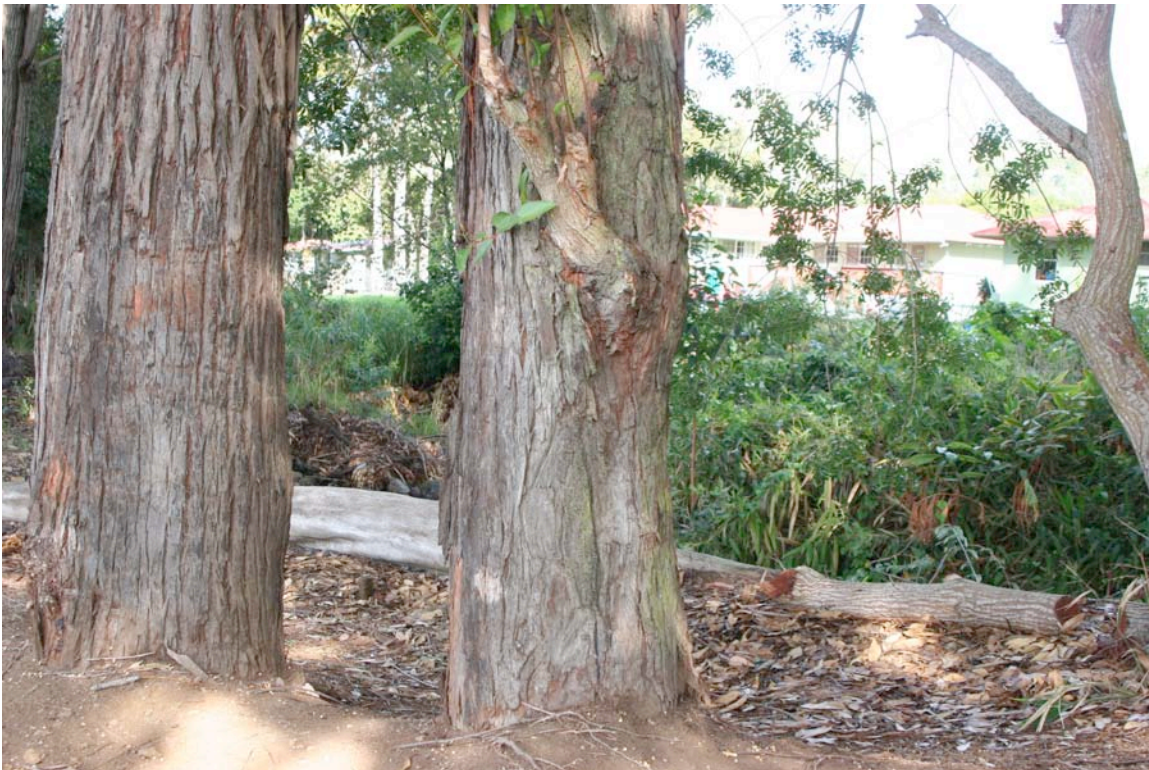
Management Recommendations: Tree is in the trail – remove.

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Tree number: 224

1. Species: Eucalyptus robusta
2. Size: DBH 30", Height 98', Crown spread 51'
3. Targets: Parking lot and trail.
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: limb stub

Management Recommendations: Tree is in the trail – remove.



Tree 224

Tree 223

Tree 222

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Tree number: 225

1. Species: Eucalyptus robusta
2. Size: DBH 34", Height 114', Crown spread 53'
3. Targets: Parking lot and trail.
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: tree is in the trail.
7. Defective root conditions: Erosion of roots on the stream side and the roots on the other side is entering the parking lot.
8. Trunk defects: none
9. Scaffold limb defects: Some dead wood.
10. Previous tree and limb failures: large limb scar

Management Recommendations: Tree is in the trail – remove.



Tree 225

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Tree number: 226

1. Species: Eucalyptus robusta
2. Size: DBH 26", Height 81', Crown spread 285'
3. Targets: Parking lot and trail.
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: on edge of trail.
7. Defective root conditions: erosion of root area on the stream side.
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Tree is located at the edge of the trail - remove

Tree number: 227

1. Species: Eucalyptus robusta
2. Size: DBH 41", Height 133', Crown spread 62'
3. Targets: Parking lot and trail.
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: on the edge of the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Tree is at the edge of the trail – remove.

Michael M. Kraus Consulting Arborist

Tree number: 228

1. Species: Eucalyptus robusta
2. Size: DBH 28", Height 65', Crown spread 18'
3. Targets: Parking lot and trail.
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: on edge of the trail.
7. Defective root conditions: none
8. Trunk defects: Cavity near the base of trunks; multi trunks appear to be re-growths.
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: possible previous trunk failure

Management Recommendations: Tree is on the edge of the trail remove.



Trees: 228 227 226

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Tree number: 229

1. Species: Eucalyptus robusta
2. Size: DBH 47", Height 104', Crown spread 55'
3. Targets: Parking lot and trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: in the trail.
7. Defective root conditions: none
8. Trunk defects: Fungus conk in old wound.
9. Scaffold limb defects: Dead wood and broken branches.
10. Previous tree and limb failures: limb stubs

Management Recommendations: Tree is in the trail – remove.



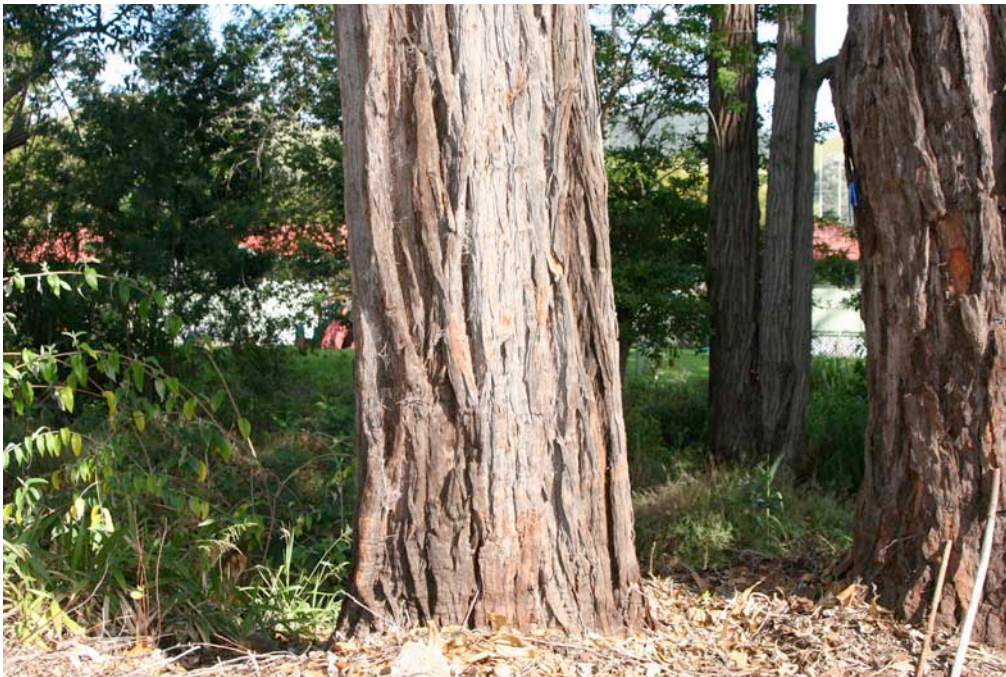
Tree 229

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Tree number: 230

1. Species: Eucalyptus robusta
2. Size: DBH 32", Height 137', Crown spread 38'
3. Targets: Parking lot and trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: in the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Tree is in the trail – remove.



Tree 230

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Tree number: 231

1. Species: Eucalyptus robusta
2. Size: DBH 37", Height 86', Crown spread 37'
3. Targets: School yard
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: multi trunks with included bark
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Crown clean.



Tree 231

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Tree number: 232

1. Species: Christmas berry
2. Size: DBH 10", Height 36', Crown spread 15'
3. Targets: none
4. Form and Crown class: Symmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: None

Tree number: 233

1. Species: Eucalyptus robusta
2. Size: DBH 29", Height 125', Crown spread 50'
3. Targets: Parking lot and trail.
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Some dead wood.
10. Previous tree and limb failures: none

Management Recommendations: Tree is in the trail – remove.

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Tree number: 234

1. Species: Eucalyptus robusta
2. Size: DBH 45", Height 126', Crown spread 57'
3. Targets: Parking lot and trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Tree is in the trail – remove.



Tree 234

Tree 233

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Tree number: 235

1. Species: Eucalyptus robusta
2. Size: DBH 28", Height 90', Crown spread 39'
3. Targets: Parking lot and trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Some dead wood
10. Previous tree and limb failures: none

Management Recommendations: Tree is in the trail - remove

Tree number: 236

1. Species: Eucalyptus robusta
2. Size: DBH 44", Height 160', Crown spread 64'
3. Targets: Parking lot and trail.
4. Form and Crown class: Asymmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: in the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: limb stub

Management Recommendations: Tree is in the trail – remove.

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Tree number: 237

1. Species: Eucalyptus robusta
2. Size: DBH 34", Height 138', Crown spread 51'
3. Targets: Parking lot and trail.
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: on the edge of the trail and river.
7. Defective root conditions: Some erosion on the stream side
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Tree is on the edge of the trail – remove.

Tree number: 238

1. Species: Eucalyptus robusta
2. Size: DBH 20", Height 60', Crown spread 15'
3. Targets: Parking lot and trail
4. Form and Crown class: Asymmetrical with a heavy lean; Suppressed
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: Trunk is fused with tree number 239 at base.
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

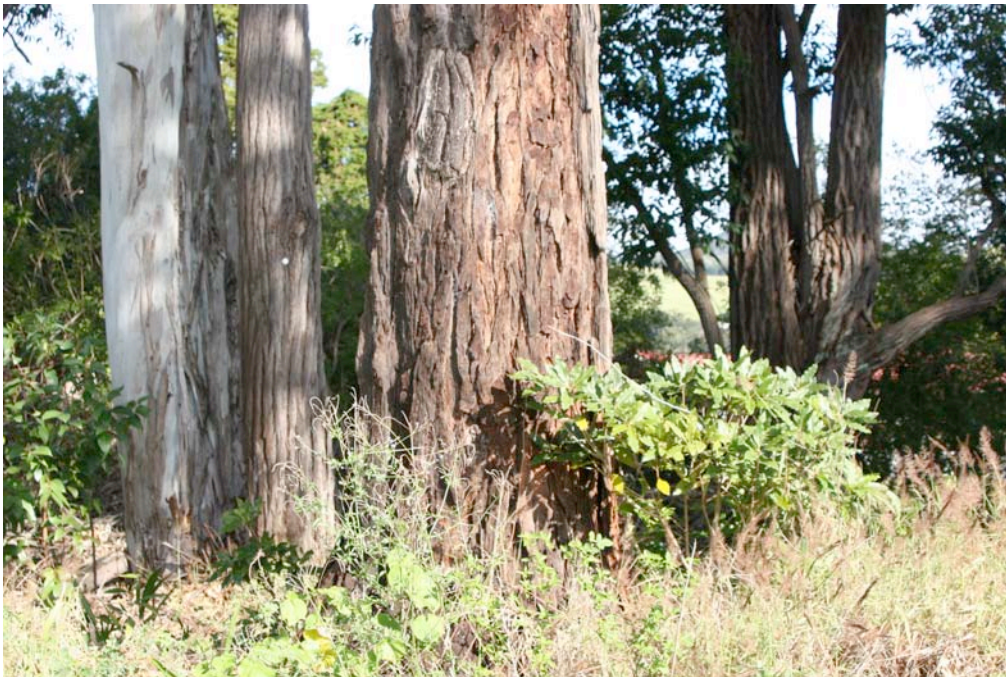
Management Recommendations: Tree is on the edge of the trail - remove

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Tree number: 239

1. Species: Eucalyptus
2. Size: DBH 36", Height 107', Crown spread 67'
3. Targets: Parking lot and trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: Trunk is fused with tree number 238 at the base.
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Tree is near edge of trail – remove.



Tree 239 238 237

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Tree number: 240

1. Species: Eucalyptus robusta
2. Size: DBH 22", Height 97', Crown spread 36'
3. Targets: Parking lot and trail.
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Near edge of the trail – remove.

Tree number: 241

1. Species: Eucalyptus robusta
2. Size: DBH 15", Height 55', Crown spread 14'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: Dead stub

Management Recommendations: Tree is in the trail – remove.

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Tree number: 242

1. Species: Eucalyptus robusta
2. Size: DBH 31", Height 91', Crown spread 47'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: at the edge of trail.
7. Defective root conditions: Girdling root.
8. Trunk defects: none
9. Scaffold limb defects: Dead wood and branches.
10. Previous tree and limb failures: none

Management Recommendations: Tree is at the edge of the trail – remove.



Tree 243

Tree 242

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Tree number: 243

1. Species: Eucalyptus robusta
2. Size: DBH 13", Height 59', Crown spread 14'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: at the edge of the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Some dead wood
10. Previous tree and limb failures: none

Management Recommendations: Tree is at the edge of the trail – remove.

Tree number: 244

1. Species: Eucalyptus robusta
2. Size: DBH 28", Height 104', Crown spread 37'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

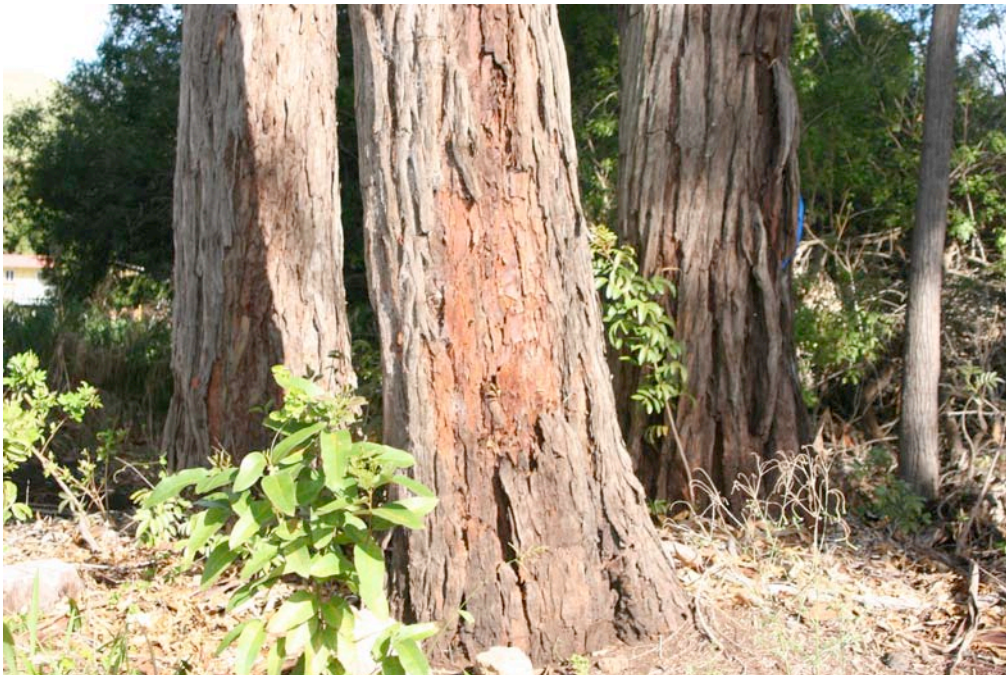
Management Recommendations: Tree is in the trail – remove.

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Tree number: 245

1. Species: Eucalyptus robusta
2. Size: DBH 31", Height 60', Crown spread 62'
3. Targets: Trail
4. Form and Crown class: Asymmetrical with a heavy lean; Suppressed
5. Tree health: Good
6. Adverse site conditions: at the edge of the trail
7. Defective root conditions: none
8. Trunk defects: Decay evident in old wounds in the trunk.
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: Dead stub

Management Recommendations: Tree is located at the edge of the trail – remove.



Tree 246

Tree 244

Tree 245

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Tree number: 246

1. Species: Eucalyptus robusta
2. Size: DBH 30", Height 125', Crown spread 64'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: edge of trail and erosion of root area.
7. Defective root conditions: erosion of roots on stream side.
8. Trunk defects: none
9. Scaffold limb defects: Dead wood and broken branches.
10. Previous tree and limb failures: Old broken branch stubs

Management Recommendations: Tree is near edge of trail – remove.

Tree number: 247

1. Species: Eucalyptus robusta
2. Size: DBH 16", Height 70', Crown spread 18'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: near edge of trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

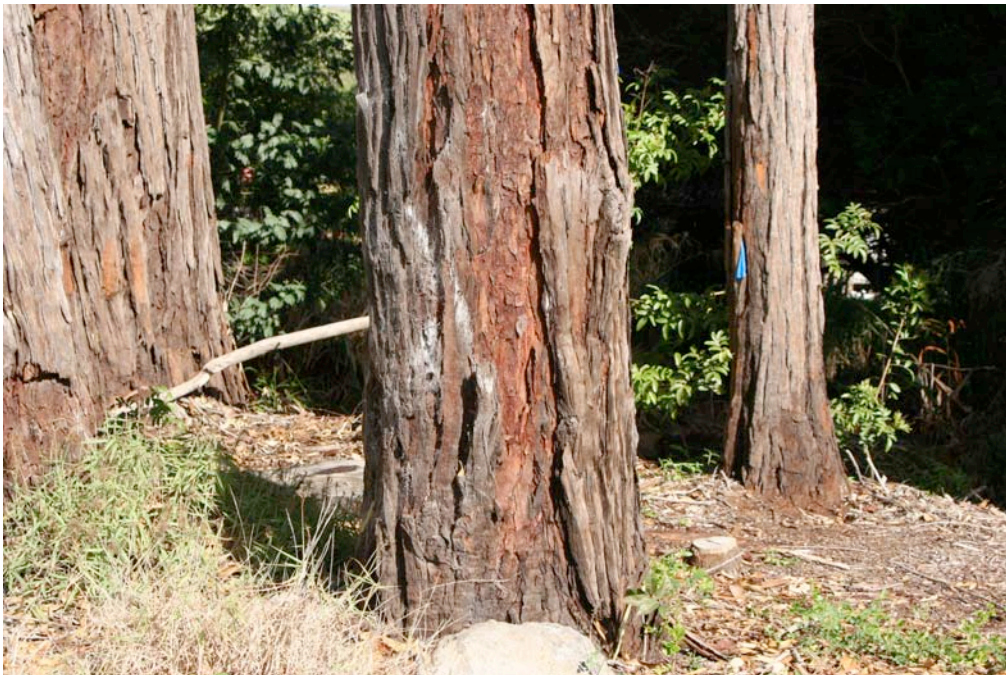
Management Recommendations: Tree is near edge of trail – remove.

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Tree number: 248

1. Species: Eucalyptus robusta
2. Size: DBH 29", Height 120', Crown spread 53'
3. Targets: Trail and the building.
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Some dead wood
10. Previous tree and limb failures: none

Management Recommendations: Tree is in the trail – remove.



Tree 248

Tree 247

Michael M. Kraus
Consulting Arborist

Tree number: 249

1. Species: Eucalyptus robusta
2. Size: DBH 24", Height 86', Crown spread 29'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in the trail.
7. Defective root conditions: none
8. Trunk defects: Old fence wire in base of trunk.
9. Scaffold limb defects: Dead wood and broken branches.
10. Previous tree and limb failures: Limb stubs

Management Recommendations: Tree is in the trail – remove.



Tree 251

Tree 249

Michael M. Kraus
Consulting Arborist

Tree number: 250

1. Species: Eucalyptus robusta
2. Size: DBH 14/17", Height 68', Crown spread 67'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: overhangs the trail.
7. Defective root conditions: none
8. Trunk defects: Sap flow at base of double trunks.
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures:

Management Recommendations: Tree is near the edge of the trail – remove.

Tree number: 251

1. Species: Eucalyptus robusta
2. Size: DBH 37", Height 103', Crown spread 61'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: near edge of trail and overhangs the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood and broken branches
10. Previous tree and limb failures:

Management Recommendations: Near the edge of the trail – remove.

Michael M. Kraus
Consulting Arborist

Tree number: 252

1. Species: Eucalyptus robusta
2. Size: DBH 41", Height 110', Crown spread 83'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: near the edge of trail and overhangs trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures:

Management Recommendations: Near the edge of the trail – remove.

Tree number: 253

1. Species: Eucalyptus robusta
2. Size: DBH 6", Height 53', Crown spread 22'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: near edge of trail and overhangs trail.
7. Defective root conditions: none
8. Trunk defects: multi-trunked from the base.
9. Scaffold limb defects: appears to be stump sprouts.
10. Previous tree and limb failures:

Management Recommendations: Near the edge of the trail and over trail – remove.

Michael M. Kraus
Consulting Arborist

Tree number: 254

1. Species: Eucalyptus robusta
2. Size: DBH 24", Height 45', Crown spread 53'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: Overhangs the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Crown clean; safety prune.

Tree number: 255

1. Species: Eucalyptus robusta
2. Size: DBH 25", Height 110', Crown spread 68'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: edge of trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood.
10. Previous tree and limb failures: none

Management Recommendations: Tree is growing at the edge of the trail – remove.

Michael M. Kraus
Consulting Arborist

Tree number: 256

1. Species: Eucalyptus robusta
2. Size: DBH 20", Height 98', Crown spread 46'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: located at the edge of the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Near edge of the trail – remove.



Tree 257

Tree 256

Tree 255

Michael M. Kraus
Consulting Arborist

Tree number: 257

1. Species: Eucalyptus robusta
2. Size: DBH 55", Height 122', Crown spread 87'
3. Targets: Trail and the Nature Park.
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: at the edge of trail and leans towards the Nature park.
7. Defective root conditions: none
8. Trunk defects: Large cavity at base.
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: stubs

Management Recommendations: Tree is at the edge of the trail – remove.

Tree number: 258

1. Species: Eucalyptus robusta
2. Size: DBH 26", Height 107', Crown spread 60'
3. Targets: Trail and the Nature Park.
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: located at the edge of the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

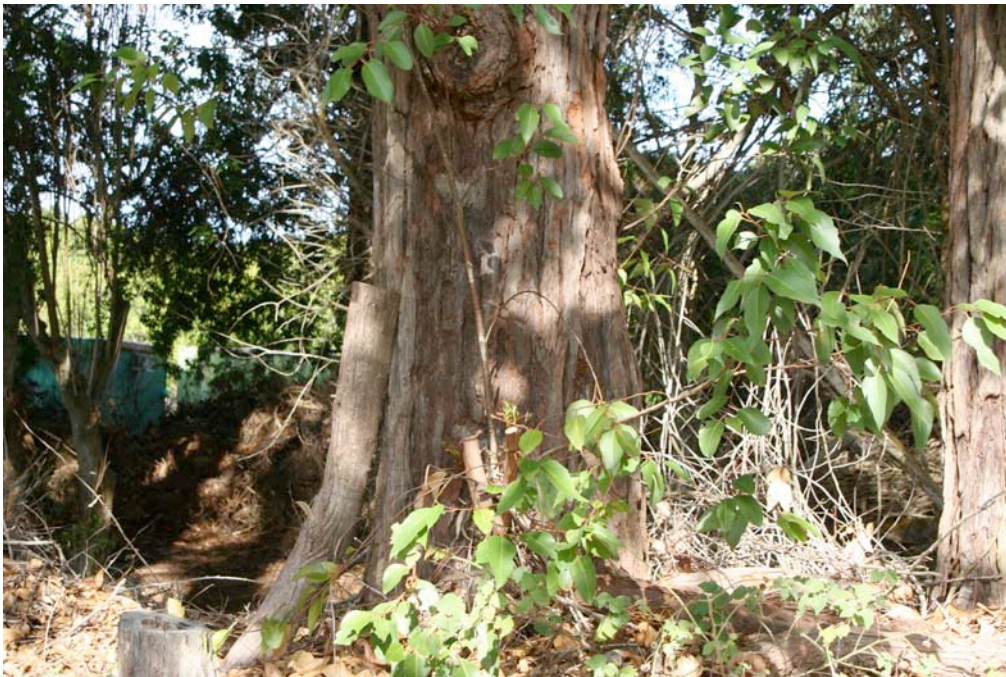
Management Recommendations: Near edge of trail; root prune, crown clean and safety prune.

Michael M. Kraus
Consulting Arborist

Tree number: 259

1. Species: Eucalyptus robusta
2. Size: DBH 44", Height 105', Crown spread 95'
3. Targets: Trail and building
4. Form and Crown class: Symmetrical with a double trunk; Suppressed
5. Tree health: Good
6. Adverse site conditions: near the edge of the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood and broken branches.
10. Previous tree and limb failures: branch stubs

Management Recommendations: Root prune, crown clean and safety prune.



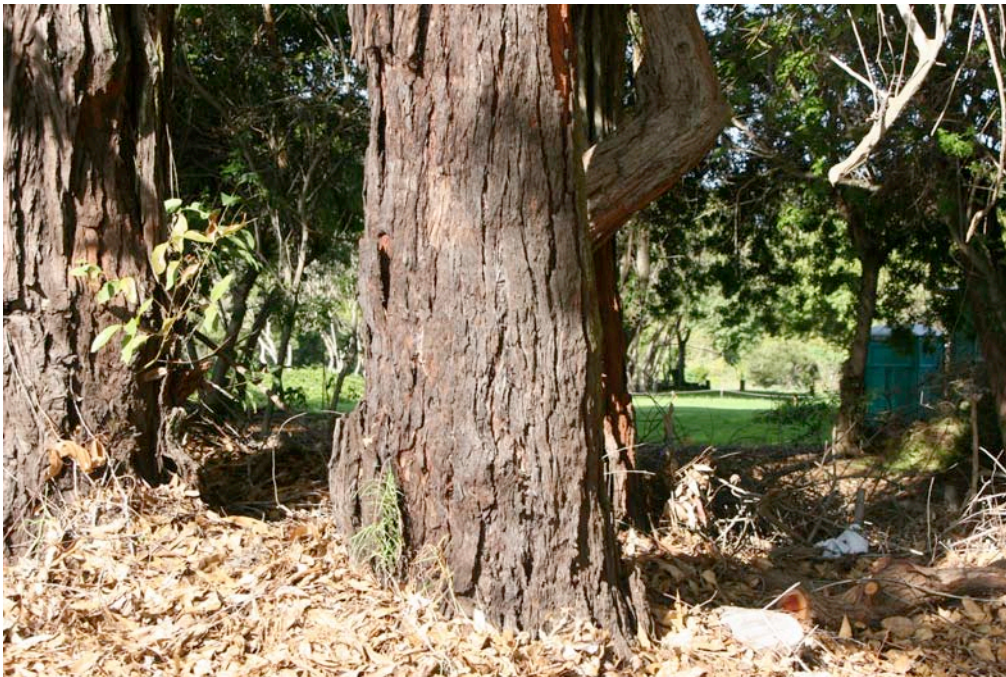
Tree 259

Michael M. Kraus Consulting Arborist

Tree number: 260

1. Species: Eucalyptus robusta
2. Size: DBH 27", Height 90', Crown spread 52'
3. Targets: Trail and the building.
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: stub

Management Recommendations: Tree is located in the trail – remove.



Tree 260

Michael M. Kraus
Consulting Arborist

Tree number: 261

1. Species: Eucalyptus robusta
2. Size: DBH 41", Height 103', Crown spread 75'
3. Targets: Trail and the Nature Park.
4. Form and Crown class: Asymmetrical with a heavy lean towards the Nature park;
Dominant
5. Tree health: Good
6. Adverse site conditions: edge of the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood and broken branches.
10. Previous tree and limb failures: none

Management Recommendations: Tree is at the edge of the trail – remove.

Tree number: 262

1. Species: Eucalyptus robusta
2. Size: DBH 30", Height 122', Crown spread 59'
3. Targets: Trail and the building.
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: in the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood and broken branches.
10. Previous tree and limb failures: branch stubs

Management Recommendations: Tree is in the trail – remove.

Michael M. Kraus Consulting Arborist

Tree number: 263

1. Species: Eucalyptus robusta
2. Size: DBH 15", Height 16', Crown spread 4'
3. Targets: Trail and the building.
4. Form and Crown class: Asymmetrical with a large section of the top broken off; suppressed.
5. Tree health: Poor
6. Adverse site conditions: edge of the trail
7. Defective root conditions: none
8. Trunk defects: Broken trunk.
9. Scaffold limb defects: Broken top.
10. Previous tree and limb failures: Broken trunk

Management Recommendations: Tree is at the edge of the trail – remove.



Tree 264

Tree 263

Tree 262

Michael M. Kraus
Consulting Arborist

Tree number: 264

1. Species: Eucalyptus robusta
2. Size: DBH 46", Height 115', Crown spread 68'
3. Targets: Trail and the building
4. Form and Crown class: Asymmetrical; dominant
5. Tree health: Good
6. Adverse site conditions: in the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken branches and dead wood.
10. Previous tree and limb failures:

Management Recommendations: Tree is in the trail - remove

Tree number: 265

1. Species: Eucalyptus robusta
2. Size: DBH 28 Height 92 Crown spread 61
3. Targets: Trail and Nature Park.
4. Form and Crown class: Asymmetrical with a lean towards the Nature park; Co-dominant.
5. Tree health: Good
6. Adverse site conditions: edge of the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken branches and dead wood.
10. Previous tree and limb failures: branch stubs

Management Recommendations: Tree is at the edge of the trail – remove.

Michael M. Kraus Consulting Arborist

Tree number: 266

1. Species: Eucalyptus robusta
2. Size: DBH 10 Height 38 Crown spread 50
3. Targets: Trail and the building.
4. Form and Crown class: Asymmetrical with a heavy lean towards tree number 267;
Suppressed.
5. Tree health: Good
6. Adverse site conditions: edge of the trail.
7. Defective root conditions: none
8. Trunk defects: the upper half is leaning on limb of number 267.
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Tree is on the edge of the trail – remove.



Tree 266

Tree 265

Michael M. Kraus
Consulting Arborist

Tree number: 267

1. Species: Eucalyptus robusta
2. Size: DBH 30 Height 54 Crown spread 45'
3. Targets: Trail and the building.
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: in the trail.
7. Defective root conditions: none
8. Trunk defects: Sap flow and decay at trunk base.
9. Scaffold limb defects: Broken top and heavy sprouting along the trunk.
10. Previous tree and limb failures: broken top

Management Recommendations: Tree is at the edge of the trail – remove.

Tree number: 268

1. Species: Eucalyptus robusta
2. Size: DBH 14' Height 32' Crown spread 0'
3. Targets: Trail and the building.
4. Form and Crown class: Dead
5. Tree health: dead
6. Adverse site conditions: in the trail.
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: tree is dead

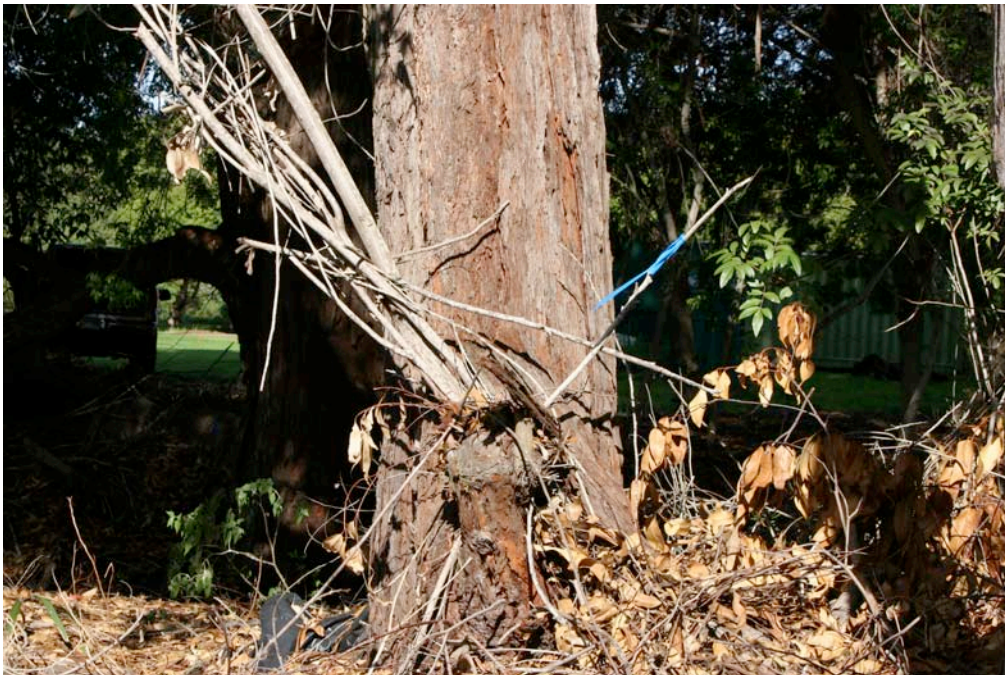
Management Recommendations: Tree is dead and in the trail – remove.

Michael M. Kraus
Consulting Arborist

Tree number: 269

1. Species: Eucalyptus robusta
2. Size: DBH 28" Height 49' Crown spread 37'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Broken top, dead hanger
10. Previous tree and limb failures: broken top

Management Recommendations: Root prune, crown clean.



Tree 269

Michael M. Kraus
Consulting Arborist

Tree number: 270

1. Species: Eucalyptus robusta
2. Size: DBH 23", Height 87', Crown spread 53'
3. Targets: Trail and the building.
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: edge of the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Tree is at the edge of the trail – remove.



Tree 271

Tree 270

Michael M. Kraus
Consulting Arborist

Tree number: 271

1. Species: Eucalyptus robusta
2. Size: DBH 25", Height 85', Crown spread 48'
3. Targets: Parking lot, trail and Nature Park
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: edge of the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Large broken branches and dead wood.
10. Previous tree and limb failures: branch stubs

Management Recommendations: Tree is at the edge of the trail – remove.

Tree number: 272

1. Species: Christmas Berry
2. Size: DBH 11", Height 22', Crown spread 38'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: at the edge of the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Multiple trunk stumps from past cuttings and dead wood.
10. Previous tree and limb failures: possible past limb failures

Management Recommendations: Root prune before trail construction and crown clean.

Michael M. Kraus
Consulting Arborist

Tree number: 273

1. Species: Eucalyptus robusta
2. Size: DBH 36", Height 9', Crown spread 8'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: Cut stump
9. Scaffold limb defects: New re-growth on the stump.
10. Previous tree and limb failures: stump

Management Recommendations: Tree is in the trail – remove.



Tree 273

Michael M. Kraus
Consulting Arborist

Tree number: 274

1. Species: Eucalyptus robusta
2. Size: DBH 49", Height 9', Crown spread 12'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: in the trail.
7. Defective root conditions: none
8. Trunk defects: Cut stump
9. Scaffold limb defects: new re-growth on a stump.
10. Previous tree and limb failures: Stump with sprouts

Management Recommendations: Tree is in the trail – remove.



Tree 274

Michael M. Kraus
Consulting Arborist

Tree number: 275

1. Species: Christmas berry
2. Size: DBH 36", Height 32', Crown spread 40'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near edge of trail and overhangs the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Extensive dead branches.
10. Previous tree and limb failures: no major failures

Management Recommendations: Tree is near edge of trail – remove.

Tree number: 276

1. Species: Christmas berry
2. Size: DBH 20", Height 35', Crown spread 48'
3. Targets: Trail
4. Form and Crown class: Asymmetrical clump of four trees; Co-dominant
5. Tree health: Good
6. Adverse site conditions: overhangs the trail
7. Defective root conditions: none
8. Trunk defects: Crack through the trunk
9. Scaffold limb defects: Extensive dead branches and stubs.
10. Previous tree and limb failures: stubs

Management Recommendations: Tree is near the edge of the trail – remove.

Michael M. Kraus Consulting Arborist

Tree number: 277

1. Species: Christmas berry
2. Size: DBH 12", Height 32', Crown spread 35'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near the edge of the trail and overhangs the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead branches and stubs.
10. Previous tree and limb failures: stubs

Management Recommendations: Tree is near edge of trail –remove.



Tree 277

Michael M. Kraus
Consulting Arborist

Tree number: 278

1. Species: Christmas berry
2. Size: DBH 12", Height 26', Crown spread 27'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: edge of trail and overhangs the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead branches and stubs throughout.
10. Previous tree and limb failures: multiple broken limbs

Management Recommendations: Tree is at the edge of the trail – remove.

Tree number: 279

1. Species: Christmas berry
2. Size: DBH 14", Height 35', Crown spread 26'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: overhangs the trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Stubs and dead wood.
10. Previous tree and limb failures: Broken limbs

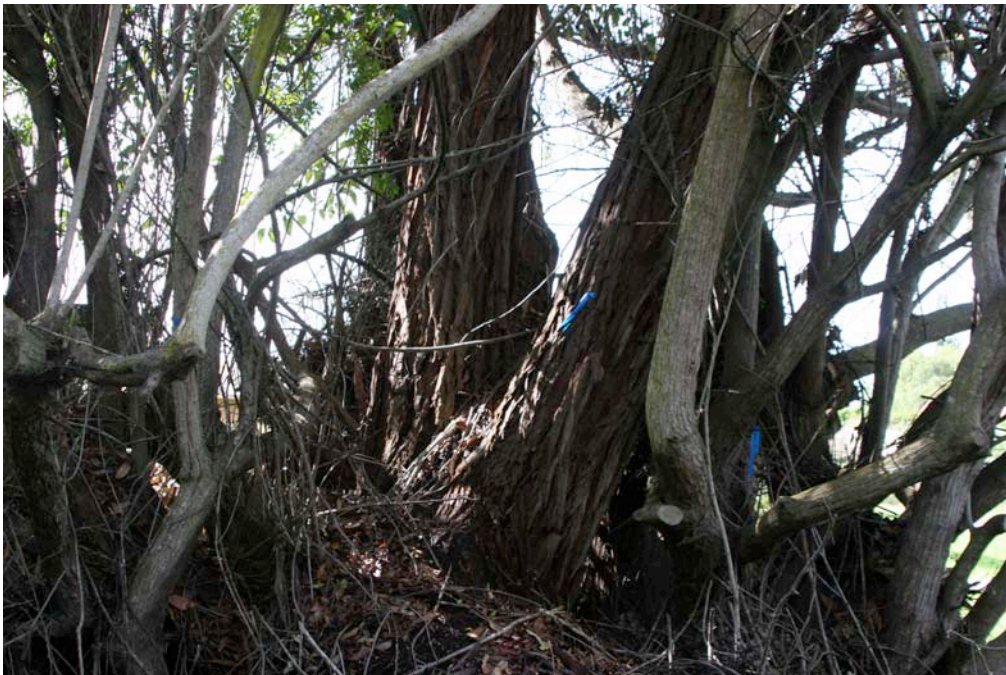
Management Recommendations: Tree is growing into tree number 278 – remove.

Michael M. Kraus
Consulting Arborist

Tree number: 280

1. Species: Eucalyptus robusta
2. Size: DBH 42", Height 55', Crown spread 65'
3. Targets: Trail and the parking lot.
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: overhangs the trail.
7. Defective root conditions: none
8. Trunk defects: included bark at base of double trunk.
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Crown clean and safety prune.



Tree 280

Michael M. Kraus
Consulting Arborist

Tree number: 281

1. Species: Christmas berry
2. Size: DBH 15", Height 38', Crown spread 35'
3. Targets: none
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood, stubs and branch rubbing against 280.
10. Previous tree and limb failures: stubs

Management Recommendations: Crown clean



Tree 281

Tree 282

Michael M. Kraus
Consulting Arborist

Tree number: 282

1. Species: Eucalyptus robusta
2. Size: DBH 18", Height 22', Crown spread 25'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: stubs
10. Previous tree and limb failures: stubs

Management Recommendations: Tree is dead - remove

Tree number: 283

1. Species: Eucalyptus robusta
2. Size: DBH 16", Height 49', Crown spread 19'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: overhangs trail
7. Defective root conditions: none
8. Trunk defects: re-growth from fallen trunk
9. Scaffold limb defects: re-growth from fallen trunk
10. Previous tree and limb failures: Fallen tree

Management Recommendations: Tree overhang trails – remove.

Michael M. Kraus Consulting Arborist

Tree number: 284

1. Species: Eucalyptus
2. Size: DBH 64", Height 115', Crown spread 118'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: overhangs the trail
7. Defective root conditions: none
8. Trunk defects: Multi trunks with included bark at base
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Root pruning before trail construction; crown clean.



Tree 284

Michael M. Kraus
Consulting Arborist

Tree number: 285

1. Species: Eucalyptus
2. Size: DBH 16", Height 85', Crown spread 37'
3. Targets: Trail and residential yard.
4. Form and Crown class: Asymmetrical with a lean; Dominant
5. Tree health: Good
6. Adverse site conditions: overhangs trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Crown clean.



Tree 285

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Michael M. Kraus
Consulting Arborist

Tree number: 286

1. Species: Eucalyptus
2. Size: DBH 12", Height 68', Crown spread 26'
3. Targets: Trail and a residential yard
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: overhangs the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Crown clean

Tree number: 287

1. Species: Eucalyptus
2. Size: DBH 34", Height 112', Crown spread 93'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: overhangs the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood and included bark at major fork
10. Previous tree and limb failures:

Management Recommendations: Crown clean

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Tree 287

Tree number: 288

1. Species: Eucalyptus
2. Size: DBH 45", Height 120', Crown spread 95'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: overhangs the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: large dead wood
10. Previous tree and limb failures: none

Management Recommendations: Crown clean

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Tree 288

Tree number: 289

1. Species: Eucalyptus
2. Size: DBH 9", Height 43', Crown spread 24'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: overhangs the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Tree is growing into the canopy of 288 – remove.

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Consulting Arborist



Tree 289

Tree number: 290

1. Species: Eucalyptus
2. Size: DBH 20", Height 62', Crown spread 37'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: overhangs the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Large scaffold branch same diameter as trunk.
10. Previous tree and limb failures: none

Management Recommendations: Remove large scaffold branch and crown clean

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Consulting Arborist



Tree 290

Tree number: 291

1. Species: Eucalyptus
2. Size: DBH 47", Height 128', Crown spread 93'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: overhangs the trail
7. Defective root conditions: none
8. Trunk defects: Double trunk
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Root prune before trail construction and crown clean.

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Tree 291

Tree 292

Tree 293

Tree number: 292

1. Species: Christmas berry
2. Size: DBH 6", Height 27', Crown spread 20'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: overhangs the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Crown clean.

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Tree number: 293

1. Species: Eucalyptus
2. Size: DBH 13", Height 52', Crown spread 28'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: overhangs the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Crown clean

Tree number: 294

1. Species: Christmas berry
2. Size: DBH 8", Height 27', Crown spread 18'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: overhangs the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: stubs

Management Recommendations: Crown clean

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Tree 293

Tree 294

Tree number: 295

1. Species: Eucalyptus
2. Size: DBH 11", Height 41', Crown spread 25'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: overhangs the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Crown clean.

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Tree 295

Tree number: 296

1. Species: Eucalyptus
2. Size: DBH 16", Height 57', Crown spread 29'
3. Targets: Trail and a residential yard
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: overhangs the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Crown clean.

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Tree 296

Tree number: 297

1. Species: Eucalyptus
2. Size: DBH 51", Height 120', Crown spread 73'
3. Targets: Trail and residential house
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: overhangs the trail and leaning towards the trail.
7. Defective root conditions: none
8. Trunk defects: Double trunk, side towards the house has been topped, fungus conk near double trunk.
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: ½ of the tree has been topped

Management Recommendations: Remove

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Tree 297

Tree number: 298

1. Species: Eucalyptus
2. Size: DBH 68", Height 86', Crown spread 105'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: overhangs the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Large stubs
10. Previous tree and limb failures: multiple large limb stubs

Management Recommendations: Crown clean.

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Tree 298

Tree number: 299

1. Species: Eucalyptus
2. Size: DBH 20", Height 78', Crown spread 48'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: overhangs the trail,
7. Defective root conditions: on top of the stream bank erosion of the root area.
8. Trunk defects: included bark at double trunk.
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Tree overhangs the trail with an eroded root base – remove.

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Tree 299 Tree 300

Tree number: 300

1. Species: Eucalyptus
2. Size: DBH 9", Height 45', Crown spread 17'
3. Targets: none
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: on eroded stream bank
7. Defective root conditions: erosion of root base on stream side.
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: stub

Management Recommendations: Crown clean.

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Tree number: 301

1. Species: Eucalyptus
2. Size: DBH 59", Height 60', Crown spread 96'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: on edge of stream across from the trail.
7. Defective root conditions: erosion of roots on stream side.
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Erosion of roots on stream side – remove.



Tree 301

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Tree number: 302

1. Species: Eucalyptus
2. Size: DBH 16", Height 82', Crown spread 34'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: growing on a severely eroded bank.
7. Defective root conditions: severe erosion of support roots.
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Severe root erosion – remove.



Tree 302

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Tree 302 303 304

Tree number: 303

1. Species: Eucalyptus
2. Size: DBH 18", Height 56', Crown spread 35'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: on a severely eroded bank.
7. Defective root conditions: severe root erosion
8. Trunk defects: fallen trunk
9. Scaffold limb defects: Large re-growth from fallen trunk over the trail.
10. Previous tree and limb failures: tree fell due to root erosion

Management Recommendations: Remove

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Tree number: 304

1. Species: Eucalyptus
2. Size: DBH 22", Height 111', Crown spread 40'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: severely eroded root area
7. Defective root conditions: severe erosion of roots
8. Trunk defects: Fallen trunk with severe root erosion, large re-growth overhanging the trail.
9. Scaffold limb defects: none
10. Previous tree and limb failures: tree fell due to root erosion

Management Recommendations: Remove

Tree number: 305

1. Species: Eucalyptus
2. Size: DBH 14", Height 78', Crown spread 37'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: growing from a severely eroded stream bank.
7. Defective root conditions: severely eroded root system
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Tree overhangs the trail with severe root erosion – remove.

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Tree number: 306

1. Species: Eucalyptus
2. Size: DBH 17", Height 42', Crown spread 45'
3. Targets: Trail
4. Form and Crown class: Asymmetrical with a heavy lean; Co-dominant
5. Tree health: Good
6. Adverse site conditions: Severely eroded root area
7. Defective root conditions: Severely eroded root area
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Heavy lean over the trail with severe root erosion – remove.



Tree 307

Tree 306

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Tree number: 307

1. Species: Eucalyptus
2. Size: DBH 12", Height 76', Crown spread 39'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: growing from a severely eroded bank
7. Defective root conditions: severely eroded root area
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Tree overhangs the trail with severe root erosion – remove.

Tree number: 308

1. Species: Eucalyptus
2. Size: DBH 22", Height 42', Crown spread 21'
3. Targets: Trail and across river approximately four trees.
4. Form and Crown class: Asymmetrical with a heavy lean; Co-dominant
5. Tree health: Good
6. Adverse site conditions: Growing on a severely eroded stream bank.
7. Defective root conditions: severe erosion of the root system.
8. Trunk defects: heavy vine growth along the trunk
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: stubs

Management Recommendations: Tree is across the stream leaning towards the trail with severe erosion – remove.

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Tree 308

Tree number: 309

1. Species: Christmas berry
2. Size: DBH 12", Height 25', Crown spread 32'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Tree is in the trail – remove.

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Tree number: 310

1. Species: Eucalyptus
2. Size: DBH 23", Height 91', Crown spread 54'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: growing on severely eroded stream bank.
7. Defective root conditions: severe root erosion
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: This tree is over the trail with severe root erosion – remove.



Tree 310

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Tree number: 311

1. Species: Black Waddle
2. Size: DBH 8", Height 26', Crown spread 9'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: growing on an eroded bank
7. Defective root conditions: roots are eroded
8. Trunk defects: none
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Remove

Tree number: 312

1. Species: Black Waddle
2. Size: DBH 10", Height 42', Crown spread 10'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: included bark and double trunk.
9. Scaffold limb defects: Dead wood
10. Previous tree and limb failures: none

Management Recommendations: Tree is in the trail – remove.

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Tree number: 313

1. Species: Black Waddle
2. Size: DBH 8", Height 31', Crown spread 9'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Tree is in the trail – remove.

Tree number: 314

1. Species: False Olive
2. Size: DBH 5", Height 23', Crown spread 30'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: root erosion
7. Defective root conditions: eroded roots
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Crown clean.

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Tree number: 315

1. Species: Black waddle
2. Size: DBH 15“, Height 12’, Crown spread 44’
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: uprooted and fallen tree
7. Defective root conditions: tree is uprooted
8. Trunk defects: tree has fallen
9. Scaffold limb defects: new growth on fallen trunk
10. Previous tree and limb failures: fallen tree

Management Recommendations: Remove



Tree 315

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Tree number: 316

1. Species: Ironwood
2. Size: DBH 29“, Height 72’, Crown spread 38’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: near edge of trail.
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: some dead wood
10. Previous tree and limb failures: none

Management Recommendations: Root prune before trail construction, prune back for trail clearance and crown clean.

Tree number: 317

1. Species: Ironwood
2. Size: DBH 39“, Height 85’, Crown spread 66’
3. Targets: Trail
4. Form and Crown class: symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Tree is in the trail – remove.

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Tree number: 318

1. Species: Ironwood
2. Size: DBH 21“, Height 62’, Crown spread 32’
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: at edge of trail
7. Defective root conditions: none
8. Trunk defects: crack at base of trunk
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Near edge of trail – remove.



Tree 318

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Tree number: 319

1. Species: Ironwood
2. Size: DBH 41“, Height 45’, Crown spread 47’
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: near edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: included bark on limb over trail and dead wood
10. Previous tree and limb failures: none

Management Recommendations: Near edge of trail – remove.



Tree 319

Tree 318

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Tree number: 320

1. Species: Christmas berry
2. Size: DBH 20“, Height 25’, Crown spread 40’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: root erosion
7. Defective root conditions: some erode roots
8. Trunk defects: multi-trunks
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Prune back away from trail and crown clean

Tree number: 321

1. Species: Black waddle
2. Size: DBH 5“, Height 20’, Crown spread 8’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: some root erosion and on the edge of the trail
7. Defective root conditions: some root erosion
8. Trunk defects: cut stump with multi trunks
9. Scaffold limb defects: none
10. Previous tree and limb failures:none

Management Recommendations: At the edge of the trail – remove.

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Tree number: 322

1. Species: Black waddles (2)
2. Size: DBH 10/16“, Height 27/25’, Crown spread 0’
3. Targets: none
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

Tree number: 323

1. Species: Black waddles (4)
2. Size: DBH 12/9/6/4“, Height 49/38/25/18’, Crown spread 12/12/8/5’
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Dominant
5. Tree health: Fair
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: bark damage
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: In the trail – remove.

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Tree number: 324

1. Species: Christmas berry
2. Size: DBH 9", Height 14', Crown spread 16'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: fallen waddle resting against this tree
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: broken limbs

Management Recommendations: Remove fallen tree and crown clean

Tree number: 325

1. Species: Black waddle
2. Size: DBH 15", Height 5', Crown spread 9'
3. Targets: none
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: fallen tree on trunk
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: broken branch

Management Recommendations: Crown clean

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Tree number: 326

1. Species: Black waddle
2. Size: DBH 13“, Height 45’, Crown spread 18’
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: some dead wood
10. Previous tree and limb failures: none

Management Recommendations: Crown clean

Tree number: 327

1. Species: Black waddle
2. Size: DBH 10“, Height 48’, Crown spread 15’
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Crown clean

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Tree number: 328

1. Species: Black waddle
2. Size: DBH 13“, Height 47’, Crown spread 16’
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: over the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Remove

Tree number: 329

1. Species: Black waddle
2. Size: DBH 5“, Height 17’, Crown spread 8’
3. Targets: none
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: erosion at root area
7. Defective root conditions: erosion
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Crown clean

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Tree number: 330

1. Species: Black waddle
2. Size: DBH 11“, Height 47’, Crown spread 15’
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: erosion at the root area
7. Defective root conditions: root erosion
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Eroded to the point of instability - remove



Tree 330

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Tree number: 331

1. Species: Black waddle
2. Size: DBH 8“, Height 25’, Crown spread 11’
3. Targets: none
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: eroded at the root area
7. Defective root conditions: some erosion
8. Trunk defects: none, with a heavy lean over the river
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: none

Tree number: 332

1. Species: Black waddle
2. Size: DBH 12“, Height 30’, Crown spread 12’
3. Targets: none
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: erosion of roots, partially uprooted, leans heavily over the river
7. Defective root conditions: eroded roots
8. Trunk defects: uprooted with a heavy lean over the river
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: fallen tree

Management Recommendations: none

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Tree number: 333

1. Species: Black waddle
2. Size: DBH 12“, Height 34’, Crown spread 16’
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: leans over trail
7. Defective root conditions: none
8. Trunk defects: large crack in trunk
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: split trunk

Management Recommendations: Remove

Tree number: 334

1. Species: Black waddle
2. Size: DBH 14“, Height 45’, Crown spread 9’
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: mostly dead
6. Adverse site conditions: leans towards trail
7. Defective root conditions: erosion
8. Trunk defects: mostly dead
9. Scaffold limb defects: mostly dead
10. Previous tree and limb failures: dieing tree

Management Recommendations: Remove

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Tree 334

Tree number: 335

1. Species: Black waddle
2. Size: DBH 8", Height 47', Crown spread 12'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood and stubs
10. Previous tree and limb failures: stubs

Management Recommendations: Near edge of trail – remove.

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Tree number: 336

1. Species: Eucalyptus
2. Size: DBH 16“, Height 50’, Crown spread 12’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: near the edge of the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Near edge of trail – remove.

Tree number: 337

1. Species: Eucalyptus
2. Size: DBH 8“, Height 17’, Crown spread 8’
3. Targets: none
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Remove

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Tree number: 338

1. Species: Eucalyptus
2. Size: DBH 10“, Height 32’, Crown spread 9’
3. Targets: none
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: bulldozed debris piled against trunk
7. Defective root conditions: root crown area buried
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Remove

Tree number: 339

1. Species: Black waddle
2. Size: DBH 6“, Height 28’, Crown spread 6’
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: near trail
7. Defective root conditions: none
8. Trunk defects: extensive bark damage near base of tree
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Remove

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Tree number: 340

1. Species: Black waddle
2. Size: DBH 18“, Height 43’, Crown spread 35’
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: overhangs trail
7. Defective root conditions: none
8. Trunk defects: cavity near the base, bark damage and cracks in the trunk
9. Scaffold limb defects: broken top and dead wood
10. Previous tree and limb failures: damaged trunk, broken top

Management Recommendations: Remove

Tree number: 341

1. Species: Black waddle
2. Size: DBH 29“, Height 60’, Crown spread 37’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: overhangs the trail
7. Defective root conditions: none
8. Trunk defects: cavity near trunk base
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Remove

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Tree 341

Tree number: 342

1. Species: Black waddle
2. Size: DBH 13", Height 40', Crown spread 33'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: overhangs trail, severe root erosion
7. Defective root conditions: severe root erosion

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8. Trunk defects: none
9. Scaffold limb defects: large dead wood
10. Previous tree and limb failures: none

Management Recommendations: Remove



Tree 342

Tree number: 343

1. Species: Black waddle
2. Size: DBH 20", Height 30', Crown spread 25'
3. Targets: Trial
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: overhangs trail, severe erosion of root area

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7. Defective root conditions: severe erosion of root area
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Remove



Tree 343

Tree number: 344

1. Species: Black waddle
2. Size: DBH 11", Height 39', Crown spread 17'
3. Targets: none

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4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: leaning away from the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Remove

Tree number: 345

1. Species: Black waddle
2. Size: DBH18", Height 42', Crown spread 27'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: near the edge of the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Near edge of trail - remove

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Consulting Arborist

Tree number: 346

1. Species: Black waddle
2. Size: DBH 17", Height 53', Crown spread 30'
3. Targets: Trail
4. Form and Crown class: Asymmetrical with a heavy lean; Dominant
5. Tree health: Good
6. Adverse site conditions: near the edge of the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Near the edge of trail - remove

Tree number: 347

1. Species: Black waddle
2. Size: DBH 16", Height 50', Crown spread 36'
3. Targets: Trail
4. Form and Crown class: Asymmetrical with a heavy lean; Dominant
5. Tree health: Good
6. Adverse site conditions: near edge of trail, leaning over trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Near edge of trail - remove

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Tree number: 348

1. Species: Black waddle
2. Size: DBH 13/14“, Height 40’, Crown spread 27’
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near edge of the trail, leans over the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood and broken branches
10. Previous tree and limb failures: stubs

Management Recommendations: Near edge of trail - remove

Tree number: 349

1. Species: Black waddle
2. Size: DBH 12“, Height 41’, Crown spread 25’
3. Targets: Trail
4. Form and Crown class: Asymmetrical with a heavy lean; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near edge of trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Near edge of trail - remove

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Tree number: 350

1. Species: Christmas berry
2. Size: DBH 10“, Height 32’, Crown spread 55’
3. Targets: none
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: none

Tree number: 351

1. Species: Norfolk Island pine
2. Size: DBH 19“, Height 54’, Crown spread 16’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: near trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Prune up to 15’ above trail

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Tree number: 352

1. Species: Norfolk Island pine
2. Size: DBH 18“, Height 66’, Crown spread 16’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: included bark and double trunk
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Raise lower limbs up to 15’ above trail and remove the smaller top

Tree number: 353

1. Species: Norfolk Island pine
2. Size: DBH 18“, Height 66’, Crown spread 16’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Raise crown to 15’ above trail

Michael M. Kraus
Consulting Arborist

Tree number: 354

1. Species: Norfolk Island pine
2. Size: DBH 16“, Height 53’, Crown spread 12’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: broken top
10. Previous tree and limb failures: failed top

Management Recommendations: Raise crown to 15’ above trail

Tree number: 355

1. Species: Norfolk Island pine
2. Size: DBH15“, Height 55’, Crown spread 12’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: good
6. Adverse site conditions: near trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Raise crown 15’ above trail

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Tree number: 356

1. Species: Norfolk Island pine
2. Size: DBH 13“, Height 27’, Crown spread 10’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: tree was topped, multiple tops growing from cut trunk
9. Scaffold limb defects:
10. Previous tree and limb failures: cut tree

Management Recommendations: remove

Tree number: 357

1. Species: Norfolk Island pine
2. Size: DBH 18“, Height 55’, Crown spread 15’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: double top
9. Scaffold limb defects: double top
10. Previous tree and limb failures: broken top

Management Recommendations: Raise crown to 15’ above trail, remove one top

Michael M. Kraus
Consulting Arborist

Tree number: 358

1. Species: Norfolk Island pine
2. Size: DBH 19", Height 59', Crown spread 15'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Raise crown to 15' above trail

Tree number: 359

1. Species: Norfolk Island pine
2. Size: DBH 12", Height 55', Crown spread 13'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: old wound approximately 5' from ground
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Raise crown to 15' above trail

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Tree number: 360

1. Species: Norfolk Island pine
2. Size: DBH 20", Height 67', Crown spread 17'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: raise the crown 15' above the trail

Tree number: 361

1. Species: Norfolk Island pine
2. Size: DBH 15", Height 30', Crown spread 9'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: tree was topped at 4'
9. Scaffold limb defects: multiple tops from cut trunk
10. Previous tree and limb failures: cut tree

Management Recommendations: Remove

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Tree 361

Tree number: 362

1. Species: Norfolk Island pine
2. Size: DBH 15", Height 30', Crown spread 10'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: near the trail
7. Defective root conditions: none

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8. Trunk defects: tree topped 5' from ground
9. Scaffold limb defects: multiple tops from cut trunk
10. Previous tree and limb failures: cut tree

Management Recommendations: Remove



Tree 362

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Tree number: 363

1. Species: Norfolk Island pine
2. Size: DBH 18“, Height 63’, Crown spread 11’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: multiple tops
9. Scaffold limb defects: multiple tops (3)
10. Previous tree and limb failures: broken top

Management Recommendations: Prune to raise crown 15’ above trail and remove excess tops

Tree number: 364

1. Species: Norfolk Island pine
2. Size: DBH 19“, Height 63’, Crown spread 15’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: raise crown to 15’ above trail

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Tree number: 365

1. Species: Norfolk Island pine
2. Size: DBH 16“, Height 59’, Crown spread 15’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: double top
9. Scaffold limb defects: double top
10. Previous tree and limb failures: broken top

Management Recommendations: raise crown to 15’ above trail and remove one top



Tree 365

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Consulting Arborist

Tree number: 366

1. Species: Black waddle
2. Size: DBH10“, Height 22’, Crown spread 12’
3. Targets: none
4. Form and Crown class: Asymmetrical with lean away from trail; Suppressed
5. Tree health: Good
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove

Tree number: 367

1. Species: Norfolk Island pine
2. Size: DBH 21“, Height 84’, Crown spread 16’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Raise crown 15’ above trail

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Tree number: 368

1. Species: Norfolk Island pine
2. Size: DBH 20", Height 84', Crown spread 17'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: raise crown 15' above trail

Tree number: 369

1. Species: Norfolk Island pine
2. Size: DBH 18", Height 66', Crown spread 17'
3. Targets: Trail
4. Form and Crown class: symmetrical; Co-dominant
5. Tree health: good
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: raise the crown 15' above the trail

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Michael M. Kraus
Consulting Arborist

Tree number: 370

1. Species: Norfolk Island pine
2. Size: DBH 21“, Height 83’, Crown spread 18’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: raise crown 15’ above trail

Tree number: 371

1. Species: Norfolk Island pine
2. Size: DBH 20“, Height 84’, Crown spread 16’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: raise crown 15’ above trail

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Tree number: 372

1. Species: Norfolk Island pine
2. Size: DBH 14", Height 34', Crown spread 7'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: topped at 5'
9. Scaffold limb defects: multiple tops from trunk cut at 5'
10. Previous tree and limb failures: cut tree

Management Recommendations: remove



Tree 372

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Tree number: 373

1. Species: Norfolk Island pine
2. Size: DBH 16“, Height 34’, Crown spread 8’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: topped at 5’, heavy sap flow from wound at base
9. Scaffold limb defects: multiple tops from cut trunk
10. Previous tree and limb failures: cut tree

Management Recommendations: remove



Tree 373

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Tree number: 374

1. Species: Norfolk Island pine
2. Size: DBH 22", Height 78', Crown spread 16'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: raise crown to 15' above trail

Tree number: 375

1. Species: Norfolk Island pine
2. Size: DBH 19", Height 31', Crown spread 11'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: topped at approximately 5' and large bark wound
9. Scaffold limb defects: multiple tops from cut trunks
10. Previous tree and limb failures: cut tree

Management Recommendations: remove

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Tree 375

Tree number: 376

1. Species: Norfolk Island pine
2. Size: DBH 20", Height 64', Crown spread 16'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near the trail
7. Defective root conditions: none

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8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: raise crown to 15' above trail

Tree number: 377

1. Species: Norfolk Island pine
2. Size: DBH 19", Height 65', Crown spread 15'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: double top
10. Previous tree and limb failures: broken top

Management Recommendations: raise crown to 15' above trail, remove one side of the double top

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Tree 377

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Tree number: 378

1. Species: Norfolk Island pine
2. Size: DBH 22", Height 51', Crown spread 16'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: broken top
10. Previous tree and limb failures: broken top

Management Recommendations: raise crown to 15' above trail

Tree number: 379

1. Species: Norfolk Island pine
2. Size: DBH 20 Height 66 Crown spread 15
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: multiple tops
9. Scaffold limb defects: multiple tops
10. Previous tree and limb failures: broken top

Management Recommendations: raise crown to 15' above trail, prune out extra tops

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Tree number: 380

1. Species: Norfolk Island pine
2. Size: DBH 24 Height 53 Crown spread 17
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: broken top
9. Scaffold limb defects: broken top
10. Previous tree and limb failures: broken top

Management Recommendations: raise crown to 15' above trail



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Tree number: 381

1. Species: Row of fourteen Cherry Blossom trees
2. Size: DBH “ N/A, Height 12’, Crown spread 8’
3. Targets: Trail and fence
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: some dead wood
10. Previous tree and limb failures: none

Management Recommendations: Crown clean



Tree 281

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Tree number: 382

1. Species: Black waddle
2. Size: DBH 10" Height 21' Crown spread 0'
3. Targets: Trail
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

Tree number: 383

1. Species: Avocado
2. Size: DBH 9, Height 29 Crown spread 15
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Poor
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: double trunk
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove

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Tree number: 384

1. Species: Ironwood
2. Size: DBH 10" Height 40', Crown spread 13'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: growing in the river
7. Defective root conditions: eroded
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove

Tree number: 385

1. Species: Ironwood
2. Size: DBH 12", Height 40', Crown spread 17'
3. Targets: none
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: growing in stream
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: heavy lean – remove

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Tree number: 386

1. Species: Ironwood
2. Size: DBH 6“, Height 27’, Crown spread 8’
3. Targets: Trail
4. Form and Crown class: Asymmetrical with a heavy lean; Co-dominant
5. Tree health: Good
6. Adverse site conditions: growing in stream
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: remove

Tree number: 387

1. Species: Ironwood
2. Size: DBH 9“, Height 40’, Crown spread 10’
3. Targets: Trail
4. Form and Crown class: Asymmetrical with a heavy lean; Co-dominant
5. Tree health: Good
6. Adverse site conditions: growing in stream
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: remove

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Tree number: 388

1. Species: Ironwood
2. Size: DBH 11“, Height 30’, Crown spread 12’
3. Targets: none
4. Form and Crown class: Asymmetrical with a heavy lean; Co-dominant
5. Tree health: Good
6. Adverse site conditions: growing in stream
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: remove

Tree number: 389

1. Species: Ironwood
2. Size: DBH 8“, Height 32’, Crown spread 15’
3. Targets: none
4. Form and Crown class: Asymmetrical with a heavy lean; Co-dominant
5. Tree health: Good
6. Adverse site conditions: growing in the stream
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: remove

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Tree number: 390

1. Species: Ironwood
2. Size: DBH 9", Height 32', Crown spread 15'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: growing in the stream
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: remove



Tree 384

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Tree number: 391

1. Species: False Olive
2. Size: DBH 8", Height 10', Crown spread 12'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: some scarring
9. Scaffold limb defects: dead wood
10. Previous tree and limb failures: none

Management Recommendations: Crown clean, prune up to 15' over trail.



Tree 291

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Tree number: 392

1. Species: Black waddle
2. Size: DBH 3“, Height 20’, Crown spread 5’
3. Targets: none
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: none



Tree 392

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Tree number: 393

1. Species: False Olive
2. Size: DBH 9", Height 15', Crown spread 17'
3. Targets: none
4. Form and Crown class: n/a
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: none



Tree 392

Tree 393

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Tree number: 394

1. Species: Black waddle
2. Size: DBH 12“, Height 33’, Crown spread 15’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: endangers trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove

Tree number: 395

1. Species: Black waddle
2. Size: DBH 16“, Height 43’, Crown spread 19’
3. Targets: Trail
4. Form and Crown class: Symmetrical.; Co-dominant
5. Tree health: Good
6. Adverse site conditions: endangers trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: In the trail - remove

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Tree number: 396

1. Species: Black waddle
2. Size: DBH 9“, Height 37’, Crown spread 10’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: poor
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove

Tree number: 397

1. Species: Black waddle
2. Size: DBH 9“, Height 38’, Crown spread 11’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove

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Consulting Arborist



Tree 397

Tree 394

Tree number: 398

1. Species: Black wattle
2. Size: DBH 15", Height 35', Crown spread 36'
3. Targets: none
4. Form and Crown class: Symmetrical with a double trunk; Dominant
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: double trunk with included bark
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: none

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Tree 398

Tree number: 399

1. Species: Black wattle
2. Size: DBH 5“, Height 25’, Crown spread 9’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: In the trail - remove

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Tree 403

Tree 399

Tree number: 400

1. Species: Black waddle
2. Size: DBH 8", Height 28', Crown spread 10'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: multi-trunks with included bark
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: In trail - remove

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Tree number: 401

1. Species: False Olive
2. Size: DBH 3“, Height 20’, Crown spread 12’
3. Targets: Trail
4. Form and Crown class: n/a
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove

Tree number: 402

1. Species: Black waddle
2. Size: DBH 14“, Height 35’, Crown spread 0’
3. Targets: Trail
4. Form and Crown class: n/a
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

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Tree number: 403

1. Species: Black waddle
2. Size: DBH 11“, Height 33’, Crown spread 10’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove

Tree number: 404

1. Species: Black waddle
2. Size: DBH 13“, Height 23’, Crown spread 15’
3. Targets: Trail
4. Form and Crown class: Asymmetrical with a heavy lean; Co-dominant
5. Tree health: Good
6. Adverse site conditions: tree is uprooted leaning over trail
7. Defective root conditions: partially uprooted
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: uprooted

Management Recommendations: Remove

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Tree 404

Tree 405

Tree number: 405

1. Species: Black waddle
2. Size: DBH 16", Height 40', Crown spread 15'
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove

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Tree number: 406

1. Species: Black waddle
2. Size: DBH 3“, Height 18’, Crown spread 6’
3. Targets: none
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: none

Tree number: 407

1. Species: Black waddle
2. Size: DBH 10“, Height 35’, Crown spread 16’
3. Targets: none
4. Form and Crown class: Asymmetrical with multi trunks; Co-dominant
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: multi trunks with included bark
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: none

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Tree number: 408

1. Species: Black waddle
2. Size: DBH 14“, Height 19’, Crown spread 18’
3. Targets: none
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Poor
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: tree is dieing
10. Previous tree and limb failures: none

Management Recommendations: Remove

Tree number: 409

1. Species: Black waddle
2. Size: DBH 6“, Height 34’, Crown spread 12’
3. Targets: none
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: none

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Tree 409

Tree 410

Tree number: 410

1. Species: Black waddle
2. Size: DBH 9", Height 19', Crown spread 14'
3. Targets: none
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: none

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Tree number: 411

1. Species: Christmas berry
2. Size: DBH 7", Height 12', Crown spread 15'
3. Targets: none
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: none

Tree number: 412

1. Species: False Olive
2. Size: DBH 4", Height 13', Crown spread 10'
3. Targets: none
4. Form and Crown class: n /a
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: none

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Tree number: 413

1. Species: False Olive
2. Size: DBH 8", Height 22', Crown spread 31'
3. Targets: none
4. Form and Crown class: n /a
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: none

Tree number: 414

1. Species: False Olive
2. Size: DBH 10", Height 25', Crown spread 30'
3. Targets: none
4. Form and Crown class: n /a
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: none

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Tree number: 415

1. Species: False Olive
2. Size: DBH 5", Height 12', Crown spread 15'
3. Targets: none
4. Form and Crown class: n /a
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: none

Tree number: 416

1. Species: False Olive
2. Size: DBH 4", Height 14', Crown spread 19'
3. Targets: none
4. Form and Crown class: n /a
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: none

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Tree number: 417

1. Species: False Olive clump
2. Size: DBH 3“, Height 15’, Crown spread 18’
3. Targets: Trail
4. Form and Crown class: clump of six
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: remove

Tree number: 418

1. Species: False Olive
2. Size: DBH 8“, Height 18’, Crown spread 21’
3. Targets: Trail
4. Form and Crown class: clump of five bushes
5. Tree health: Good
6. Adverse site conditions: leaning across trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove

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Tree number: 419

1. Species: False Olive
2. Size: DBH 1“, Height 10’, Crown spread 25’
3. Targets: Trail
4. Form and Crown class: clump of bushes
5. Tree health: Good
6. Adverse site conditions: in the trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove

Tree number: 420

1. Species: False Olive and Black waddles0
2. Size: DBH 10“, Height 29’, Crown spread 75’
3. Targets: Trail
4. Form and Crown class: n /a
5. Tree health: Fair
6. Adverse site conditions: leaning over trail
7. Defective root conditions: none
8. Trunk defects: included bark
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove

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Tree 420

Tree number: 421

1. Species: Black waddle
2. Size: DBH 10", Height 26', Crown spread 13'
3. Targets: none
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Poor
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: die back
10. Previous tree and limb failures: dieing

Management Recommendations: Remove

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Tree 421

Tree number: 422

1. Species: Black waddle
2. Size: DBH 22“, Height 40’, Crown spread 25’
3. Targets: none
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: heavy sap flow
9. Scaffold limb defects: poor structure
10. Previous tree and limb failures: none

Management Recommendations: Entangled with Christmas berry - remove

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Tree number: 423

1. Species: Blue Gum Eucalyptus
2. Size: DBH 28", Height 50', Crown spread 30'
3. Targets: Church property
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Poor
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: die back
10. Previous tree and limb failures: none

Management Recommendations: Remove



Tree 9

Tree 423

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Tree number: 424

1. Species: Black Butt Eucalyptus
2. Size: DBH 13“, Height 50’, Crown spread 10’
3. Targets: Church property
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Crown clean



Tree 423

Tree 424

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Tree number: 425

1. Species: Black Butt Eucalyptus
2. Size: DBH 16“, Height 75’, Crown spread 30’
3. Targets: Trail and Church property
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Crown clean

Tree number: 426

1. Species: Black Butt Eucalyptus
2. Size: DBH 36“, Height 100’, Crown spread 50’
3. Targets: Trail and Church property
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: wire fencing imbedded in trunk
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: none

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Tree number: 427

1. Species: Black Butt Eucalyptus
2. Size: DBH 26“, Height 80’, Crown spread 35’
3. Targets: Trail and Church property
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: wire fence imbedded in trunk
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Crown clean

Tree number: 428

1. Species: Black Butt Eucalyptus
2. Size: DBH 17“, Height 65’, Crown spread 20’
3. Targets: Trail and Church property
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: evidence of old wounds well healed
9. Scaffold limb defects: upper limb rubbing hard on tree number 429
10. Previous tree and limb failures: none

Management Recommendations: Prune to separate from number 429; check tree for stability after pruning

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Tree number: 429

1. Species: Black Butt Eucalyptus
2. Size: DBH 18“, Height 90’, Crown spread 20’
3. Targets: Trail and Church property
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: old trunk wounds, healing well
9. Scaffold limb defects: large wound where number 428 is rubbing
10. Previous tree and limb failures: none

Management Recommendations: Prune to separate from 429 if necessary; crown clean

Tree number: 430

1. Species: Black Butt Eucalyptus
2. Size: DBH 14“, Height 55’, Crown spread 15’
3. Targets: Trail and Church property
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: old healed wound
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Crown clean

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Tree number: 431

1. Species: Black Butt Eucalyptus
2. Size: DBH 21“, Height 85’, Crown spread 25’
3. Targets: Trail and Church property
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: old healed wounds on trunk
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Crown clean

Tree number: 432

1. Species: Black Butt Eucalyptus
2. Size: DBH 19“, Height 76’, Crown spread 25’
3. Targets: Church property and trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: old healed wound on trunk
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Crown clean

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Tree 36

Tree 432

Tree 430

Tree number: 433

1. Species: *Eucalyptus robusta*
2. Size: DBH 33", Height 45', Crown spread 40'
3. Targets: Waimea Office Center building
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: root erosion on stream side
7. Defective root conditions: root erosion on stream side
8. Trunk defects: old large trunk wound
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Crown clean

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Tree 433

Tree 435

Tree 439

Tree number: 434

1. Species: *Eucalyptus robusta*
2. Size: DBH 23", Height 45', Crown spread 40'
3. Targets: Waimea Office Center building
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: erosion from stream
7. Defective root conditions: erosion on stream side
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: stubs

Management Recommendations: Crown clean

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Tree 433 435 434 436 437 438 439

Tree number: 435

1. Species: Eucalyptus robusta
2. Size: DBH 11", Height 25', Crown spread 20'
3. Targets: Waimea Office Center building
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: erosion from stream
7. Defective root conditions: erosion on stream side
8. Trunk defects: cavity in trunk - healing
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Crown clean

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Tree 433 435 434 436

Tree number: 436

1. Species: Eucalyptus robusta
2. Size: DBH 10", Height 25', Crown spread 10'
3. Targets: Waimea Office Center building
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: erosion from stream
7. Defective root conditions: erosion on stream side
8. Trunk defects: none
9. Scaffold limb defects: lower limb rubbing on number 434
10. Previous tree and limb failures: none

Management Recommendations: Remove branch rubbing on 434; crown clean

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Tree number: 437

1. Species: Eucalyptus robusta
2. Size: DBH 13“, Height 25’, Crown spread 20’
3. Targets: Waimea Office Center building
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: erosion from stream
7. Defective root conditions: erosion on stream side
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Crown clean

Tree number: 438

1. Species: Black Butt Eucalyptus
2. Size: DBH 7“, Height 20’, Crown spread 10’
3. Targets: none
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: erosion from stream
7. Defective root conditions: erosion on stream side
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Crown clean

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Tree number: 439

1. Species: Eucalyptus robusta
2. Size: DBH 11“, Height 25’, Crown spread 15’
3. Targets: none
4. Form and Crown class: Symmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: erosion from stream
7. Defective root conditions: eroded on stream side
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Crown clean

Tree number: 440

1. Species: False Olive
2. Size: DBH “, Height ’, Crown spread ’
3. Targets: Trail
4. Form and Crown class: bush
5. Tree health: Poor
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove

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Tree number: 441

1. Species: Black waddle
2. Size: DBH 4", Height 20', Crown spread 8'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: remove

Tree number: 442

1. Species: Black waddle
2. Size: DBH 7", Height 15', Crown spread 10'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: excessive sap flow
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove

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Tree number: 443

1. Species: Black waddle
2. Size: DBH 9", Height 40', Crown spread 16'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Near the trail - remove

Tree number: 444

1. Species: Black waddle
2. Size: DBH 7", Height 30', Crown spread 14'
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove

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Tree number: 445

1. Species: Black waddle
2. Size: DBH 7“, Height 15’, Crown spread 8’
3. Targets:
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

Tree number: 446

1. Species: Black waddle
2. Size: DBH 8“, Height 15’, Crown spread 4’
3. Targets:
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

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Tree number: 447

1. Species: Black waddle
2. Size: DBH 10", Height 25', Crown spread 14'
3. Targets: none
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Fair
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: none

Tree number: 448

1. Species: Black waddle
2. Size: DBH 7", Height 25', Crown spread 6'
3. Targets:
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

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Tree number: 449

1. Species: Black waddle
2. Size: DBH 8“, Height 25’, Crown spread 15’
3. Targets: Fencing
4. Form and Crown class: Asymmetrical with a heavy lean; Co-dominant
5. Tree health: Fair
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove

Tree number: 450

1. Species: Black waddle
2. Size: DBH 13“, Height 40’, Crown spread 18’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove

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Michael M. Kraus
Consulting Arborist

Tree number: 451

1. Species: Black waddle
2. Size: DBH 9“, Height 25’, Crown spread 12’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: sap flow
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove

Tree number: 452

1. Species: Black waddle
2. Size: DBH 6“, Height 35’, Crown spread 8’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Suppressed
5. Tree health: Fair
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove

Michael M. Kraus
Consulting Arborist

Tree number: 453

1. Species: Black waddle
2. Size: DBH 10“, Height 20’, Crown spread 10’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: none



Tree 453

Michael M. Kraus
Consulting Arborist

Tree number: 454

1. Species: Black waddle (2)
2. Size: DBH 10“, Height 20’, Crown spread 10’
3. Targets:
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

Tree number: 455

1. Species: Black waddle
2. Size: DBH 7“, Height 20’, Crown spread ’8
3. Targets:
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

Michael M. Kraus
Consulting Arborist

Tree number: 456

1. Species: Black waddle
2. Size: DBH 10“, Height 20’, Crown spread 8’
3. Targets:
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

Tree number: 457

1. Species: Black waddle
2. Size: DBH 8“, Height 15’, Crown spread 6’
3. Targets:
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

Michael M. Kraus
Consulting Arborist

Tree number: 458

1. Species: Black waddle
2. Size: DBH 8“, Height 15’, Crown spread 5’
3. Targets:
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove



Tree 458

Michael M. Kraus
Consulting Arborist

Tree number: 459

1. Species: Black waddle
2. Size: DBH 4“, Height 15’, Crown spread 7’
3. Targets:
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove



Tree 459

Tree 460

Michael M. Kraus
Consulting Arborist

Tree number: 460

1. Species: Black waddle
2. Size: DBH 4“, Height 15’, Crown spread 5’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Fair
6. Adverse site conditions: in trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove

Tree number: 461

1. Species: Black waddle
2. Size: DBH 12“, Height 25’, Crown spread 15’
3. Targets:
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

Michael M. Kraus Consulting Arborist

Tree number: 462

1. Species: Black waddle
2. Size: DBH 17", Height 30', Crown spread 20'
3. Targets:
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove



Tree 462, 461, 463

Michael M. Kraus
Consulting Arborist

Tree number: 463

1. Species: Black waddle
2. Size: DBH 10“, Height 30’, Crown spread 12’
3. Targets:
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

Tree number: 464

1. Species: Black waddle
2. Size: DBH 16“, Height 17’, Crown spread 15’
3. Targets:
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

Michael M. Kraus
Consulting Arborist

Tree number: 465

1. Species: Black waddle
2. Size: DBH 15“, Height 18’, Crown spread 8’
3. Targets:
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove



Tree 465

Michael M. Kraus
Consulting Arborist

Tree number: 466

1. Species: Black waddle
2. Size: DBH 21“, Height 35’, Crown spread 20’
3. Targets:
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

Tree number: 467

1. Species: Black waddle
2. Size: DBH 18“, Height 40’, Crown spread 25’
3. Targets: none
4. Form and Crown class: Suppressed; Co-dominant
5. Tree health: dieing
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: dieing
9. Scaffold limb defects: dieing
10. Previous tree and limb failures: none

Management Recommendations: Tree is dieing - remove

Michael M. Kraus Consulting Arborist

Tree number: 468

1. Species: Black waddle
2. Size: DBH 8", Height 25', Crown spread 10'
3. Targets:
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove



Tree 468 469 467

470

Michael M. Kraus
Consulting Arborist

Tree number: 469

1. Species: Black waddle
2. Size: DBH 14“, Height 25’, Crown spread 18’
3. Targets:
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dea
10. Previous tree and limb failures: dead

Management Recommendations: Remove

Tree number: 470

1. Species: Black waddle
2. Size: DBH 14“, Height 25’, Crown spread 16’
3. Targets:
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

Michael M. Kraus
Consulting Arborist

Tree number: 471

1. Species: Black waddle
2. Size: DBH 10“, Height 20’, Crown spread 12’
3. Targets:
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove



Tree 471

Michael M. Kraus
Consulting Arborist

Tree number: 472

1. Species: Black waddle
2. Size: DBH 13“, Height 30’, Crown spread 12’
3. Targets: Trail
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove



Tree 472 473

Michael M. Kraus
Consulting Arborist

Tree number: 473

1. Species: Black waddle
2. Size: DBH 8", Height 25', Crown spread 8'
3. Targets: Trail
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

Tree number: 474

1. Species: Black waddle
2. Size: DBH 7", Height 15', Crown spread 8'
3. Targets: Trail
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

Michael M. Kraus
Consulting Arborist

Tree number: 475

1. Species: Black waddle
2. Size: DBH 12“, Height 25’, Crown spread 12’
3. Targets: Trail
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove



Tree 475 474

Michael M. Kraus
Consulting Arborist

Tree number: 476

1. Species: Black waddle
2. Size: DBH 11“, Height 25’, Crown spread 15’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Co-dominant
5. Tree health: Fair
6. Adverse site conditions: near trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove

Tree number: 477

1. Species: Black waddle
2. Size: DBH 18“, Height 15’, Crown spread 10’
3. Targets: Trail
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

Michael M. Kraus
Consulting Arborist



Tree 477

Tree number: 478

1. Species: Black waddle
2. Size: DBH 15“, Height 15’, Crown spread 10’
3. Targets: Trail
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

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Michael M. Kraus
Consulting Arborist



Tree 478

Tree number: 479

1. Species: Black wattle
2. Size: DBH13", Height 25', Crown spread 12'
3. Targets: Trail
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

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Michael M. Kraus
Consulting Arborist

Tree number: 480

1. Species: Black waddle
2. Size: DBH 13“, Height 20’, Crown spread 10’
3. Targets: Trail
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

Tree number: 481

1. Species: Black waddle
2. Size: DBH 15“, Height 25’, Crown spread 15’
3. Targets: Trail
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

Michael M. Kraus
Consulting Arborist



Tree 481

Tree number: 482

1. Species: Black waddle
2. Size: DBH 9", Height 20', Crown spread 8'
3. Targets: Trail
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

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Michael M. Kraus
Consulting Arborist

Tree number: 483

1. Species: Black waddle
2. Size: DBH 7“, Height 20’, Crown spread 10’
3. Targets: Trail
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

Tree number: 484

1. Species: Black waddle
2. Size: DBH 11“, Height 25’, Crown spread 15’
3. Targets: Trail
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

Michael M. Kraus
Consulting Arborist

Tree number: 485

1. Species: Black waddle
2. Size: DBH 15“, Height 20’, Crown spread 10’
3. Targets: Trail
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

Tree number: 486

1. Species: Black waddle
2. Size: DBH 18“, Height 20’, Crown spread 12’
3. Targets: Trail
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

Michael M. Kraus
Consulting Arborist



Tree 486

Tree number: 487

1. Species: Black waddle
2. Size: DBH 19", Height 35', Crown spread 25'
3. Targets: Trail
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

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Michael M. Kraus
Consulting Arborist

Tree number: 488

1. Species: Black waddle
2. Size: DBH 10“, Height 30’, Crown spread 20’
3. Targets: Trail
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

Tree number: 489

1. Species: Black waddle
2. Size: DBH 13“, Height 35’, Crown spread 20’
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: near trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: remove

Michael M. Kraus
Consulting Arborist

Tree number: 490

1. Species: Black waddle
2. Size: DBH 15“, Height 30’, Crown spread 15’
3. Targets: Trail
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

Tree number: 491

1. Species: Black waddle
2. Size: DBH 13“, Height 30’, Crown spread 15’
3. Targets: Trail
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

Michael M. Kraus
Consulting Arborist



Tree 490

Tree 491

Tree number: 492

1. Species: Black waddle
2. Size: DBH 19", Height 30', Crown spread 20'
3. Targets: Trail
4. Form and Crown class: dead
5. Tree health: dead
6. Adverse site conditions: dead
7. Defective root conditions: dead
8. Trunk defects: dead
9. Scaffold limb defects: dead
10. Previous tree and limb failures: dead

Management Recommendations: Remove

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Michael M. Kraus
Consulting Arborist



Tree 492

Tree number: 493

1. Species: Black waddle
2. Size: DBH 8", Height 18', Crown spread 12'
3. Targets: none
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: near trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: none

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Michael M. Kraus
Consulting Arborist

Tree number: 494

1. Species: Black waddle
2. Size: DBH 6“, Height 15’, Crown spread 10’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: near trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove

Tree number: 495

1. Species: Black waddle
2. Size: DBH 10“, Height 30’, Crown spread 10’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: near trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove

Michael M. Kraus
Consulting Arborist

Tree number: 496

1. Species: Black waddle
2. Size: DBH 10“, Height 30’, Crown spread 12’
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove

Tree number: 497

1. Species: Black waddle
2. Size: DBH 9“, Height 30’, Crown spread 12’
3. Targets: Trail
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: near trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove

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Michael M. Kraus
Consulting Arborist

Tree number: 498

1. Species: Black waddle
2. Size: DBH 10“, Height 25’, Crown spread 10’
3. Targets: Trail
4. Form and Crown class: Symmetrical; Dominant
5. Tree health: Good
6. Adverse site conditions: near trail
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: Remove



Tree 498

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Michael M. Kraus
Consulting Arborist

Tree number: 499

1. Species: Black wattle
2. Size: DBH13“, Height 25’, Crown spread 12’
3. Targets: none
4. Form and Crown class: Asymmetrical; Co-dominant
5. Tree health: Good
6. Adverse site conditions: none
7. Defective root conditions: none
8. Trunk defects: none
9. Scaffold limb defects: none
10. Previous tree and limb failures: none

Management Recommendations: none



Tree 499

P. O. Box 277, Hilo HI 96721
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U.S. Department
of Transportation
**Federal Highway
Administration**

Hawaii Federal-Aid Division

November 19, 2010

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CERTIFIED MAIL

7010 1060 0000 9538 1386

Mr. Loyal Mehrhoff, Field Supervisor
U.S. Department of the Interior
Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Blvd., Room 3-122, Box 50088
Honolulu, Hawai'i 96850

Dear Mr. Mehrhoff:

**Subject: Section 7, Endangered Species Act (ES)
Request for Concurrence with "NLAA" Determination
Ke Ala Kahawai O Waimea, Waimea Trails and Greenways
Waimea, South Kohala District, Hawai'i Island
Various TMKs**

The Federal Highway Administration (FHWA), in cooperation with the County of Hawai'i, wishes to inform the U.S. Fish and Wildlife Service (USFWS) of its determination that the subject project is "not likely to adversely affect (NLAA)" any listed threatened or endangered species. Moreover, there is no federally designated critical habitat within the project area. This determination has been made in accordance with Section 7 of the Endangered Species Act (ESA), and we are seeking your concurrence with our determination.

Project Overview

The *Ke Ala Kahawai O Waimea* ("stream trail of Waimea") will be a multi-use bicycle and pedestrian path extending approximately 4.5 miles through Waimea on the Island of Hawai'i. The project is proposed by the County of Hawai'i, Department of Parks and Recreation (DPR) in collaboration with the Waimea Trails and Greenways Committee of the Waimea Preservation Association. A Draft Environmental Assessment (DEA) is currently being prepared for the project in accordance with the National Environmental Policy Act (NEPA) and State of Hawai'i's Chapter 343 HRS environmental regulations.



A major objective of the *Ke Ala Kahakai O Waimea* project is to provide an alternative form of transportation linking major destination points including residential areas, schools, office and commercial areas, and recreational areas. The path will follow the meandering route of Waikoloa Stream, beginning at Church Row in Waimea Town, and heading west through urban and agricultural lands, terminating at a future County park (former Clark property) on Kawaihae Road, opposite the South Kohala View Estates subdivision (see attached figure). The path will be paved, 10 to 12 feet in width and comply with Americans with Disabilities Act (ADA) guidelines for most of its length. It will be constructed in phases as funding is available.

A separate equestrian trail may also be developed in the area west of the County refuse transfer station. The equestrian trail would roughly parallel, but be physically separated from the main path. A trail head and horse trailer parking could be constructed on State-owned land adjacent to the County Transfer station.

Coordination with the USFWS

Two recent letters have been received from the USFWS regarding this project. The first letter, dated August 28, 2009 was sent to the County Department of Parks and Recreation in response to a request for a "species list" for Increment 1 of the proposed project. Increment 1 is the first phase of the project to be developed, covering a one-mile segment between Lindsey Road and Kahawai Street. The second letter from USFWS, dated June 18, 2010, was received during the DEA early consultation period.

Both letters note that based on the information in USFWS files and data compiled by the Hawai'i Biodiversity and Mapping Program and the Hawai'i GAP program, the federally endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) and Blackburn's sphinx moth (*Manduca blackburni*) may occur in the project area. Blackburn's sphinx moth larvae feed upon non-native tree tobacco (*Nicotiana glauca*) and potentially other non-native host plants. The USFWS indicated that from the information on hand, it could not ascertain whether there are host plants at the proposed project site.

The endangered Hawaiian hoary bat was not detected during biological surveys conducted in 2000 and in 2010 by AECOS, Inc. Neither the Blackburn's sphinx moth nor the host tree tobacco was identified during the either of the surveys. Because the tree tobacco is fairly drought tolerant, it would have been observed during at least one of the surveys if it were present. The biologists have concluded that neither tree tobacco nor other non-native plants presently known to have potential to support Blackburn's sphinx moth larvae (USFWS, 2005¹) presently occur in the area where vegetation will be removed. Therefore, the Blackburn's sphinx moth will not be harmed by the project.

2000 and 2010 Natural Resources Assessments

Natural resource assessments for the project were conducted in May 2000 and updated in November 2010 by AECOS, Inc. The assessments included stream biota, botanical resources,

¹ USFWS. 2005. Recovery Plan for Blackburn's Sphinx Moth (*Manduca blackburni*). Trdition 1, U.S. Fish and Wildlife Service, Portland, OR. 125 pp.

avifauna and terrestrial mammals. The purpose of the surveys was to assess the presence of sensitive biota and habitat, defined as species listed (or candidate) as threatened or endangered by the federal government or by State administrative rules, or species comprising a community of native plants and animals regarded as special and worthy of preservation.

No threatened or endangered species were identified in any of the field studies. The findings are briefly described below.

Stream Biota. The assessment of stream biota was based on a 2000 field survey of Waikoloa Stream conducted by AECOS, Inc., and a December 2001 survey of Waikoloa and Keanu‘i‘omanō Streams conducted for the Department of Hawaiian Home Land’s Lalamilo project.

Both the 2000 and 2001 surveys sampled for damselflies. Of the two endemic Hawaiian species of Megalagrion now listed as endangered, the Flying Earwig Hawaiian Dameselfly (*M. nesiotēs*) has not been seen on Hawai‘i Island for over 80 years. Because adults appear not to associate with streams, the trail would be unlikely to impact this species. The other species, the Pacific Hawaiian Dameselfly (*M. pacificum*), is believed to be extirpated from the Island of Hawai‘i. In addition, the preferred habitat of this species is not present in the project area.

No threatened or endangered aquatic animals were found in or around the Waikoloa or Keanu‘i‘omanō Stream areas during either the 2000 or 2001 surveys. It was noted that surveys conducted by the Department of Land and Natural Resources, Division of Aquatic Resources (DLNR-DAR) identified the endemic goby, ‘o‘opu ‘alamo ‘o (*Lentipes concolor*) as using these stream channels to access the permanently flowing, upper reaches of the streams.

The proposed project could have up to nine stream crossings over Waikoloa Stream, and one crossing over Keanu‘i‘omanō Stream. The AECOS, Inc. study concluded that the proposed project should have no adverse impact on stream fauna, but recommended that any culverts at the crossings either have unlined bottom surfaces or a surface that is completely flush with the natural streambed, to avoid blocking upstream migrations of the ‘o‘opu ‘alamo ‘o.

Finally, as recommended by USFWS in its June 18, 2010 letter, best management practices will be followed during construction to minimize degradation of water quality.

Botanical Resources. Based on Gagne and Cuddihy’s 1999 classification of Hawaiian plant communities, the vegetation within the entire project corridor was categorized as Anthropogenic or Alien, with three sub-types: pasture, riparian, and urban. No threatened or endangered plant species were found.

Several endemic plant species were identified within the project corridor, including a sword fern, *ho‘i‘o* (*Diplazium sandwichianum*), *wiliwili* (*Erythrina sandwicensis*), *pua kala* and *‘akia*. Indigenous species identified include the lace fern *pala ‘a* (*Odontosoria chinensis*); *Cyperus polystachyos* Rottb., a member of the sedge family; *‘aka ‘akai* or great bulrush; *koali*, in the morning-glory family; false mallow; *‘ilima* (*Sida fallax* Walp.); *popolo* or glossy nightshade (*Solanum americanum* Mill.), and *‘uhaloa* (*Waltheria indica*).

The vast majority of trees within the project area were eucalyptus (*E. robusta* and *E. saligna*) and black wattle (*Acacia mearnsii*), both non-native species. None of the trees in the project corridor are, or could be considered candidates for the County's exceptional tree program.

Avifauna and Terrestrial Mammals. The biologists noted the ongoing drought and very dry habitat conditions in 2010, and bird numbers and diversity were significantly lower than during the original 2000 survey. In 2000, a total of 400 individual birds of 18 species representing 11 separate families were detected during station counts. During the 2010 survey, only 117 individual birds representing 16 separate species were recorded.

All but one of the avian species recorded during both the 2000 and 2010 surveys are considered to be alien to the Hawaiian Islands. The single native species recorded was the Pacific Golden-Plover (*Pluvialis fulva*), an indigenous, migratory shorebird that nests in the high Arctic during the late spring and summer and returns to Hawai'i to spend the fall and winter.

During the original 2000 survey, six mammalian species were detected--domestic dogs (*Canis f. familiaris*), small Indian mongoose (*Herpestes a. auropunctatus*), cat (*Felis catus*), numerous domestic cattle (*Bos taurus*), and two groups of goats (*Capra h. hircus*). By contrast, during the 2010 survey, only one live cow, three live horses and several feral goats were observed. Also encountered were 17 dead cows, one dead horse, and one dead mongoose, graphically demonstrating the severity of the ongoing drought conditions.

The study noted that just as the extreme drought has resulted in the loss of cover, feeding resources, and water for avian species, the habitat for terrestrial mammals has also been radically altered. Currently, there is very little vegetation on the site to sustain anything but the hardiest of feral ungulates.

Overall, the biological assessments concluded that given the nature of the highly disturbed, alien dominated grasslands within the project corridor, the construction and operation of the *Ke Ala Kahawai O Waimea* path will not result in significant impact to native avian or mammalian species. From a native avian and mammalian perspective, there is nothing special or unique about this site, and current conditions do not support any protected avian and mammalian species (AECOS, Inc. 2010).

Threatened and Endangered Species

Although no threatened or endangered species or their habitats were identified within the project area, it is possible that small numbers of the endangered endemic Hawaiian Petrel (*Pterodroma sandwichensis*) and the threatened Newell's Shearwater (*Puffinus auricularis newelli*) overfly the area. The primary potential impact of the project on Hawaiian Petrels and Newell's Shearwaters is the possibility that these birds will become disoriented and downed as a result of outdoor lighting.

In order to mitigate these potential impacts, if night time construction activity or equipment maintenance is proposed, all associated lights will be shielded. If large flood/work lights are used, they should be placed on poles that are high enough to allow the lights to be pointed directly towards the ground.

No lighting is currently proposed for the multi-use path. However, it is possible that decisions will be made to light certain segments or areas, such as the parking lots at two future County parks along the path. If lights are installed, they will be shielded. This measure would serve the dual purpose of minimizing the threat of disorientation and downing of Hawaiian Petrels and Newell's Shearwaters, while at the same time complying with Hawai'i County Code §14-50 et seq. requiring shielding to lower ambient glare on the Mauna Kea observatories.

NLAA Determination

Based on the above information, we have determined that the project is not likely to adversely affect any listed species or their habitats. We respectfully seek your concurrence with this determination. If you have any questions, please feel free to contact me at (808) 541-2305. Thank you for your assistance.

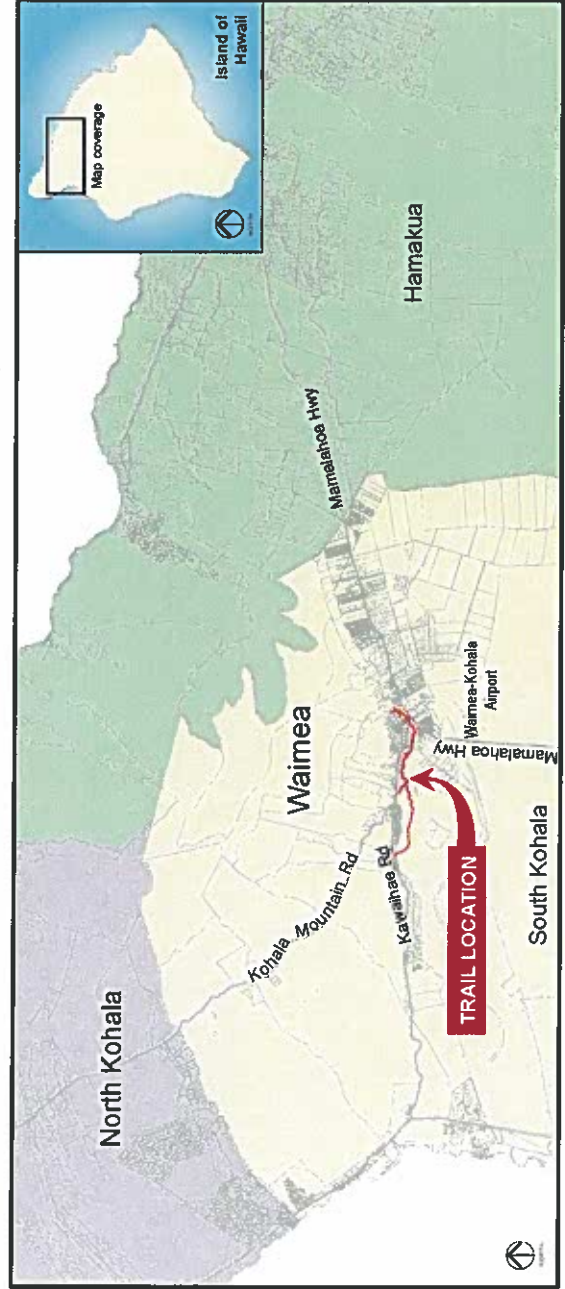
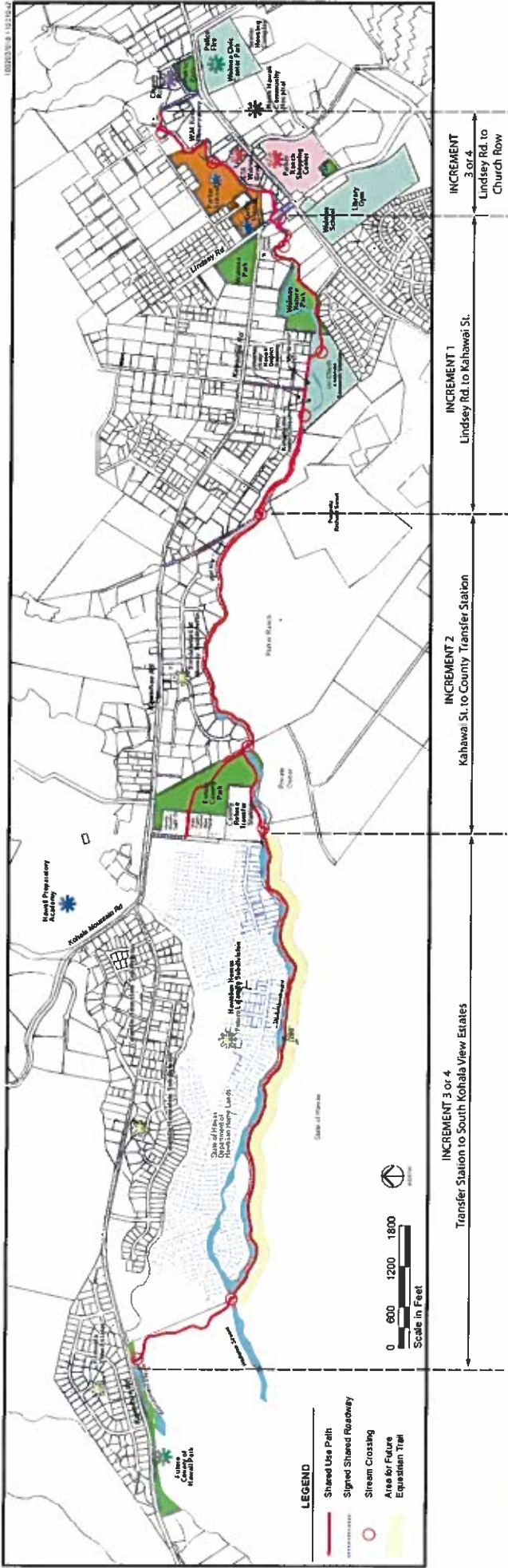
Sincerely,

A handwritten signature in blue ink that reads "Pat Phung". The signature is written in a cursive style with a large, sweeping "P" and "F".

Pat V. Phung, P.E.
Lead Civil Engineer

Enclosure

cc: Mr. Bob Fitzgerald, County of Hawai'i Department of Parks and Recreation
Mr. Glenn Kimura, Kimura International, Inc.



WAIMEA TRAILS AND GREENWAYS
Ke Ala Kahawai O Waimea
SHARED USE PATH

Draft

Literature Review and Field Inspection
for the Waimea Trails and Greenway Project
Lālāmilo, ‘Ōuli, Mamoualua, Lanikepu, Keoniki, Waiaka,
Kauniho, Waikōloa, Waiuia, Haleaha Ahupua‘a,
South Kohala District,
Hawai‘i Island, Various TMK’s

Prepared for
Kimura International, Inc.

Prepared by
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Management Summary

Reference	Draft Literature Review and Field Inspection for the Waimea Trails and Greenway Project Lālāmilo, 'Ōuli, Mamoualoha, Lanikepu, Keoniki, Waiaka, Kauniho, Waikōloa, Waiuia, Haleaha Ahupua'a, South Kohala District, Hawai'i Island, Various TMK's (Pammer and Hammatt 2010)
Date	October 2010
Project Number (s)	Cultural Surveys Hawai'i, Inc. (CSH) Project Code: LALAMILO 2
Investigation Permit Number	The fieldwork for this project was carried out under archaeological permit number 10-10 issued by the State Historic Preservation Division / Department of Land and Natural Resources (SHPD/DLNR)
Project Location	The proposed project area is defined by two narrow corridors, the shared use path (preferred alignment) and the alternate alignment. The preferred alignment extends along and occasionally crossing Waikōloa Stream from South Kohala View Estates in the west to "Church Row" in Waimea Town in the east. The alternate alignment extends from the north end of Kahawai Street in the east and follows various streams north of Kawaihae Rd. to South Kohala View Estates in the west. The project area is depicted on a 1995 Kamuela USGS 7.5-minute topographic quadrangle
Land Jurisdiction	State; Private
Agencies	SHPD/DLNR
Project Description	The proposed project involves the development of a cleared and marked trail along Waikōloa Stream. The proposed trail is part of The Waimea Trails and Greenway Project which is designed to provide a green belt through Waimea town for non-motorized transportation. The overall trail system passes through 10 separate <i>ahupua'a</i> , Lālāmilo, 'Ōuli, Mamoualoha, Lanikepu, Keoniki, Waiaka, Kauniho, Waikōloa, Waiuia, Haleaha, on the island of Hawai'i. The proposed project consists of a preferred alignment which follows the Waikōloa Stream, south of Kawaihae Road, and an alternate alignment which is north of Kawaihae Road. The study also includes a possible equestrian trail, located along a portion of the western half of the preferred alignment, beginning at the first crossing of the Waikōloa Stream and ending at the County Refuse Transfer Station.
Project Acreage	The current project area covers approximately 8.4 miles: a preferred alignment at 4.7 miles, an alternate alignment at 3 miles, and the shared use roadways totaling 0.72 miles.

Area of Potential Effect (APE)	For the purposes of the current literature review and field inspection, the APE is defined as the entire, approximately 8.4-mile, project area.
Historic Preservation Regulatory Context	<p>Multiple surveys have been completed along the preferred alignment, including an archaeological assessment of the preferred alignment in 2000 (Kikiloi et al. 2002) and an inventory survey of Increment 1 in the eastern half of the preferred alignment (Yucha et al. 2009). The current study will mostly address the alternate alignment and the signed shared roadways which will not include a constructed trail, but represent the connection points to the trail (Opelo Road, Kahawai Street, and South Kohala Distribution Road).</p> <p>This investigation is not an archaeological inventory survey, per the requirements of HAR Chapter 13-276. However, this study includes detailed historical, cultural, and archaeological background research, and a field inspection of the actual sections of the project area. The document is intended to facilitate the project's planning and support the project's historic preservation compliance. Based on results, cultural resource management recommendations are presented. An archaeological assessment was conducted by CSH in 2000 of the project areas preferred alignment (Kikiloi et al. 2002). Though this project was titled an 'archaeological assessment', it was not considered an archaeological assessment per HAR Chapter 13-276 and would be more appropriately termed a 'literature review and field inspection'. An archaeological assessment typically consists of an archaeological inventory level survey with no historic properties identified, as per HAR Chapter 13-13-284-5. Throughout the remainder of this report, the Kikiloi et al. (2002) report will be referred to as a literature review and field inspection. In 2003, a companion cultural impact assessment (CIA) study was prepared to support the Kikiloi et al. 2002 literature review and field inspection (Souza et al 2003). This CIA is used to support the current project area; however, if the alternate alignment is chosen for trail's location, an addendum CIA should be prepared. The original CIA was prepared to support the project's Hawai'i state environmental review, per the guidelines of the Hawai'i State Department of Health's Office of Environmental Quality Control "<i>Guidelines for Assessing Cultural Impacts</i>", further evaluates the project's potential impacts to cultural resources. Both documents will support the project's historic preservation consultation effort.</p>

Fieldwork Effort	The fieldwork component of this literature review and field inspection was accomplished on August 18, 2010 by two CSH archaeologists, Michelle Pammer, B.A. and Rosanna Runyon, B.A. under the general supervision of Hallett H. Hammatt, PhD (principal investigator). The fieldwork required approximately 2 person-days to complete.
Number of Historic Properties Identified	The pedestrian inspection identified 14 historic properties: seven previously identified historic properties or historic property concentrations, and 7 newly identified historic properties, consisting of multiple features within or adjacent to the current field inspection area
Identified Cultural Resources and Significance Assessments	<p>During the course of the field inspection, CSH identified 14 historic properties that may be affected by the project: Seven previously identified historic properties or historic property concentrations: SIHP – 18568, SIHP – 18581, SIHP - 18587, SIHP - 18588, SIHP - 18590, SIHP – 18593, and a historic property concentration containing six previously identified historic properties (SIHP - 18569, -18583 to -18586, and -18597); and seven newly identified historic properties, consisting of multiple features (CSH 001-007).</p> <p>Only the previously identified sites are considered significant as insufficient data was collected for the newly identified sites to conduct significant assessments at this time. Additionally, two of the previously identified historic properties have been recommended for preservation (SIHP – 18588 and SIHP – 18590).</p>
Mitigation Recommendation	<p>A thorough review of historical records, previous archaeology, and modern land use, suggest that the area surrounding the current project area has been significantly impacted during historic times, specifically during the construction of modern subdivisions. Much of the project area has likely been graded to support the subdivisions and associated roadways, and some evidence of bulldozing was apparent during the field inspection. However, previous archaeology as well as results from the current project suggests that a significant number of historic properties remain within the area despite the surrounding land disturbance.</p> <p>The field inspection revealed a large number of both pre and post-contact historic properties that will be affected by the proposed project. These findings are consistent with previous surveys of the surrounding area.</p> <p>Of the previously identified historic properties located within the project area that would be affected by the proposed alternate alignment corridor, at least two of the historic properties have been</p>

recommended for preservation, SIHP #'s -18588, burial mounds, and -18590, permanent habitation (Rechtman 2000:20). Preservation measures have been taken for SIHP # -18588, which now has a large enclosure encircling the two mounds. The remaining previously identified historic properties are either recommended for no further work or have no specific recommendations due to the standards at the time of the original study (Rechtman 2000; Barrera Jr. 1994). Within the preferred alignment, two historic properties have also been recommended for preservation by avoidance: SIHP# 50-10-06-26871 Feature A, a collapsed and severely damaged concrete ford or bridge, and SIHP# 50-10-06-26873 (CSH 3), a historic-era concrete ford and associated roadway (Yucha et al. 2009).

Because this report is only a literature review and field inspection and not an inventory survey, the newly identified historic properties (CSH 001 – 007), have not been fully documented. Therefore, a full archaeological significant assessment per HAR Chapter 13-276 is not part of this study. Thus, if the alternate alignment is chosen for the Waimea Trails and Greenway project, further documentation in the form of an archaeological inventory survey is recommended for its entire length. Increment 1 of the current project area's preferred alignment was previously subject to an inventory level survey (see Figure 9; Yucha et al. 2009). If the preferred alignment is chosen for the Waimea Trails and Greenway Project's final location, an archaeological inventory survey is recommended, though an additional inventory survey would not be required for the Increment 1 portion.

Previous archaeological studies have shown a high density of historic properties, similar to the findings for the current study, within the preferred alignment corridor. Two previous studies have been conducted for the Waimea Trails and Greenway Project along the preferred alignment, a 2002 literature review and field inspection along 6 miles of the trail (Kikiloi et al 2002) and an inventory survey of a 1.1 mile portion located between Lindsey Road and Kahawai Street (Yucha et al 2009). Additionally, in 1993, Chiniago Inc. conducted an archaeological inventory survey of approximately 50 acres for the Sandalwood Estates, which borders the northern edge of the central portion of the preferred alignment (Barrera Jr. 1993) and in 2002, an inventory survey was also conducted of an approximately 266 acre area bordering the north edge of the preferred alignment's western half (Haun et al 2002). Though the eastern half of the alternate alignment has not been inspected, based on the findings from previous archaeological studies within the area, it is likely that the historic property density is similar to that found within the western portion.

	<p>Based on the background studies and field inspection, Cultural Surveys Hawai'i recommends an inventory-level survey for the entire chosen alignment, preferred or alternate, including the proposed location for the possible equestrian trail. No further work is required for Increment 1, surveyed by Yucha et al. in 2009. The field inspection indicated that the alternate alignment has a concentration of sites similar to that of the preferred alignment. It is recommended that an inventory survey should await a staked alignment so that historic properties can be accurately located in relation to the alignment.</p>
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Section 1 Introduction

1.1 Project Background

At the request of Kimura International, Inc., Cultural Surveys Hawai‘i (CSH) conducted an Literature Review and Field Inspection for the Waimea Trails and Greenway Project Lālāmilo, ‘Ōuli, Mamoualua, Lanikepu, Keoniki, Waiaka, Kauniho, Waikōloa, Waiaulia, Haleaha Ahupua‘a, South Kohala District, Hawai‘i Island. The project covers an approximately 8.4 mile corridor and encompasses a significant number of TMK’s and land owners. This information has been formatted in a table which can be found in Appendix A.

The proposed project area is defined by two narrow corridors, the shared use path (preferred alignment) and the alternate alignment. The preferred alignment extends along and occasionally crossing Waikōloa Stream from South Kohala View Estates in the west to “Church Row” in Waimea Town in the east. The alternate alignment extends from the north end of Kahawai Street in the east and follows various streams north of Kawaihae Rd. to South Kohala View Estates in the west. The project area is depicted on a 1995 Kamuela USGS 7.5-minute topographic quadrangle (Figure 1), tax map (Figure 2 and Figure 3), and aerial photograph (Figure 4).

The proposed project involves the development of a cleared and marked trail along Waikōloa Stream. The proposed trail is part of The Waimea Trails and Greenway Project which is designed to provide a green belt through Waimea town for non-motorized transportation. The overall trail system passes through 10 separate *ahupua‘a*, Lālāmilo, ‘Ōuli, Mamoualua, Lanikepu, Keoniki, Waiaka, Kauniho, Waikōloa, Waiaulia, Haleaha, on the island of Hawai‘i.

The proposed Waimea Trails and Greenway Project consists of a preferred alignment which follows the Waikōloa Stream, south of Kawaihae Road, and an alternate alignment which is north of Kawaihae Road (Figure 5). The study also includes a possible equestrian trail, located along a portion of the western half of the preferred alignment, beginning at the first crossing of the Waikōloa Stream and ending at the County Refuse Transfer Station. Multiple surveys have been completed along the preferred alignment, including an archaeological assessment of the preferred alignment in 2000 (Kikiloi et al. 2002) and an inventory survey of Increment 1 in the eastern half of the preferred alignment (Yucha et al. 2009). The current study will mostly address the alternate alignment and the signed shared roadways which will not include a constructed trail, but represent the connection points to the trail (Opelo Road, Kahawai Street, and South Kohala Distribution Road).

This investigation is not an archaeological inventory survey, per the requirements of HAR Chapter 13-276. However, this study includes detailed historical, cultural, and archaeological background research, and a field inspection of the actual sections of the project area. The document is intended to facilitate the project’s planning and support the project’s historic preservation compliance. Based on results, cultural resource management recommendations are presented. An archaeological assessment was conducted by CSH in 2000 of the project areas preferred alignment (Kikiloi et al. 2002). Though this project was titled an ‘archaeological assessment’, it was not considered an archaeological assessment per HAR Chapter 13-276 and would be more appropriately termed a ‘literature review and field inspection’. An archaeological

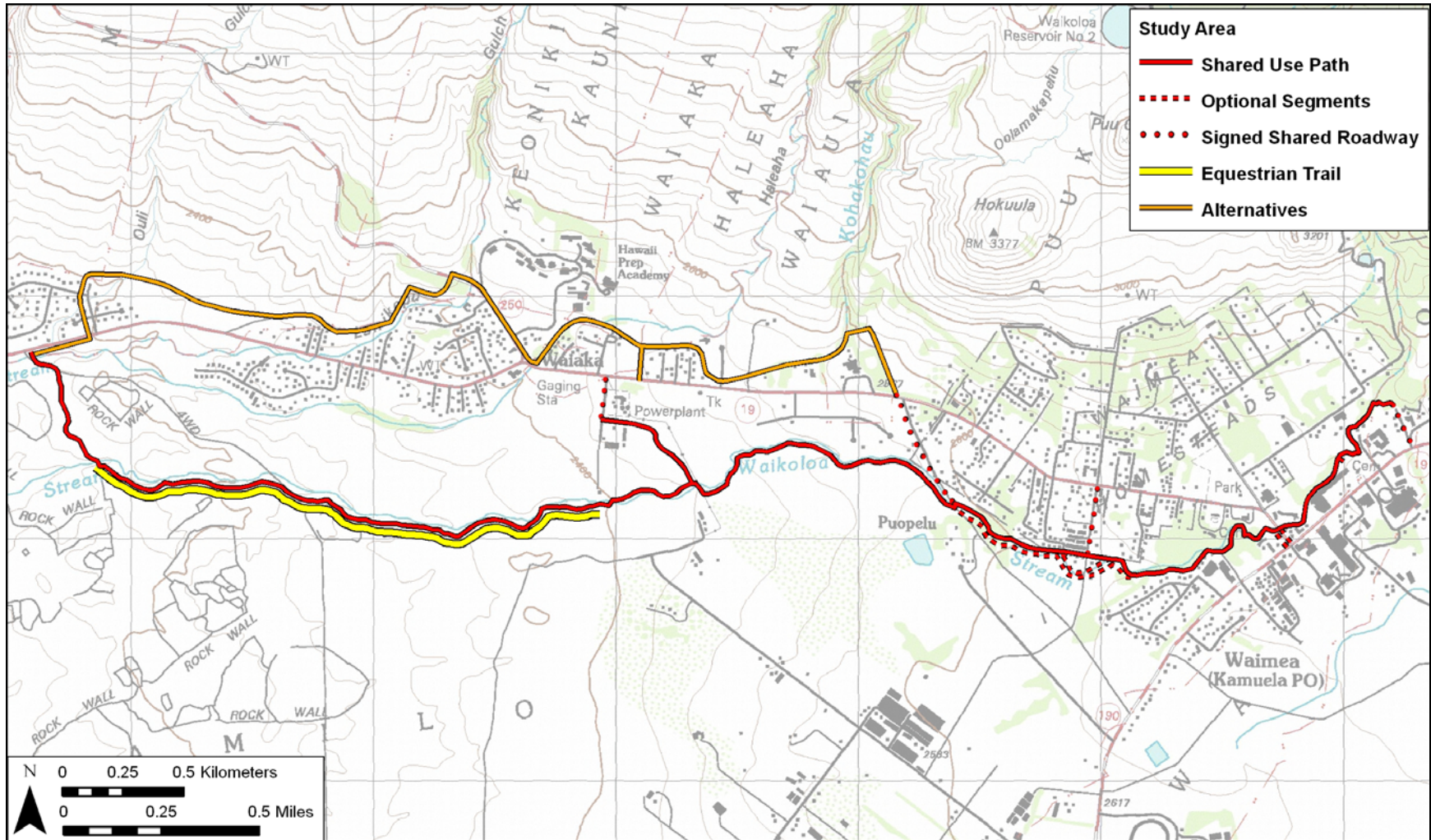


Figure 1. Portion of the 1995 Kamuela USGS 7.5-minute topographic quadrangle showing the current project area

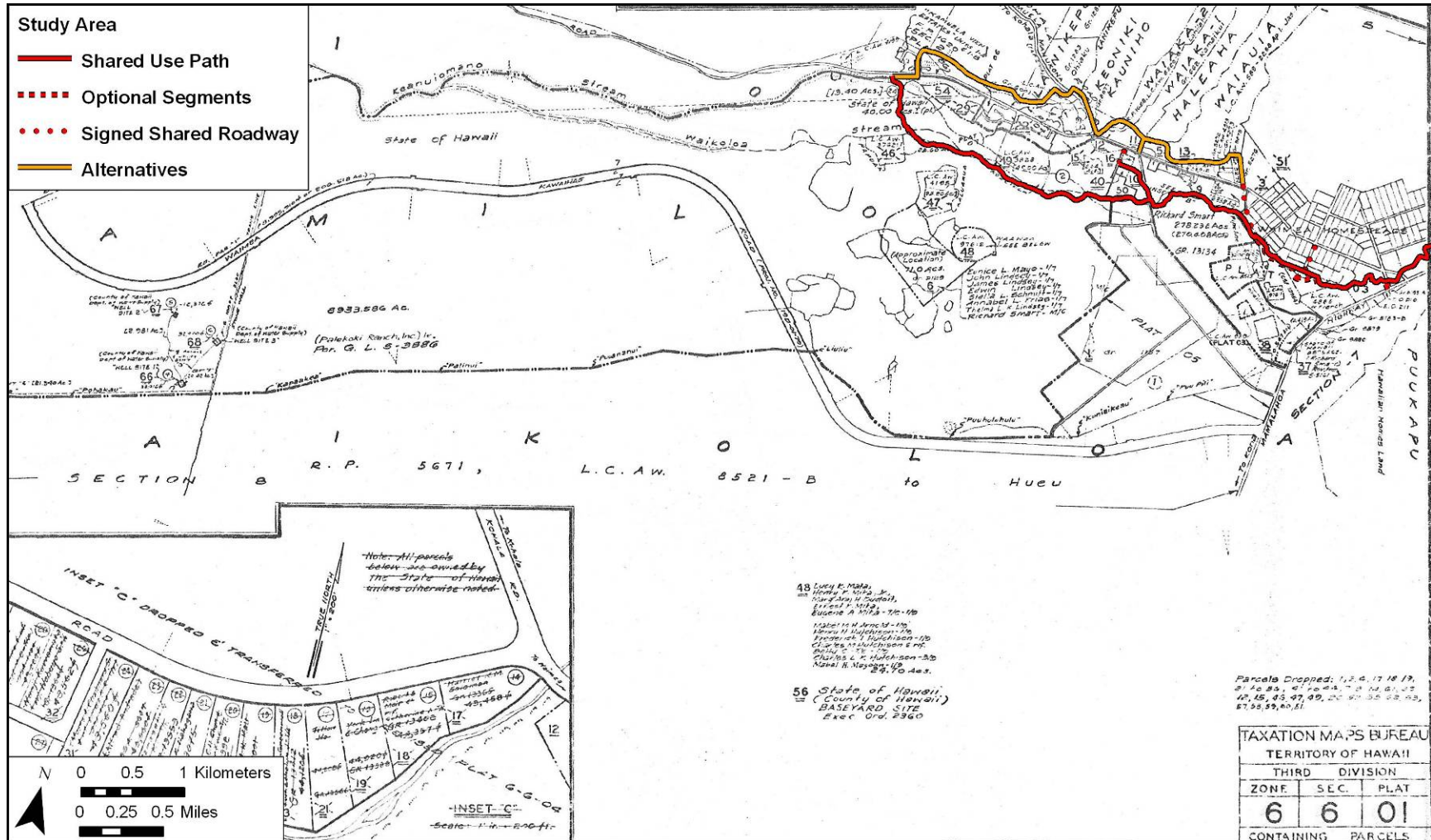


Figure 2. Tax Map Key (TMK) [3] 6-6-01 showing the western half of the project area

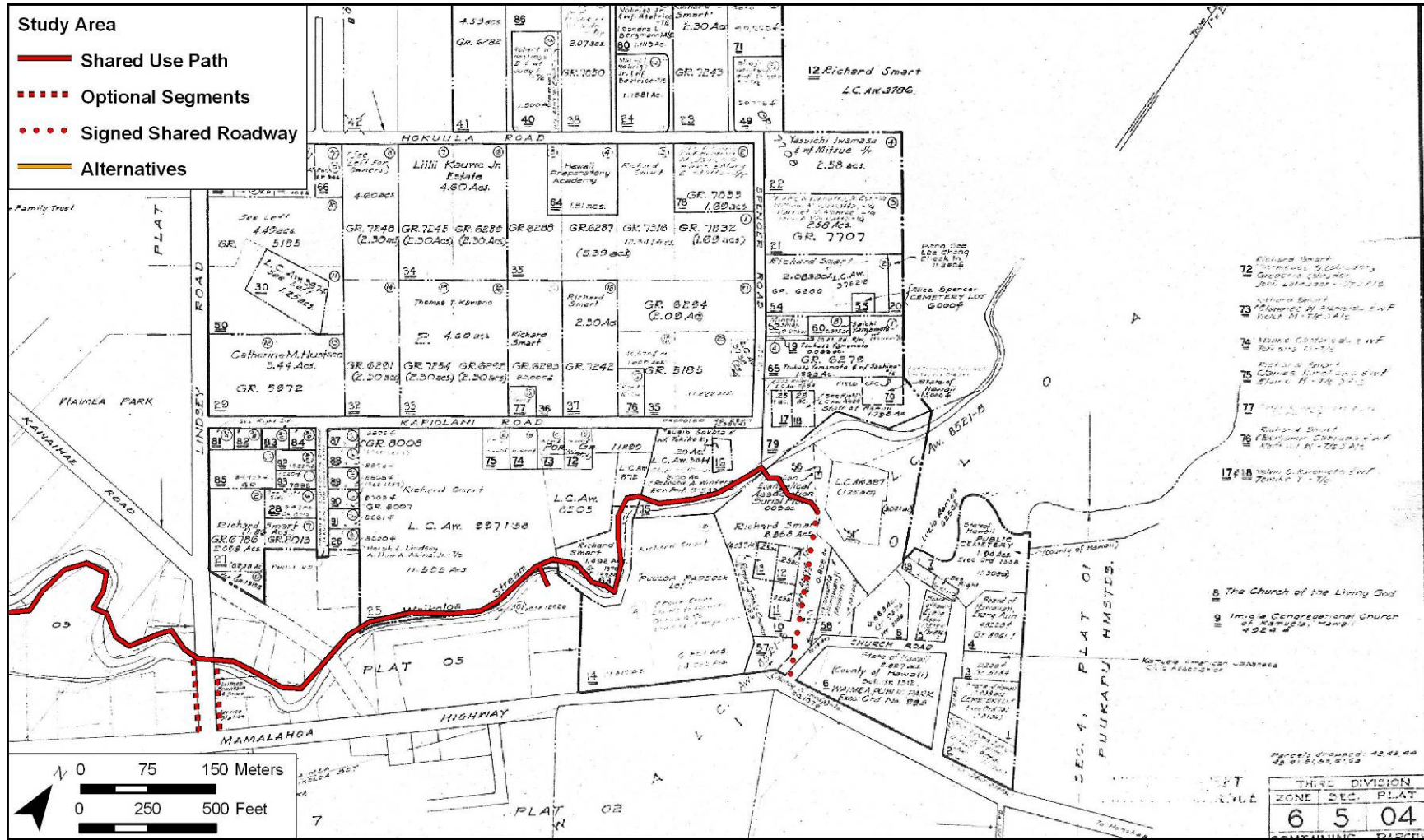


Figure 3. TMK [3] 6-5-04 showing the eastern half of the project area

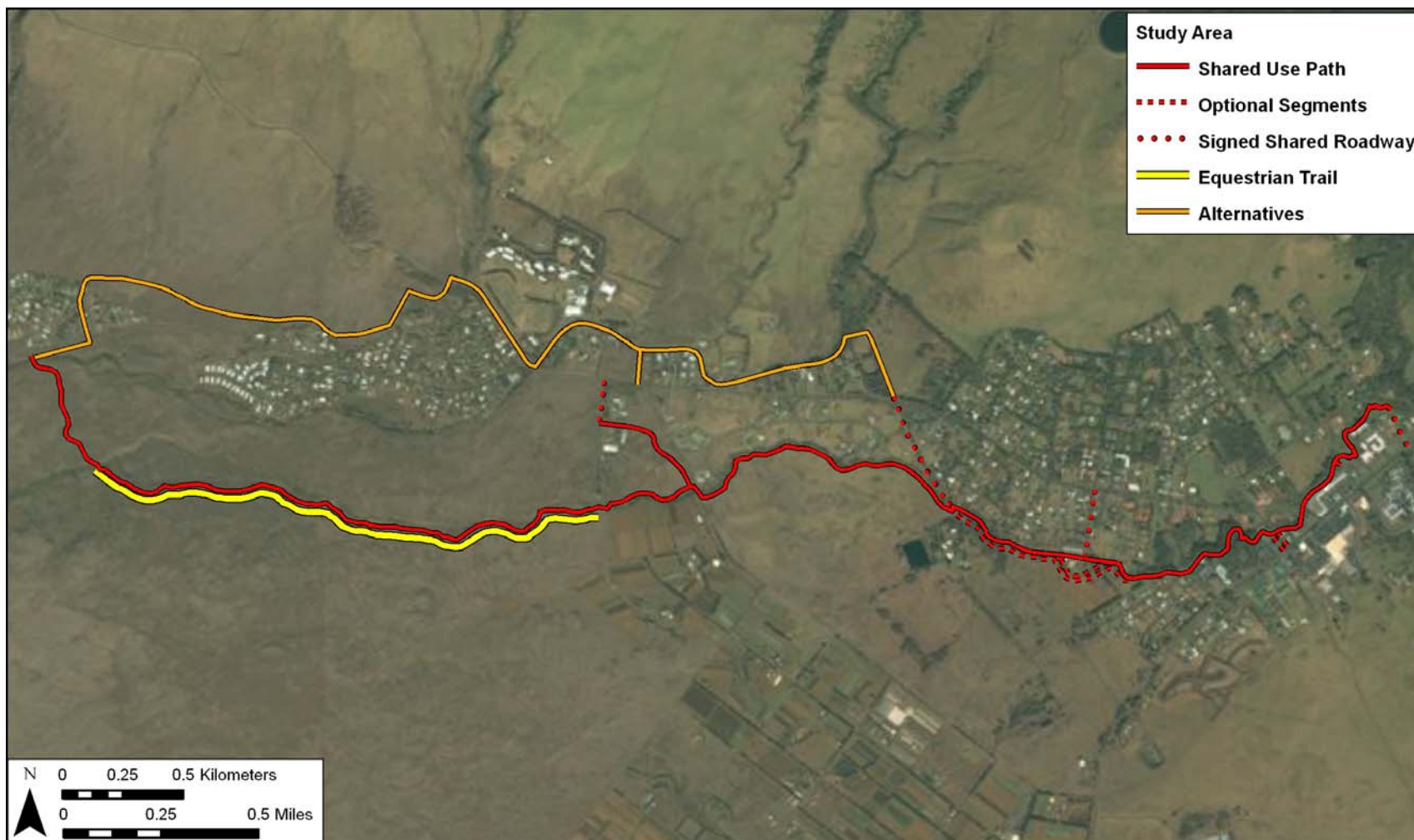


Figure 4. Aerial photograph showing the current project area (source: Geoeye 2001)

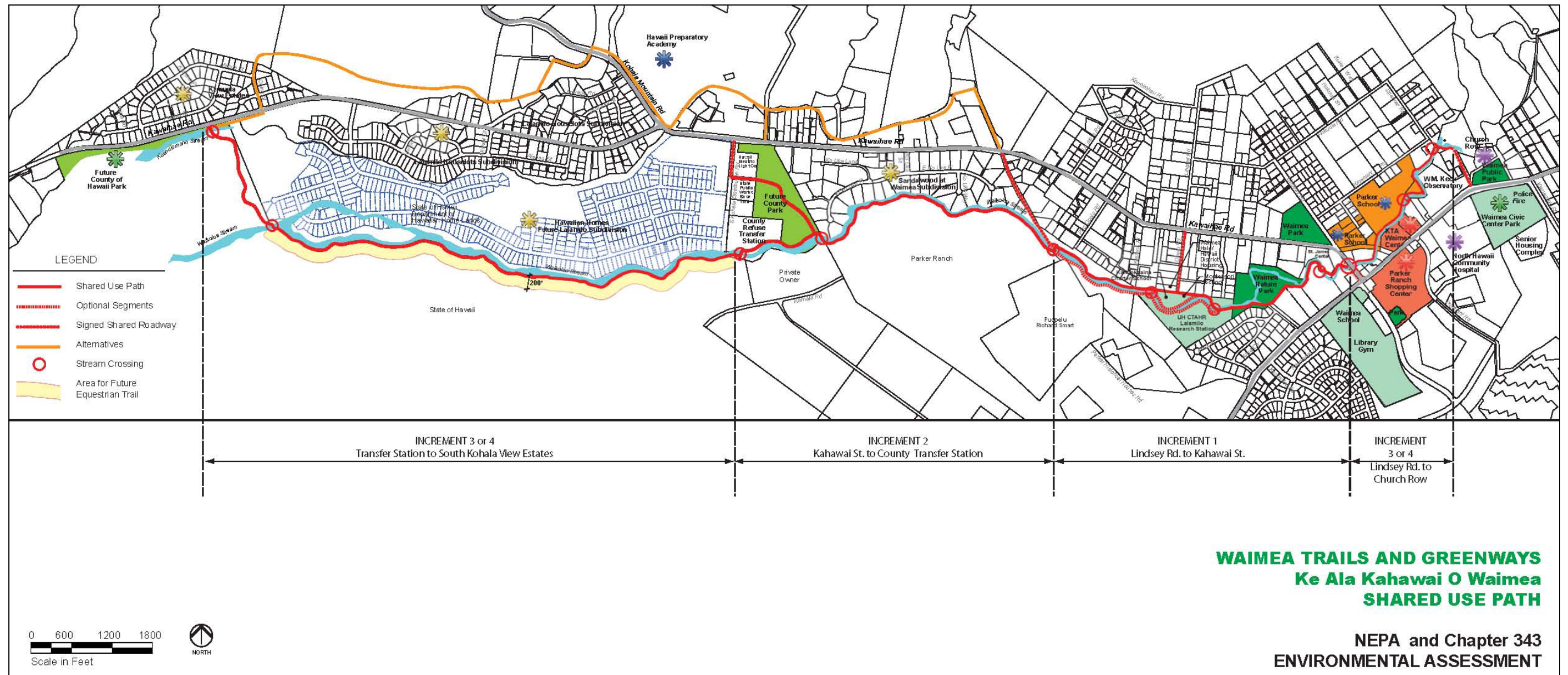


Figure 5. The proposed project area map showing the locations of the alternate alignment, preferred alignment (shared use path), the signed shared roadways, and the proposed area for a future equestrian trail.

assessment typically consists of an archaeological inventory level survey with no historic properties identified, as per HAR Chapter 13-13-284-5. Throughout the remainder of this report, the Kikiloi et al. (2002) report will be referred to as a literature review and field inspection. In 2003, a companion cultural impact assessment (CIA) study was prepared to support the Kikiloi et al. 2002 literature review and field inspection (Souza et al 2003). This CIA is used to support the current project area; however, if the alternate alignment is chosen for trail's location, an addendum CIA should be prepared. The original CIA was prepared to support the project's Hawai'i state environmental review, per the guidelines of the Hawai'i State Department of Health's Office of Environmental Quality Control "*Guidelines for Assessing Cultural Impacts*", further evaluates the project's potential impacts to cultural resources. Both documents will support the project's historic preservation consultation effort.

1.2 Scope of Work

The agreed upon scope of work for this archaeological literature review and field inspection is as follows:

1. Historical and previous archaeological background research to include study of archival sources, historic maps, Land Commission Awards and previous archaeological reports to construct a history of land use and to determine if archaeological sites have been recorded on or near this property.
2. Field inspection of the project area's alternate alignment to identify any surface archaeological features and to investigate and assess the potential for impact to such sites. This assessment will identify any sensitive areas that may require further investigation or mitigation before the project proceeds.
3. Preparation of a report to include the results of the historical research and the fieldwork with an assessment of archaeological potential based on that research, with recommendations for further archaeological work, if appropriate. It will also provide mitigation recommendations if there are archaeologically sensitive areas that need to be taken into consideration.

1.3 Environmental Setting

1.3.1 Natural Environment

The project area is located in the Waimea area of Hawai'i Island and includes a corridor running generally west-east from Kamuela View Estates to the western edge of the Waimea Public Park. The preferred alignment corridor is along Waikōloa Stream. In its entirety the trail and greenway may extend about 12 miles, however, the current report only covers approximately 8.4 miles: a preferred alignment at 4.7 miles, an alternate alignment at 3 miles, and the shared use roadways totaling 0.72 miles. The study also includes a possible equestrian trail located along a portion of the western half of the preferred alignment, but because this portion has not been confirmed as part of the project it is not included within the project area acreage.

In a larger context, the project area is situated in the Waimea Saddle region between the Kohala Mountains and Mauna Kea Volcano at elevations between 2,000-3,000 ft above sea

level. The climate is generally cool, moist and windy. Temperatures usually range between 60-70° F, with mean maximums between 70-80 °F, and mean minimums in the upper 40° F. The mean annual rainfall ranges from 500 to 750 mm (20 to 30 in) per year (Giambelluca et al. 1986). Winds are dominated by consistent northeasterly trades. There are three major streams flowing off the Kohala slopes and onto the plains of Waimea, including Lanikepu, Waikōloa, and Kohākōhau (also known as Keanu‘i‘omanō) Streams.

Soils within the project area primarily consist of Waimea Very Fine Sandy Loam, 6 to 12 percent slopes (Figure 6). Soils of the Waimea series are described as, "...well-drained very fine sandy loams that formed in volcanic ash... on uplands at an elevation ranging from 2,000 to 6,000 feet" (Sato et al. 1973).

Vegetation within the project area consists of Ironwood (*Casuarina equisetifolia*), Christmas Berry (*Lycium carolinanum*), Yellow Ginger (*Hedychium flavescens*), 'Ape (*Alocasia macrorrhiza*), Bamboo (*Schizostachyum glaucifolium*), Spanish Needle (*Bidens alba*), Castor Bean (*Ricinus communis*), Eucalypts, Banana (*Musa paradisiacal*), Māmaki (*Pipturus albidus*), exotic plantings of conifers, and exotic grasses.

1.3.2 Built Environment

The project area is located within narrow undeveloped corridors that border several developed areas from Kamuela View Estates to the western edge of the Waimea Public Park. The eastern end of the project area's preferred alignment is bordered by the Waimea Public Park, W.M Keck Observatory, Church Row, and the Hawaii Belt Road. The central portion is bordered by Residential and commercial subdivisions, Waimea Nature Park, the University of Hawai'i College of Tropical Agriculture and Human Resources Lālāmiilo Research Station, the Hale Waimea Apartment Complex, and small stretches of pasture land. The western end is bordered by residential subdivisions (Kamuela View Estates) to the north and open pasture land to the south.

The eastern end of the alternate alignment extends from the north end of Kahawai Street, heading north into the pasturelands and follows various streams north of Kawaihae Rd. The central portion of this alignment is bordered by Hawaii Preparatory Academy (HPA) and residential and commercial subdivisions. The western end of the project area is bordered by South Kohala View Estates and pasturelands in the west.

The project area is depicted on a 1995 Kamuela USGS 7.5-minute topographic quadrangle (see Figure 1), tax map (see Figure 2 and Figure 3), and aerial photograph (see Figure 4). The current study will mostly address the alternate alignment and the signed shared roadways which represent the connection points to the preferred alignment corridor (Opelo Road, Kahawai Street, and South Kohala Distribution Road) as seen in Figure 5.

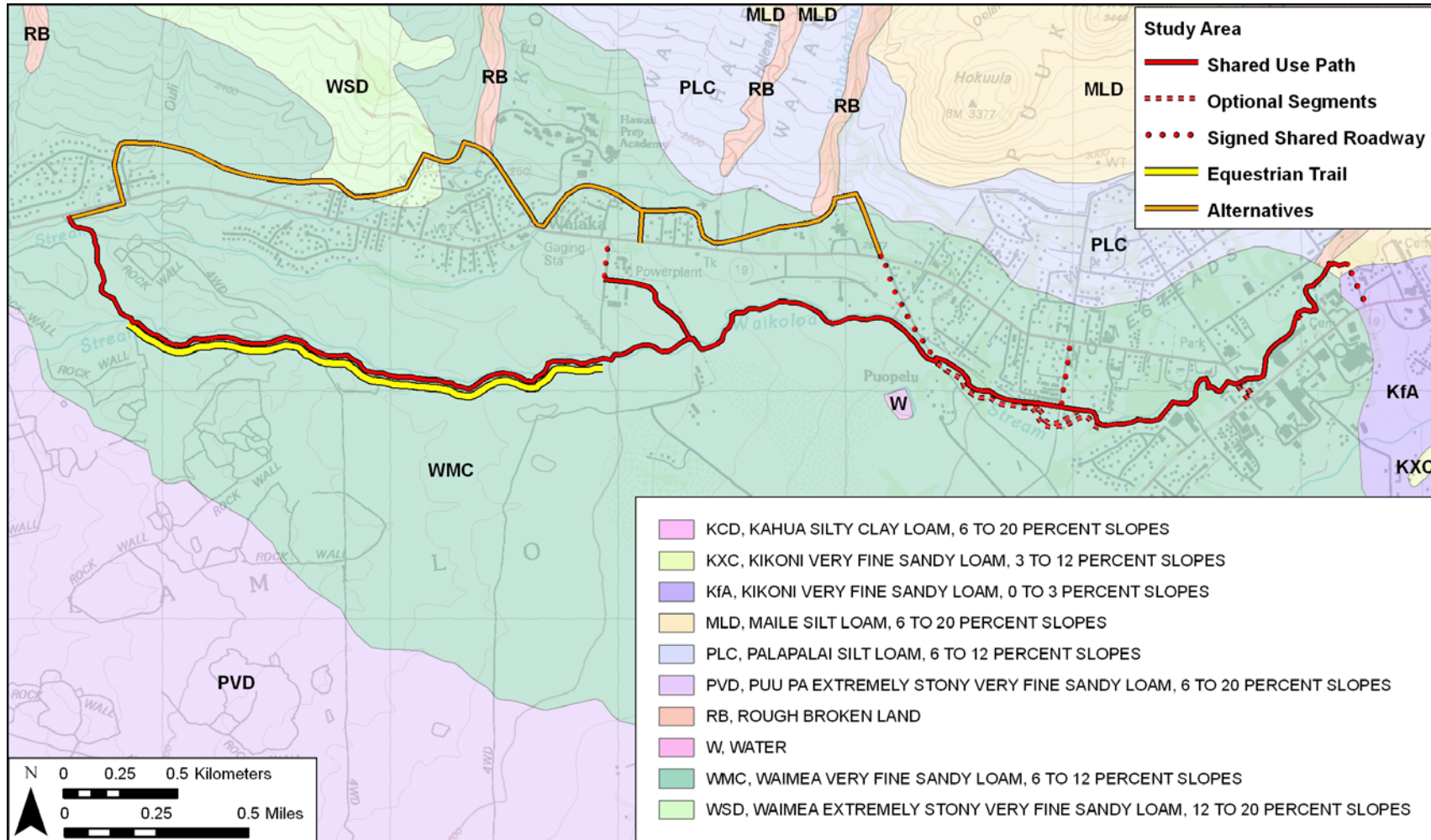


Figure 6. Overlay of Soil Survey of the State of Hawai'i (Sato et al. 1973), indicating sediment types within the project area

Section 2 Methods

2.1 Field Methods

The fieldwork component of this literature review and field inspection was carried out under archaeological research permit number 10-10, issued by the Hawai'i State Historic Preservation Division/Department of Land and Natural Resources (SHPD/DLNR), per Hawai'i Administrative Rules (HAR) Chapter 13-13-282. The fieldwork component of this literature review and field inspection was accomplished on August 18, 2010 by two CSH archaeologists, Michelle Pammer, B.A. and Rosanna Runyon, B.A. under the general supervision of Hallett H. Hammatt, PhD (principal investigator). The fieldwork required approximately 2 person-days to complete.

In general, the purpose of the field inspection was to develop data on the nature, density, and distribution of archaeological sites within the project area's alternate alignment. The field inspection consisted of a walk-through reconnaissance within the accessible areas of the alternate alignment and the signed shared roadways. Potential archaeological sites or site areas were to be documented with written descriptions and photographs and located with a GARMIN GPSMAP60Cx unit (accuracy +/- 2-5 m). A walk-through was not possible for some areas due to abundant residences preventing access. In these areas photos were taken as best as possible of the general area and assessed from the road for possible archaeological sites.

2.2 Document Review

Background research included: a review of previous archaeological studies on file at SHPD; review of documents at Hamilton Library of the University of Hawai'i at Mānoa, the Hawai'i State Archives, the Mission Houses Museum Library, the Hawai'i Public Library, and the Archives of the Bishop Museum; study of historic photographs at the Hawai'i State Archives and the Archives of the Bishop Museum; and study of historic maps at the Survey Office of the Department of Land and Natural Resources. Historic maps and photographs from the CSH library were also consulted. In addition, Māhele records were examined from the Waihona 'Aina database (<www.waihona.com>).

Section 3 Background Research

3.1 Traditional and Historical Background

3.1.1 Place Names and *Mo'olelo*

Ke kīpu'upu'u ho'anu 'ili o Waimea

(The Kīpu'upu'u rain of Waimea that chills the skin of people)

[Puku'i 1983:188; #1748]

The project area region is generally referred to as “Waimea” which literally means reddish water, as it was thought to be tinted as it was drained through the *hāpu'u* tree fern forests or though the red soil (Elbert, Ms in Barrera and Kelly 1974). Waimea has been poetically characterized as being “like a spear rubbed by the wind, as the cold spray is blown by the *kīpu'upu'u* rain...” (Proverb from a Kamehameha *mele* quoted by Henry Judd in Doyle 1953:42) and has a rich history that is evident in its place names and proverbs.

The area is also popularly known as Kamuela (Samuel), named either for post master Samuel Spencer or for the rancher, Samuel Parker (Pukui et al. 1974). In *‘Ōlelo no’eau* (Pukui 1983), Waimea is noted as an area of cool climate and chilling rains:

(A) *Hele po'ala i ka anu of Waimea*

Going in a circle in the cold of Waimea

Said of a person who goes in circles and gets nowhere. Waimea, Hawai'i is a cold place and when foggy, it is easy for one unfamiliar with the place to lose his way [Puku'i 1983: 83; #757].

(B) *Ka ua Kī pu'upu'u o Waimea/ Waimea i ka ua Kīpu'upu'u*

The Kīpu'upu'u rain of Waimea/ Waimea, land of the Kīpu'upu'u rain

An expression often used in songs of Waimea Hawai'i. This area is famed for its cold rain. When Kamehameha organized an army of spear fighters and runners from Waimea, they called themselves Kīpu'upu'u after the cold rain of their homeland [Puku'i 1983:169, 319; #1571 & #2913].

(C) *Ka ua paliloa o Waimea*

The Tall-cliff rain of Waimea

The rain of Waimea, Hawai'i, that sweeps down cliffs. [Puku'i 1983:172; #1593]

Ke kānoa kapu o Lono-Makahiki: 'oia ho'i 'o Hōkū'ula!

(The sacred bowl of Lono-Makahiki: it is Hōkū'ula!)

[*Ka Hōkū o Hawai'i* 4/23/1914 in Franklin et al. 1994]

Translated and interpreted by Kepā Maly (Franklin et. al 1994), the legend of Ka-Miki was published in the Hawaiian newspaper *Ka Hōkū of Hawai'i* between the years of 1914-1917. It is

a story about two brothers and their journey around the island of Hawai'i. The legend includes references to over 800 place names, and provides interesting information about Pu'u Hōkū'ula, the most prominent hill located just north of Waimea town.

Hōkū 'ula (Red Star): When Ka-Miki and Maka'iole drew near to completing their formal *'ōlohe* training (fighting and competing skills) under their goddess/great grandmother Ka'uluhe, she told them to go and visit their *kūpuna* (ancestress) Lani-nui-ku'i-a-mamao-loa who dwelt at Lanimaomao (Waimea). Lani-nui-ku'i-amamao-loa was the guardian and keeper of the sacred *kānoa* ('awa mixing bowl) Hōkū'ula which belonged to Lono-Makahiki, and the *ma'au* (strainer) called Kalau-o-Kāhuli which was upon the plain of Waikōloa. These two items were to be used in 'awa ceremonies for the brothers 'ailolo (brain eating- completion of training ceremonies) [*Ka Hōkū o Hawai'i* 2/5/1914 in Franklin et al. 1994].

The association of the bowl, or *kānoa* of the god Lono (a provider of abundant crops and rain-laden clouds) with Hōkū'ula may refer to the agricultural lands of the region; i.e., (1) the bowl or container could symbolize a land of agricultural abundance; (b) the sprinkling of waters from the bowl could refer to the waters of the streams that flow from the uplands and spread across the plains; and (c) the importance of the rituals of Lono in agricultural endeavors, particularly in the areas of Kohala where large rain-fed field systems have been archaeologically documented. Thus the legendary account may symbolically represent actual resources of the Waimea region.

3.1.2 Accounts of Pu'u Kapu

A missionary account by Lorenzo Lyons in the 1850's tells of legends within the setting of Waimea, that may relate to the origin of the name "Pu'u Kapu":

On a nearby ridge stood another *heiau* built "...by the great Akua Makuakua who has come from far off Kahiki." from the hillside he watched the rainbows "...and there he found the beautiful goddess Wao." They lived at Hōkū'ula Each time Wao was ready to bear a child she returned to the Waimea hills, which were sacred to her. The *kapu* was proclaimed in her honor- the forbidden ground extended ..."down across the plains to whatever place a stone happened to stop rolling when started above by her servants" [Doyle 1953 in Barrera and Kelly 1974]

According to legend, Wao changed her servants into stones to guard the land during the night hours; when daylight came she transformed them back into their human forms (Barrera and Kelly 1974:1).

Lorenzo Lyons also tells of the legendary story of a Ho'opili-a-Hae, and mentions her as being the founder of a *heiau* for women in Waimea:

The earliest chiefs of Waimea of whom we have record stemmed from the same Ulu-Hema line that led to Līloa, the founder of the island dynasty. Līloa's grandson Keawe-nui-a-'Umi took as one of his wives Ho'opili-a-Hae, daughter of Līloa's *kahuna* Pae-a-Molenole. [Clark and Kirch, 1983:26]

(The *heiau*) was attended exclusively by young virgins. In the sanctity of the cool highland forest, they "...performed the sacred ceremonies, learning also the science of healing so that they might eventually minister to others. Hoapiliaha'e's children were named for the five rains of the *heiau*" [Doyle 1953: 42-43] (in Barrerra and Kelly 1974:1)

A passing reference to Pu'u kapu is made in the story of "Kai A Kahinalii" in which a fisherman of Kawaihae who fishes all day long and, setting out early, observes: "the sun has now risen, and was looking over the hills of Pu'u kapu." (Thrum 1923:229)

3.1.3 Historical Battles at Waimea

'O ke aluka koa a Kama i Waimea

(a multitude of warriors had Kama at Waimea)

[Kamakau 1961:55-61 in Barrerra and Kelly 1974]

Hōkū 'ula, located just northeast of the alternate alignment and north of the east end of the preferred alignment within the current project area, is famed for being the location of a prominent battle ground in which Kamalālāwalu, the ruler of Maui Island waged war against the island of Hawai'i. Deceived by misleading advice from his trusted advisors and poor strategic planning, Kamalālāwalu arrived on Hawai'i island, landing at Kawaihae only to realize that there were no people there. The Maui forces continued up to Hōkū'ula, a prominent bluff. Situated in this manner, he believed his army would be able to have the advantage in defending themselves against the Hawai'i island forces.

Upon hearing of Kamalālāwalu's arrival, Lonoikamakahiki, the Hawai'i island ruler sent armies from Kona, Ka'ū, Puna, and Hilo to Hōkū'ula, where the Maui warriors were stationed. The following morning Kamalālāwalu observed that the lowlands were literally covered with countless men. He soon realized that his Maui forces were inferior in numbers and asked his ally Kumaikeau "*E Kumaikeau ma, pehea kēia? He aha kēia lehulehu o lalo?*" "Kumaikeau and the rest of you, how is the situation? What is the extent of their numbers below?" Kumaikeau relied "*Akahi nō au a 'ike i ka nui o nā kānaka o Hawai'i nei,*" "I have never seen so many people in Hawai'i before..." After three days of negotiations, the two combating forces waged battle, with Lonoikamakahiki gaining the victory over Kamalālāwalu's army (Fornander 1916:342-350).

Another battle fought in the Waimea area was between the leeward and windward chiefs of Hawai'i Island toward the middle of the 18th century. This clash took place at Mahiki, east of Waimea and just across the district boundary in Hāmākua. Here the father of the great chief Alapa'inuiakauaua was leading his forces against the Hilo chiefs when he was killed. Alapa'inui was on Maui at the time but returned to Hawai'i and ultimately regained control of the Kona and Kohala districts (Kamakau 1961: 65). Eventually he went on to take over the whole island of Hawai'i and place it under his rule. In his later years, Alapa'inui lived first in Waipi'o, then lived for sometime in Waimea, and later moved to Kawaihae (Kamakau 1961: 77).

During Kamehameha's campaign to extend his rule to all the major islands, he stayed at Waimea and at Kawaihae for some time. There are mentions of Kamehameha's visits to Waimea in 1791 and 1792 when he rebuilt Pu'u Koholā Heiau (Clark and Kirch 1983). At that time a large work force was required and the people of Waimea were solicited. It has also been

suggested by Clark and Kirch (1983:27) that food and tapas were brought from Waimea to feed and clothe the many warriors in preparation of the *Peleleu* fleet to battle Maui and O'ahu in 1794 and 1795.

3.1.4 Post-contact Period

The Waimea area, with its favorable soils, and water from Kohala Mountain streams that could be harnessed and distributed on the fairly level plains, was an obvious area for the expansion of introduced food crop production. Waimea was very productive agriculturally in the early years following contact with the Western world. Based on early accounts, *kalo*, or taro (*Colocasia esculata sp.*) was the dominant crop with 'uala, or sweet potatoes (*Ipomoea batatas sp.*) and *kō*, or sugar cane (*Saccharum officinarum sp.*) also grown in substantial quantities.

The decline in traditional Hawaiian agriculture in the Waimea region has been attributed to factors such as 1) depopulation and the concomitant abandonment of the fields; 2) the pursuit of other commercial interests such as sandalwood and the *pulu* trade, sugarcane, and finally the introduction of cattle.

It is important to mention that after the abandonment of traditional Hawaiian agriculture in Waimea, there were two resurgences of agricultural endeavors to boost the economy of Waimea (Clark and Kirch 1983). In the late 1820's, two Chinese, Lau Ki and 'Aiko started a sugar mill at Līhu'e in upper Lālāmilo. While the mill was not successful commercially, sugar production continued in the Waimea area (Barrerra and Kelly 1974: 47).

It was during this time that an expansive irrigation system was developed consisting of several dendritic 'auwai that diverted water from Waikōloa and Lanimaumau Streams. Portions of one named 'auwai, "Akona's 'Auwai", is located within portions of the project area's preferred alignment. Akona's 'Auwai was used primarily to power the sugar mill at Līhu'e and to irrigate nearby sugarcane fields (Burtchard and Tomonari Tuggle 2003). "Akona was a Chinese who lived in the Waimea area in the 1840's and 50's (and perhaps somewhat before and after)" (Clark 1981:28).

In the late 1830's, cotton was grown in Waimea when Governor Kuakini ordered the planting of an "immense field of cotton in the Waimea area," (Kuykendall 1967: 183). In the late 1840's and early 1850's, both sweet and Irish potatoes were cultivated extensively, however by 1865, their crops were reported to have been greatly diminished.

3.1.5 Sandalwood and Pulu

The mountains surrounding Waimea were well known for rich sandalwood reserves. During the early part of the 19th century as contact with the West was growing, the extent of the sandalwood trade was evident as it became one of the earliest commodities of a newly formed market oriented economy.

Similar to the sandalwood trade was the exploitation of *pulu*, the soft fiber gathered from the buds of the tree fern (*Cibotium sp.*) and used for stuffing pillows, mattresses, and furniture (Thrum 1929 in Erkelens 1998: 15). The *pulu* trade began in 1851 with shipments to the WestCoast of North America and Australia. Like sandalwood, the over-exploitation of this resource also led to its demise and by 1860, the trade had virtually ended (Doyle 1945: 182).

3.1.6 Population Estimates

The general impression of the pre-contact settlement pattern, constructed from a variety of archaeological and early historical sources, is one of scattered settlements along Waikōloa Stream (Clark 1987: 103; Erkelens 1998: 11). During subsequent decades, with the arrival of western foreigners and missionaries, impressions of the life and landscape would be recorded for 19th-century Waimea. In 1823, Asa Thurston counted 220 houses in his walk through Waimea in the section between 'Ōuli and Pu'u Kapu (a distance of approximately 4.8 km or 3 miles); this was interpreted as representing a population of 1,100 to 1,200 individuals (Ellis 1979:399 in Erkelens 1998:11). Although the population was concentrated at Kea'ali'i (located along Wai'aka Stream) at the time of Thurston's visit, a settlement of 300 to 400 individuals near the present Waimea town is a reasonable estimate (Clark 1987: 103).

It was not, however, until the 1830s that a missionary would be stationed in northern Hawai'i. On July 13, 1832 Lorenzo Lyons and his wife Betsy arrived at Kawaihae by brig from Honolulu to take up residence at Waimea. Lorenzo Lyons had a church and school (for adults) at Waimea in 1835, serving a congregation of 100 to 500 Hawaiians. In his writings, Lyons stated:

During the past year I have taken a census of the population of this district and find it to be as follows: Waimea, 1,396; Kohala 6,175; Hamakua 4,015; total 11,586, from which it appears there has been a diminution of the people 3,500, within three and a half years. Marriages are numerous. But the progeny are wanting. Children are not in general, objects of desire. Taxes are in proportion to the number of children. My census may not be correct. Many think I am numbering them for the purpose of taxation, and conceal a part of their number. [Doyle 1945:82-83]

3.1.7 The Māhele

The Organic Acts of 1845 and 1846 initiated the process of the Māhele, the division of Hawaiian lands, which introduced private property into Hawaiian society. In 1848, the crown and the *ali'i* received their land titles. The common people (*maka'āinana*) received their *kuleana* awards (individual land parcels) in 1850. It is through records for Land Commission Awards (LCAs) generated during the Māhele that the first specific documentation of land use within the vicinity of the project area comes to light.

The records associated with these awards illuminate the character of the settlement within the *ahupua'a* at the mid-19th century. The majority of the individual *kuleana* claims are situated close to streams emptying from the southern slope of Kohala Mountain. The streams include Waikōloa, Kohākōhau, Haleaha, Waiaka, and Kanikepu. These and other streams flowed onto the Waimea plain then turned to the west (*makai*) to flow down slope towards the Kawaihae/Puako area. The focus of habitation and agriculture was at the base of Kohala Mountain and extending out onto the Waimea plain. The awarded *kuleana* were in a relatively narrow band extending from approximate elevation 2,100 ft and 2,900 ft. This zonal band would include the proposed preferred alignment corridor as well as the alternate alignment.

Approximately 31 LCAs are located within the vicinity of the current project area's preferred and alternate alignments (Figure 7 and Table 1). Documentation of a sample of these LCAs was

reviewed in an attempt to reconstruct land use patterns during the mid 19th century (Table 2 and Appendix B). The Māhele documentation in the vicinity of the project area shows a presence of several house lots with associated dry land agricultural fields, as well as a slaughter house within what is now Waimea Town. Of particular note is the high frequency of prominent foreign awardees, like William French and William Beckley, who are associated with early business ventures throughout the Hawaiian Islands.

It should be noted that LCA 04886 is not a house lot or fields as was common in the area, but a slaughter house owned by William French. Kuakini had expressed a liking for one of French's horses and so French gave him "one of his good horses and that is how he had received that cattle slaughtering area in Waimea. It has been enclosed with a stone wall and French has lived there well to this time; no one has objected to him" (Native Testimony vol. 2, pg. 494-495; February 2, 1848). This slaughter house was likely associated with the large cattle industry located within Waimea, largely as part of the Parker Ranch.

3.1.8 Cattle Industry

The first cattle were delivered to Hawai'i in 1793 by Captain George Vancouver aboard the HMS Discovery. The cattle were a gift to Kamehameha I, who, following Vancouver's advice, immediately placed a 10-year *kapu* on the cattle, which greatly increased their number (Brennan 1995). An examination of the cattle industry in the Waimea area clearly shows its dominant role. The cattle industry, which eventually changed the economy and lifestyle of Waimea, had its origins in bullock hunting, which was controlled by Hawaiian chiefs. The initial increase in cattle population was aided by a ten-year *kapu* placed on hunting or taking of cattle. Feral cattle multiplied rapidly and ran wild on the plains of Waimea. For some two to three decades after the lifting of the protective ban, bullock hunters were employed to hunt down the wild cattle and take them to a market.

In the 1830's, meat, hides, and tallow began to be marketed, and thus formed the true beginning of the cattle industry. By 1847, about two-thirds of Waimea area had been converted to pasture for government herds of cattle, as well as for sheep and horses (Doyle 1945). By the middle of the 1800's the Waimea region was the center of the industry.

The cattle industry had two major impacts on Waimea. The first was the effect of marauding cattle on the unprepared Hawaiian farmer (Erkelens 1998:19). As early as 1802, there were complaints concerning the destruction of gardens by feral cattle (Turnbull 1813:243, in Barrerra and Kelly 1974:44). In 1836, Waimea was surrounded by a stone wall to protect it from cattle.

The second major impact on Waimea was the increase in population as a result of economic opportunities provided by the cattle industry (Erkelens 1998:19). Bishop (Bishop 1828, in Erkelens 1998:19) reports that Kuakini's arrival in Waimea marked the beginning of the cattle industry, as attendance at church services increased to approximately 1,000 individuals from a previous attendance of 200 (Doyle 1945).

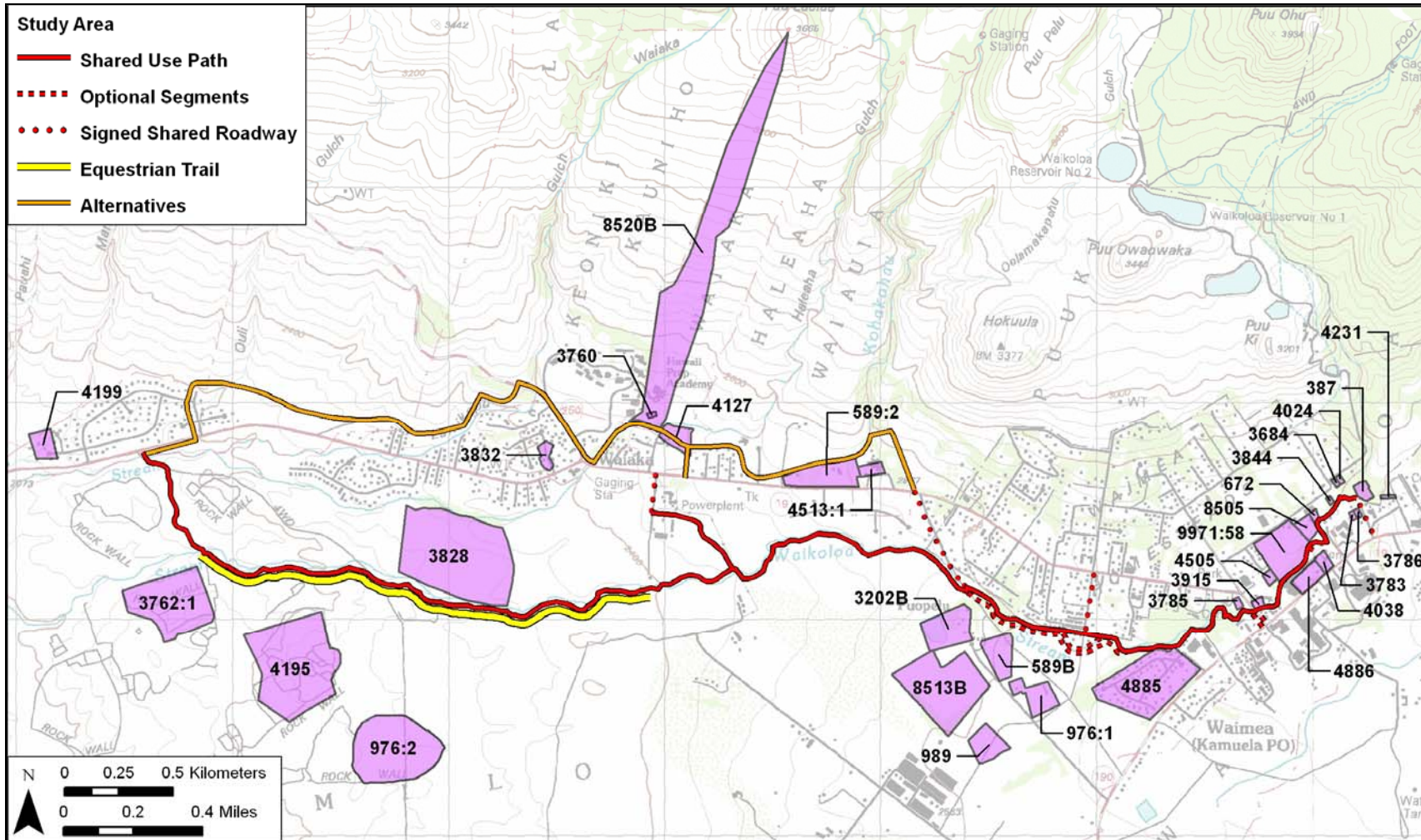


Figure 7. Map showing the approximate location of Land Commission Awards within the vicinity of the project area

Table 1. Land Commission Awards Located in the Vicinity of the Current Project Area

Land Claim #	Claimant	'Ii
00387	Lyons, Lorenzo	Waikōloa
00589	Fay, James	Keanuiomano
00589B	Naholowaa	Pu'uapelu
00672	Hall, James	Waimea
00976	Beckley, William	Owahawaha (Waawaa)
00989	Davis, John	Napooakolu
03202B	Bowers, Jose	Pu'uopelu
03684	Makalahae	Waikōloa
03760	Aa, Jose	Waiaka
03762	Auwae	Papuaa
03783	Ohiku	Waikōloa
03785	Olepau	Kauakanaka, Opeawai, Alaohia
03786	Opunui, W.	Waikōloa
03828	Palea, J.A.	Koaliula
03832	Poolipi	Kauniho
03844	Puahala	Waikōloa
03915	Nahoena	Waimea
04024	Seabury, James	Waikōloa
04038	Beadle	Waimea
04127	Kuahine	Waiakanui
04195	Kanehailua	Kaluaana
04199	Kaikai	Ouli
04231	Kaulua, G.	Paulama
04505	Manuwa	Waimea
04513	Paukeaho	Keanuiomano
04885	French, William	Ahuli
04886	French, Wm.	Puloa

08505	Kikipane	Waikōloa
08513B	Hoolulu	Napoʻoakolu
08520B	Lahilahi, M.	Waiaka & 2
09971	Leleiohoku, W.P.	Puanui, Kawaihae, Pohua 1, Kaaiao, Kamakahonu, Niulii

Table 2. Table of a Sample of Land Commission Awards With Descriptions of Land Use

Land Claim #	Claimant	'Ili	Land Use
00589B	Naholowaa	Puʻuapelu	1 house lot, 3 fields partly under cultivation
03202B	Bowers, Jose	Puʻuopelu	House lot, 3 fields
03832	Poolipi	Kauniho	Lot for cultivation with 1 house
04513	Paukeaho	Keanuiomano	1 house; 2 taro gardens in forest
04886	French, Wm.	Pulua	Slaughter house, grass houses, cookhouse

Following Kuakini's construction of the road between Kawaihae and Waimea in 1830, ox carts were able to haul commercial items much more efficiently than was previously possible. Although missionary census records for the period from 1832 to 1845 suggest little overall change in population of Waimea (approximately 1,000 individuals), there was undoubtedly a change in composition of the constituency from predominantly Hawaiian to a mix of foreigners and Hawaiians.

3.1.9 Parker Ranch and the 20th Century

John Palmer Parker, an American born in Newton, Massachusetts in 1790, intended a sailing career when he left home in 1809. After several years at sea, Parker arrived on Hawai'i Island in 1815 and decided to remain there. By 1819, Parker had a Hawaiian *ali'i* wife, Kipikane, and a baby daughter, Mary. Parker and his family went to live at Waiapuka in Kohala where he farmed on twenty-one acres that had been granted to him by Kamehameha. In this era, most of the ranch work consisted of capturing wild cattle and domesticating them. As the ranching industry expanded so did responsibilities such as managing the many personnel of the Parker Ranch, building houses and growing food to feed all. Subsequently, Parker hired South American and Mexican horsemen to train his ranch hands to track, rope, brand, and bring in the wild cattle. These "vaquero", "*paniolo*," or "espangnol" not only introduced the management of cattle and horses, but also brought colorful clothes, hats and saddles that became the mark of Hawaiian *paniolo*. The first Hawaiian *paniolo* or cowboys actually predate many of the mainland western cowboys. The ranch personnel also made most of their own gear and machinery, including saw mills.

In the last years of the 19th Century, Waimea remained a small town concentrating on the shipment of cattle to export markets. The Waimea of 1881 was graced with two stores, a boarding house, lodging house, and a coffee saloon (Bowser 1881:540). Even at this seemingly late date, wild cattle were occasionally a problem. In 1888, Paul Jarrett was the first to commence fencing Parker Ranch lands to segregate the domesticated from the wild cattle (Doyle 1904). The next Parker Ranch manager, A.W. Carter, (manager 1899-1936), consolidated all the Parker family land holdings under the control of his ward, Thelma Parker. A.W. Carter then began in earnest to increase ranch lands, systematically breed for better, stronger, healthier cattle and horse stock, bought a barge to ship cattle with other Big Island ranchers, increased ditches for watering livestock and imported different grasses and feed for cattle. He provided the U.S. military branches with cavalry horses. He also ventured for a short time into training horses and horsemen for polo teams, and then became one of the major providers of horses in Hawai'i and abroad for work, pleasure, and shows. His son, A.H. Carter succeeded him in 1937. The Parker Ranch had become one of the biggest private businesses in Hawaii and remains the dominant economic force in Waimea.

Since the early 1900s Waimea has been part of a fast paced urbanization of the Big Island. After the World War II (late 1940s-1950s) a small portion of land near South Kohala Distribution Road was used as a dump "and remnant pieces of disposed car parts and miscellaneous "junk" can be seen lying on the surface (personal communication, Woody Ramous in McGuire 2002). More recently new developments such as the Sandalwood Subdivision, the Waimea Center, Carter Professional Center, and the Canada France Hawaii Telescope have added to the growing town of Waimea.

In 1993 the W. M. Keck Observatory was placed on Mauna Kea. The headquarters resides in Waimea Town, south of the Waikōloa Stream and north of Mamalahoa Highway. Waimea continues to grow with further urbanization, though Parker Ranch remains a mainstay of the economy of the area.

3.1.10 Camp Tarawa

In 1943, the U.S. Army leased approximately 91,000 acres in Waikōloa from Parker Ranch for military training that continued until June 1946. Artillery firing and troop maneuvers by the 2nd Marine Division, the 28th Regiment, 5th Marine Division, the 6th Marine War Dog Platoon, the 31st Naval Construction Battalion, the Army's 471st Amphibian Truck Company, the Army's 6th Section of the 726th Signal Aircraft Warning Company, the 11th Amphibian Tractor Battalion, and the 5th Joint Assault Signal Company occurred over large expanses of the leased lands (Conner 1950, Bryson 1995).

Initially named Camp Waimea, the central operations area, located on the south side of Waimea Town adjacent to the current project area, became known as Camp Tarawa. "It consisted of tents, Quonset huts, wooden structures, and roads covering approximately 467 acres: the largest military settlement on the Big Island during World War II" (Nees and Williams 1998:16). The camp was named by marines of the 2nd Marine Division returning directly from victory at Tarawa Atoll located approximately 2,479 miles to the southwest of the small town of Waimea. The roadways within Camp Tarawa were also given names of islands and locations in and around Tarawa Atoll.

A second wave of marines, those of the 5th Marine Division, was stationed at Camp Tarawa for another purpose. "Pu'u Ula'ula and Buster Brown were scaled daily so that men would be ready to climb the infamous Mt. Suribachi when the time came..." (Bryson 1995:15). The men were preparing for the fateful attack on Iwo Jima, which occurred on February 19, 1945.

The influx of up to 50,000 U.S. Marines at Camp Tarawa had profound and lasting effects on the small town of Waimea. Among these effects were the increased revenue brought to local businesses, electricity, refrigeration, and the arrival of the hamburger. At least two hamburger stands popped up around Camp Tarawa including The Magnolia Inn, located within the present boundaries of Lanakila Park, adjacent to an eastern portion of the project area's preferred alignment (Melrose 1997). Hisa Kimura recounts of the Waimea hamburger stands:

One day, Tsugi, or "Sue" as she was called by the marines, saw a boy who looked local in the endless line of diners. When she asked him if he were local or not, he introduced himself as Ira Hayes, an American Indian. (Bryson 1995:15)

As quickly as they had appeared, the Marines stationed near Waimea had departed, and by the end of June, 1946, Camp Tarawa was abandoned, roadways were renamed, and camp infrastructure was left for ruin.

3.2 Previous Archaeological Research

This section is separated into two sections, a general summary of the previous archaeology within the vicinity of the project area, and a summary specific to the current project. Previous archaeological studies conducted within the vicinity of the current project area are shown in Figure 8 and presented in Table 3. The following is a summary of these archaeological studies.

One of the most widely cited studies in this area was completed by Barrera and Kelly (1974). In 1973, the Bishop Museum conducted an archaeological survey and historical review for the proposed Waimea to Kawaihae Road corridor, during which over 4,500 archaeological features were identified, the majority of which were located either near the coast at Kawaihae or in the Lālāmilo area near Waimea.

Of particular interest are the historic properties located in upper Lālāmilo and upper Waikōloa, which are nearest to the current project area. Based on the survey results, Lālāmilo contains nearly 3,500 features (Barrera and Kelly 1974). The study resulted in the designation of the "*Kuleana* and Ranch District" in the Lālāmilo portion of the project area (Ibid.). This information is important as it indicates the high density of surface archaeology that one can expect to find in upper Lālāmilo near the project area. Historic properties have been described as being included in an extensive habitation and agricultural system.

In 1981, Bishop Museum conducted an archaeological survey of the proposed Lālāmilo Agricultural Park, located south of the current project area, abutting a portion of the preferred alignment and containing a portion of the possible future equestrian trail (Clark 1981). A total of 321 historic properties were identified and recorded. The historic properties were broadly associated with the Waimea agricultural system. One historic property number, SIHP# -9179, was assigned to all of the irrigation ditches (*auwai*) within the study area including "Akona *auwai*", portions of which are located within or adjacent to portions of the current project area's preferred alignment. Clark (1981:28) describes Akona's *Auwai* as follows:

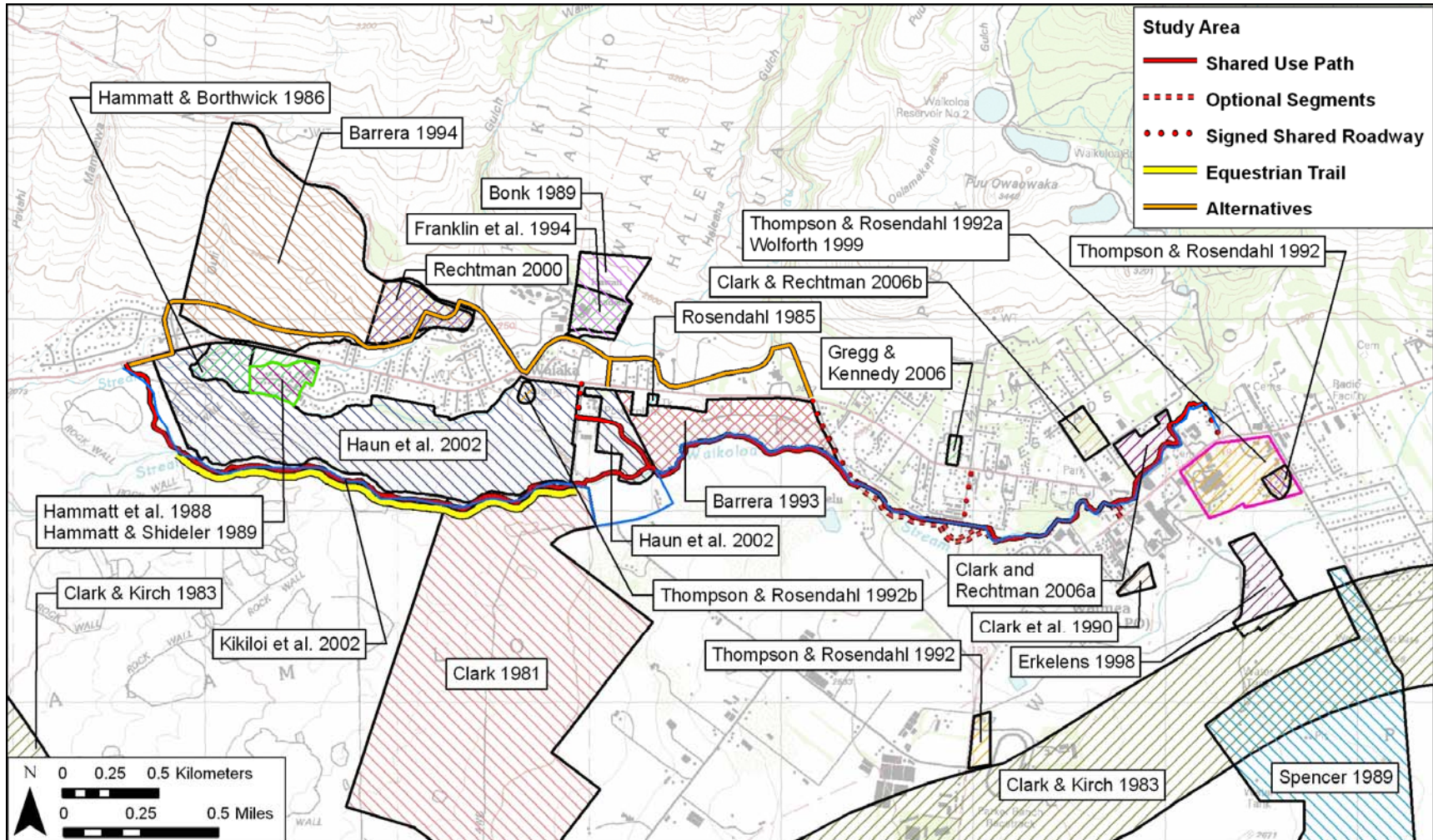


Figure 8. Map showing location of previous archaeological studies in the Waimea area relative to the current project area

Table 3. Previous Archaeological Studies in the Waimea area

Reference	Nature of Study	Location	Findings
Barrera & Kelly 1974	Archaeological Reconnaissance Survey	Waimea to Kawaihae Road Corridor	Approx. 4,561 features were recorded incl. habitation and agricultural complexes. The majority were near coastal Kawaihae or in the Lālāmilo area near Waimea. Of particular interest is the area referred to as the “ <i>kuleana</i> and ranch district.”
Clark 1981	Archaeological Survey	Adjacent to existing Lālāmilo Farm Lots, bounded on the north by Waikōloa Stream	321 historic properties associated with the Waimea agricultural system. SIHP# -9179 ‘ <i>auwai</i> system including Akona's ‘ <i>Auwai</i> .
Clark and Kirch 1983	Archaeological Investigations	0.61 km wide corridor extending just south of Waimea Town	Defined the Waimea agricultural system and subsystems. SIHP# -2684, dendritic ‘ <i>auwai</i> possibly connecting to Akona's ‘ <i>Auwai</i>
Rosendahl 1985	Archaeological Reconnaissance Survey	TMK [3] 6-6-001: 005 por.	None
Hammatt & Borthwick 1986	Archaeological Reconnaissance Survey	Lālāmilo Houselots Subdivision	8 historic properties including agricultural features and complexes typical of the Waimea Field System
Hammatt et al. 1988	Archaeological Inventory Survey w/ Subsurface Testing	Lālāmilo Houselots Subdivision	Seven Archaeological historic properties recorded and limited subsurface excavation conducted. Both habitation and agricultural historic properties were documented.
Hammatt & Shideler 1989	Lālāmilo, Ka La Loa Subdivision	Data Recovery	Data analysis suggested that the informal agricultural activity (represented in ag. mounds) were occurring by the mid 13 th century, and field boundary walls were constructed by the mid-15 th century, with permanent habitation occurring from early 16 th century to

Reference	Nature of Study	Location	Findings
			the late 18 th century.
Bonk 1989	Archaeological Reconnaissance Survey	Waiaka, N side of road to Kawaihae	Agricultural terraces related to Field Complex #1 as defined by Clark and Kirch (1983)
Spencer 1989	Archaeological Investigations	30' wide 4,500' long Ag Pipeline Corridor	None
Clark et al. 1990	Archaeological Testing and Data Recovery	Waimea School Improvements TMK [3] 6-7-002:017 por.	Documentation of SIHP# 8808 part of the Waimea agricultural system as defined by Clark and Kirch (1983).
Thompson & Rosendahl 1992a	Archaeological Inventory Survey	7 parcels scattered around edge of Waimea Town	SIHP# -16095, 'auwai complex SIHP# -18054, agricultural field complex
Thompson & Rosendahl 1992b	Archaeological Inventory Survey	TMK [3] 6-7-002:017 por.	Further documentation of SIHP# -16095
Barrera Jr. 1993	Archaeological Inventory Survey	Sandalwood Estates, 50-acres	SIHP# -14948 a complex of pre-contact agricultural field borders
Barrera Jr. 1994	Archaeological Inventory Survey	TMK: [3] 6-2-001:009	43 historic properties, SIHP#'s 18558 – 18601, consisting of habitations, agriculture, burials, walls, trails, and 'animal barriers'
Franklin et al. 1994	Archaeological Inventory Survey	Hawai'i Preparatory Academy TMK [3] 6-5-001:033 por.	SIHP# -19643 to -19649 including two significant historic properties, a historic habitation terrace (SIHP# -19648) and a cemetery and associated features (SIHP# -19649)
Erkelens 1998	Archaeological Investigations	Waimea Town Center	SIHP# -8812 <i>kuleana</i> lots SIHP# -19416 Duncan-Lanakila Cemetery SIHP# -19417 Pukalani stables and blacksmith shop SIHP# -19418 veterinary office

Reference	Nature of Study	Location	Findings
			SIHP# -19419 breaking corral.
Wolforth 1999	Data Recovery	TMK [3] 6-7-002:013	Documentation of an <i>'auwai</i> within the study area
Rechtman 2000	Supplemental Archaeological Inventory Survey	TMK [3] 6-2-001:091	Assessment of previously identified historic properties. SIHP# -18579 (newly identified), historic trash dump.
Haun et al. 2002	Archaeological Inventory Survey	DHHL Residential Development	76 historic properties generally related to habitation and agricultural practices
Kikiloi et al. 2002	Literature Review and Field Inspection	Waimea Trails and Greenway Project	During the assessment they concluded that the trail corridor intersects a number of features, such as <i>'auwai</i> and field walls and recommended an inventory survey.
Clark and Rechtman 2006a	Archaeological Inventory Survey	TMK [3] 6--5-004:025 and -063	SIHP# -26680 historic wall SIHP# -26681 historic wall SIHP# -26682 <i>'auwai</i> SIHP# -26683 wooden structure (WWII-era)
Clark and Rechtman 2006b	Archaeological Monitoring	TMK [3] 6-5-004:029, 030, and 050	SIHP# -24168 Feature H - stone and concrete decorative element
Gregg and Kennedy 2006	Archaeological Assessment	TMK [3] 6-5-002:043	None
Yucha et al. 2009	Archaeological Inventory Survey	Increment 1 for the Waimea Trails and Greenway Project	SIHP# -26871 WWII-era infrastructure; Camp Tarawa SIHP# -26872 Akona's <i>'Auwai</i> SIHP# -26873 Concrete ford and roadway

The main channel was labeled the Akona 'auwai by Wall, thus lending its name to the entire subset...The Akona subsystem branches into a large dendritic network through the center of the survey area. It is this irrigation network which fed into the Līhu'e sugarcane fields. It also, however, extends well beyond this, indicating that it is not merely a development for the short-lived sugar industry in Lālāmilo.

In 1983, Bishop Museum conducted archaeological investigations of the Mudlane-Waimea-Kawaihae road corridor (Clark and Kirch 1983). The fieldwork, performed in 1973, identified 4,561 archaeological features. These feature complexes were then referred to as the Waimea agricultural system:

The Waimea agricultural system comprises the remains of an extensive series of agricultural features, throughout which are scattered multiple residential structures. The system forms a large arc to the W and S of the present-day village of Waimea. Beginning on the S flank of Kohala Mountain, a short distance below Pu'u La'ela'e, this system extends down the slope and onto the Waimea plain W of town. It then bends to the E, fading out just S of Waimea and W of Kuhio Village (Clark and Kirch 1983: 293).

Additionally, numerous historic properties were identified, both agricultural and habitation, and the project provided a broad database for comparing site distribution data from the coast to upland. Excavations associated with the Mudlane to Kawaihae project resulted in a total of 45 charcoal samples undergoing radiocarbon analyses. Approximately 71% of the dates were post 1600 A.D. and considered relatively late (Clark and Kirch 1983). Additionally, the Mudlane to Kawaihae project yielded "evidence that the prehistoric and early historic inhabitants of the Waimea region practiced an intensive form of cultivation, utilizing what Clark has termed 'supplemental irrigation.'" This differs from the two classic forms of indigenous Hawaiian agriculture, irrigated pondfield cultivation and dryland field-system cultivation. (Ibid.: 528).

As a result of the information gained through the Mudlane to Kawaihae project, Clark went on to develop a settlement pattern model for the Kawaihae-Waimea region (Clark 1987) This settlement pattern included four zones: Coastal Zone, Intermediate Zone, Kula zone, and Wilderness zone. The current project area lies within the Kula Zone, described as follows:

Extends from the Intermediate Zone to between 7.3 and 9.7 km inland. It ranges in elevation from 585 m to 830 m (1,919-2,722 ft) in elevation, with small sections extending to as much as 975 m (3,198 ft) elevation. Subsistence activity is dominated by agriculture...Crops included sweet potatoes, dry-land taro, gourds, and *wauke*. Habitation sites included single use sites, extended and recurrent occupations, and permanently occupied sites. Habitation features include small walled shelters, caves, overhangs, terraces, platforms, and enclosures. The more intensively occupied habitation sites are clustered in neighborhoods sometimes larger wards. Burial features are also present (Clark 1987).

In 1985, Paul H. Rosendahl, Ph.D., Inc (PHRI), conducted an archaeological reconnaissance survey of the Kawaihae Reservoir No. 1 Site, located in the central portion of the current project

area between the alternate and preferred alignments (Rosendahl 1985). No surface historic properties were encountered and no further archaeological work was recommended.

In 1986, Cultural Surveys Hawai'i (Hammatt and Borthwick 1986) conducted an archaeological reconnaissance survey on approximately 50 acres located immediately north of Waikōloa Stream. Eight historic properties, typical of the Waimea Agricultural System, were located (portions of Field Complexes 1 and 2). This work was followed by a detailed archaeological survey and subsurface testing of 12 acres of the original study area (Hammatt et al. 1988). Seven historic properties were documented including both agricultural and habitation complexes. Excavations revealed an abundance of indigenous artifacts and midden, indicating "this small agricultural-habitation complex was in use in the late prehistoric period and was abandoned before European manufactured goods were available (probably 1820 or before)" (Hammatt et al. 1988:69). Data recovery of historic properties yielded radiocarbon dates which "suggest an initial low investment agricultural effort probably in sweet potato production, followed by a gradual intensification of effort just to the west over a period of several centuries" (Hammatt and Shideler 1989:50).

In 1989, University of Hawai'i at Hilo conducted an archaeological reconnaissance survey near the Hawai'i Preparatory Academy in Waimea located north of the current project area's alternate alignment (Bonk 1989). The study area is located within Field Complex #1 as defined by Clark and Kirch (1983). Historic properties located within the study area consisted of varying sizes of agricultural terraces. No 'auwai or habitation structures were observed. Data recovery and additional mapping of these terraces was recommended prior to construction within the project area.

In 1989, Soil Conservation Service conducted archaeological investigations of the Lālāmiilo agricultural addition irrigation pipeline corridor and the livestock distribution system and management area (Spencer 1989). The study area is located southeast of the current project area. No historic properties were observed and no further archaeological work was recommended.

In 1990, Bishop Museum conducted archaeological testing and data recovery for the Waimea School improvements (Clark et al. 1990). The study area is located southeast of the current project area. Surface and subsurface investigations focused on documentation of previously recorded SIHP# -8808, part of the Waimea agricultural system as defined by Clark and Kirch (1983). Three 'auwai, were studied. Profiles suggest a historic period origin with some indirect evidence for possible pre-contact construction. A sample from the lower charcoal lens yielded a preferred range of A. D. 1449 to 1674.

In 1992, PHRI conducted an archaeological inventory survey for potential historic properties for the North Hawai'i Community Hospital (Thompson and Rosendahl 1992a). The study area consisted of seven individual parcels located near the current project area. The survey identified two historic properties, SIHP# -16095 and -18054. SIHP# -16095 is an 'auwai system located on the surface of Parcels 1 to 4. SIHP# -18054 is an agricultural field complex located within Parcel 7 with is near the alternate alignment for the current project. The agricultural field complex was equated to Field Complex 2 as defined by Clark and Kirch (1983).

In 1992, PHRI conducted an archaeological inventory survey for the Waimea Elderly Housing Project (Thompson and Rosendahl 1992b). The project area is located near the alternate

alignment for the current project. The study consisted of further documentation of SIHP# -16095, an *'auwai* system. A program of archaeological monitoring was recommended.

In 1993, Chiniago Inc. conducted an archaeological inventory survey of approximately 50 acres for the Sandalwood Estates (Barrera Jr. 1993). The study area borders the preferred alignment for the current project area. A complex of agricultural field borders was identified during subsurface testing and assigned SIHP# -14948. The agricultural field borders were determined to be located at the east of Field Complex 2 as defined by Clark and Kirch (1983). No further archaeological work was recommended.

In 1994, PHRI conducted an archaeological inventory survey for the Hawai'i Preparatory Academy Waimea campus expansion (Franklin et al. 1994). The study area is located north of the current project area's alternate alignment. During fieldwork, seven historic properties (SIHP# -19643 to -19649) associated with agriculture and habitation were identified. The historic properties comprised the formal types: water channel, cemetery, terrace, concrete foundation, and alignment. Only two historic properties, SIHP# 19648, a historic habitation terrace and SIHP -19649 a cemetery with associated feature were determined to be significant.

In 1994, Comstock Cultural Resource Management, Inc. conducted an archaeological inventory survey of approximately 250 acres (Barrera 1994). The study area is part of the western half of the alternate alignment for the current project area. 43 historic properties were identified, both pre-contact and historic, and included habitations, agriculture, burials, walls, trails, and 'animal barriers'.

In 1998, International Archaeological Research Institute, Inc. (IARII) conducted archaeological investigations of the *kuleana* lots at Pukalani within the Waimea Town Center project area (Erkelens 1998). The study area is located southeast of the current project area. A total of five historic properties were documented during the study; SIHP# -8812 *kuleana* lots, SIHP# -19416 Duncan-Lanakila Cemetery, SIHP# -19417 Pukalani stables and blacksmith shop, SIHP# -19418 veterinary office, and SIHP# -19419 breaking corral.

In 1999, PHRI conducted data recovery for the North Hawai'i Community Hospital with focus on investigations at an *'auwai* in the Lālāmilo field system (Wolforth 1999). The study area is located southeast of the east end of the current project area. During the study, an *'auwai* located within the study was cross-sectioned and bulk sediment samples were collected for radiocarbon dating and palynological analysis. Several subsurface features were also identified.

In 2000, Rechtman Consulting, LLC conducted a supplemental archaeological inventory survey of TMK [3] 6-2-001:091 located within the western portion of the alternate alignment for the current project area (Rechtman 2000). The study assessed previously recorded historic properties within the current project area and encountered one newly identified historic property, SIHP# -18579, a historic trash dump. Additionally, several new agricultural features of SIHP# -18581 were identified.

In 2000, CSH conducted a literature review and field inspection of approximately 6 miles for the proposed Waimea Trails and Greenway Project (Kikiloi et al 2002). This literature review and field inspection consisted of a pedestrian inspection of the proposed alignment, which roughly follows the route of the preferred trail alignment and possible future equestrian trail location for the current project. Most of the area had been urbanized to such an extent that no

surface historic properties exist, except for concrete and boulder stream crossing structures(s). One section in the western portion contained historic property complexes associated with agriculture and habitation from the pre-and post- contact eras. The Trail Corridor intersected a number of features, such as, `auwai and field walls. The corridor was not staked; thus a precise inventory of possibly affected historic properties and features was not possible and an inventory survey investigation of the staked alignment was recommended.

In 2002, Haun and Associates conducted an archaeological inventory survey of a 266-acre area for a Department of Hawaiian Home Lands (DHHL) development at Lālāmilo (Haun et al. 2002). The study area is located near the west end of the current project area. A total of 76 historic properties consisting of 819 features were documented during the study. Historic property types included mounds, enclosures, walls, irrigation ditches, platforms, and field boundaries.

In 2006, Rechtman Consulting, LLC conducted an archaeological inventory survey of TMK [3] 6--5-004:025 and -063 (Clark and Rechtman 2006). The study area is located partially within the east end of the current project area. A total of four historic properties were documented during the study (SIHP# -26680 to -26683). These historic properties consisted of two historic walls, one *'auwai* that extends parallel to Waikōloa Stream, and a historic wooden structure likely erected by the U.S. Military during WWII.

In 2006, Rechtman Consulting, LLC conducted archaeological monitoring of development activities associated with the Waimea Parkside Residential Subdivision (Clark and Rechtman 2006b). The study area is located north of the east end of the current project area. No historic properties were newly identified during the study, however, an additional feature (Feature H) was added to SIHP# -24168. Feature H of SIHP# -24168 is described as a small stone and concrete construction with a concave concrete floor. The feature was determined to function as a "former decorative garden element or a small pond" (Clark and Rechtman 2006b:6). Two adze fragments along with midden and historic trash were also recorded throughout the study area.

In 2006, Archaeological Consultants of the Pacific, Inc. conducted an archaeological assessment of a property located at TMK [3] 6-5-002:043 (Gregg and Kennedy 2006). The study area is located north of the current project area. No historic properties were identified during the study.

In 2009, CSH conducted an archaeological inventory survey of Increment 1 for the Waimea Trails and Greenway Project (Yucha et al. 2009). The study area is located near the east end of the project areas preferred alignment, between Lindsey Road and Kahawai Street. A total of three historic properties were documented during the study (SIHP# -26871, SIHP# -26872, and SIHP# -26873). These historic properties consisted of WWII-era infrastructure associated with Camp Tarawa, a portion of Akona's *'Auwai*, and a concrete ford and associated roadway.

3.3 Previous Archaeology Associated with the Waimea Trails and Greenway Project

The Waimea Trails and Greenway Project consists of two separate alignments, a preferred alignment and an alternate alignment (see Figure 5). The preferred alignment is located along Waikōloa Stream from Kamuela View Estates to the western edge of the Waimea Public Park.

There are three signed shared roadways leading from Kawaihae Road to the preferred alignment. The first, westernmost roadway follows Opelo Rd, the second, central roadway follows Kahawai Street, and the third roadway follows the S. Kohala Distribution Road for a short distance, turning east to then cut through the Future County Park to meet with the preferred alignment at Waikōloa Stream. The signed shared roadways will not include a constructed trail, and represent the connection points to the trail.

Two previous studies have been conducted for the Waimea Trails and Greenway Project along the preferred alignment, a 2000 literature review and field inspection along 6 miles of the trail (Kikiloi et al 2002) and an inventory survey of a 1.1 mile portion located between Lindsey Road and Kahawai Street (Yucha et al 2009; Figure 9). Neither the signed shared roadways nor the alternate alignment have been previously surveyed. The field inspection portion of this study area focused on areas that had not yet been surveyed (the signed shared roadways and the alternate alignment). The previously conducted archaeological investigations provide sufficient information for the recommendations specific to the preferred alignment. A summary of the fieldwork and findings from the previous studies is provided below.

3.3.1 2002 Literature Review and Field Inspection (Kikiloi et al.)

In 2000, CSH conducted a literature review and field inspection of approximately 6 miles for the proposed Waimea Trails and Greenway Project (Kikiloi et al 2002; Figure 10). Though this project was titled an 'archaeological assessment', it was not considered one per HAR Chapter 13-276 and would be more appropriately termed a literature review and field check. An archaeological assessment typically consists of an archaeological inventory level survey with no historic properties identified, as per HAR Chapter 13-13-284-5. This literature review and field inspection consisted of a pedestrian inspection of the proposed route, which roughly follows the route of the preferred trail alignment for the current project. The inspected area was divided into five different sections based on terrain type, degree of urbanization, and the potential for cultural resources (Figure 10). The western portion of this project area borders the Haun et al. 2002 inventory survey of 266-acres, located just north of the project area.

Section 1 encompassed the trail corridor from the Kawaihae Road intersection at South Kohala View Estates to the County Refuse Transfer Station. Section 1 is within what has been referred to as the Lālāmilo Field Complex, a subset of the Waimea agricultural system (Clark 1987). Additionally, Section 1 is, at least in part, within the "Lalamilo Kuleana and Ranch District;" State site 50-10-05-2292 (Barrera and Kelly 1974).

The Field Complex and Kuleana and Ranch District designations were based on surveys related to the proposed Waimea/Kawaihae Highway. The types of sites and features reported on include `auwai (irrigation ditches), agricultural fields and house sites (both pre-and post contact). The `auwai - some stone-lined, others with soil embankments - extend off the three streams, Waikōloa, Keahuiomano and Lanikepu, in Section 1 of the project area.

The `auwai irrigate fields which are delineated by low mounded walls, sometimes utilizing the natural landscape. Natural swales or depressions are often enhanced to create the fields. The house sites range from low platforms to high-walled enclosures and, as mentioned earlier, are from both before and after A.D. 1776. The historic time period house sites have been documented as related to 1800s Land Commission Awards (i.e. LCA or kuleana).

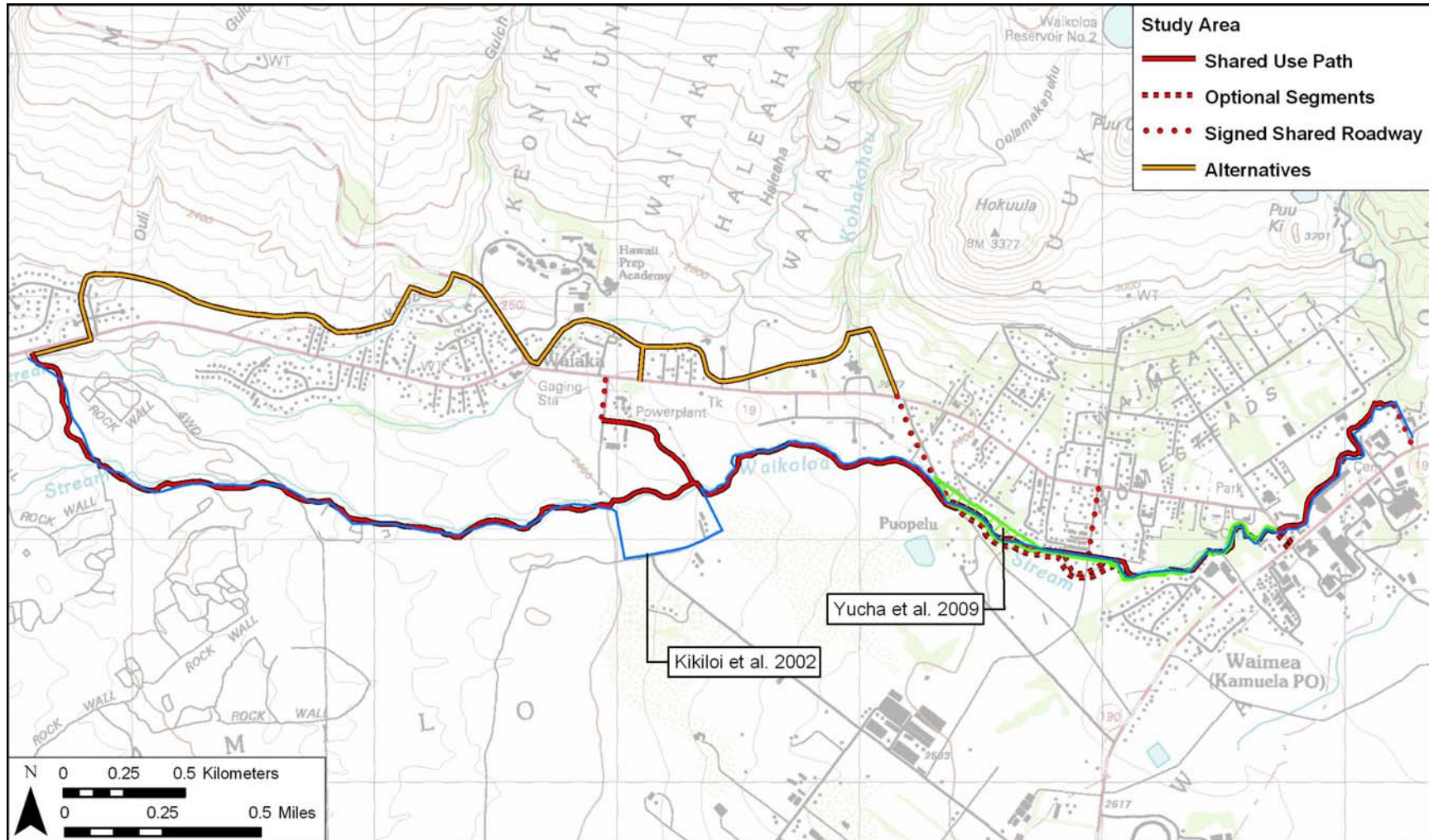


Figure 9. Portion of the 1995 Kamuela USGS 7.5-minute topographic quadrangle showing the location of the current project area in relation to the 2002 Kikiloi et a. and 2009 Yucha et al. project areas.

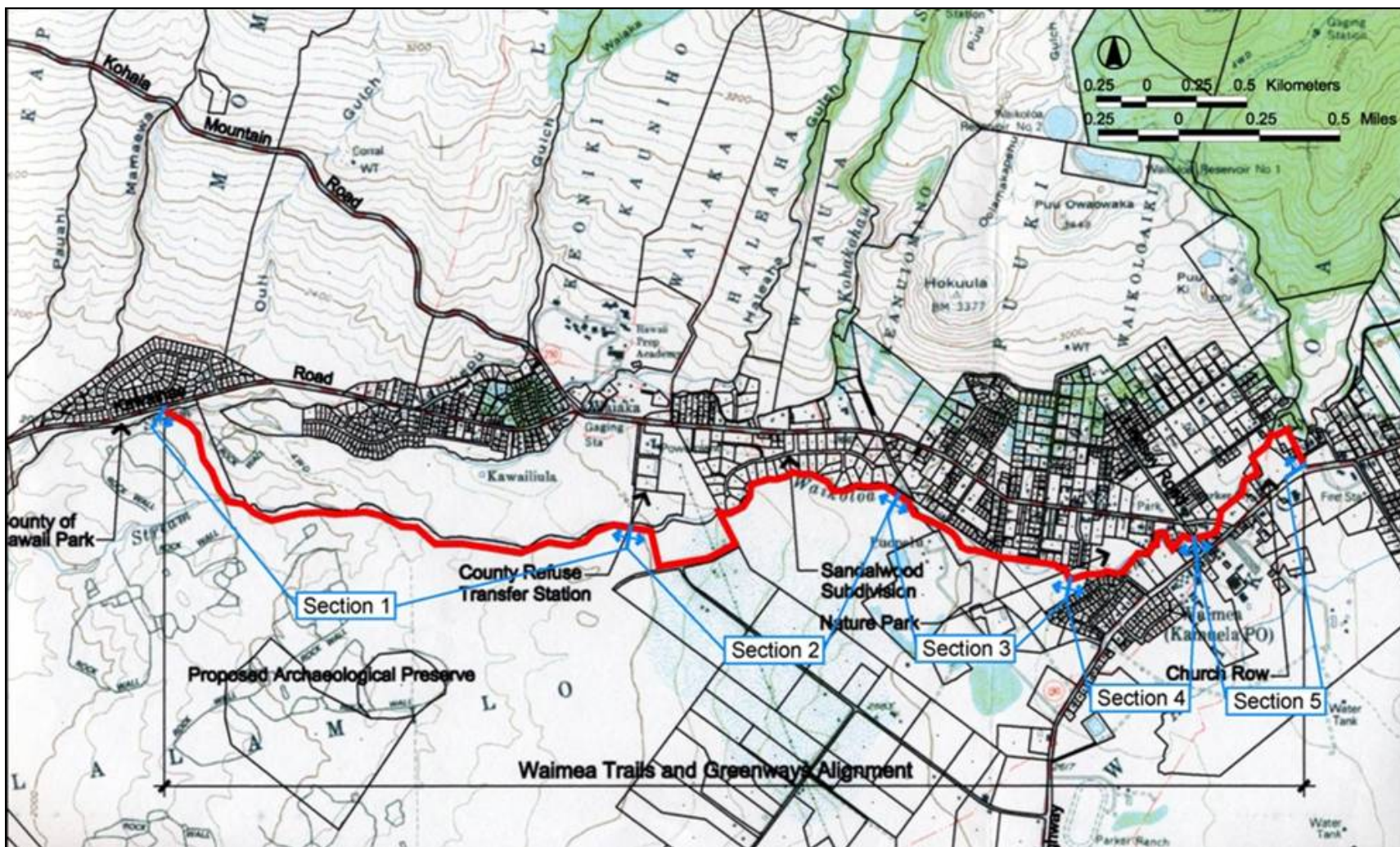


Figure 10. USGS Topographic Map, Kamuela Quadrangle, showing the location of the Kikiloi et al. (2002) project area and the location of each of the 5 sections.

Section 1 was not staked during the field inspection so no specific site or features designations were accomplished in relation to intersects with the Kikiloi et al. (2002) proposed trail route. The field inspection did indicate that certain `auwai sections, a wall segment, and a number of fields are in the vicinity of the trail corridor. No house sites appear to be within the trail corridor.

Section 2 refers to the portion of the trail corridor between the existing county refuse transfer station and the eastern end of the Sandalwood Subdivision. At the conjunction of Sections 2 and 3 is an old concrete ford in Waikōloa Stream. The ford is associated with an old, asphalt covered roadway that extends from the Kawaihae Road to Pu`u `Opelu, the former Parker Ranch Headquarters and residence of Richard Smart, now a museum open to the public. The roadway and associated stream crossing are presumably older than 50 years and thus can be considered historic properties, although the proposed trail would have no significant impact on the features.

The portion of the proposed trail corridor adjoining the Sandalwood Subdivision is pasture type land that is presently separated from active pasture by a new fence line. The area had not been grazed for a while and the Kikuyu grass is fairly thick. No historic features were observed on either side of the fence line. The heavily grazed side had excellent ground visibility. The ungrazed side had poor ground visibility.

The portion of Section 2 that is State land, just east of the existing transfer station, has been altered extensively by bulldozing and old landfill activities. The trail corridor follows a bulldozed path between Waikōloa Stream and the 'mountain of trash' of the old land fill. No historic properties were observed in Section 2.

Section 3 refers to the portion of the proposed trail route between the east end of the Sandalwood subdivision and Waiki`i Village Road. The proposed route shifts to the northern side of Waikōloa Stream for most of Section 3 where it is adjacent to existing houselots. The area has been altered in association with the residential properties and no archaeological resources were observed in Section 3.

Section 4 refers to the area between Waiki`i Village Road and Lindsay Road Bridge. This section is dominated by a stand of large Eucalyptus trees within which Waikōloa Stream makes a few sharp bends or meanders. Unlike Section 5, the buildings and associated infrastructure (e.g. parking lots) within Section 4 do not encroach up to the edge of the stream. The stand of Eucalyptus trees buffers the proposed trail route from the office buildings.

Remnant structures related to a pipeline crossing and possibly a concrete ford were observed in Section 4. The large concrete slab remnant had an imprinted date of "194_" suggesting a World War II association. The pipe crossing remnant structures are short, faced, ramp like structures with the faced vertical side facing the stream. Construction type is similar to the Section 5 crossing, consisting of basalt boulders and concrete.

Section 5 is the eastern trail terminus at Church Row westward to the Waikōloa stream bridge at Lindsey Road. Section 5 has been altered extensively by modern urbanization. The proposed route would be on the southern side of Waikōloa stream which has been more altered by recent construction than the northern side. Construction activity in this section includes: the Baptist Church yard, KECK office complex, new parking lots for the Koa Grill Restaurant, and the Waimea Shopping Center.

The southern bank of Waikōloa Stream in Section 5 is dominated by thick kikuyu grass, christmas berry, ginger, and other introduced plants. The area between the modern buildings and the stream is fairly narrow especially behind the Waimea Shopping Center. Two historic structures were observed within Section 5; a stacked stone wall behind the KECK offices and a remnant of a basalt boulder and concrete stream crossing. The boulder wall is typical of the many dry masonry stone walls in the Waimea area and presently serves as the stream side property boundary for the KECK office complex. The remnant boulder and concrete stream crossing appears to be for an old narrow roadway and/or for an old pipeline. The old stream crossing is situated behind a row of stores some 200 ft. east of the Lindsey Road bridge. Additionally, the eastern terminus of the trail is in close proximity to Imi'ola Church and associated cemetery. The church is on the State and National Register of Historic Places and has been allotted State Site # 50-10-06-7151.

Based on the field observation, Sections 2-5 have been urbanized to such an extent that no surface historic properties exist, except for concrete and boulder stream crossing structures(s). Section 1, west of the County Refuse Transfer Station, has been altered little during the modern urbanization of Kamuela town. Section 1 contains site complexes associated with agriculture and habitation from the pre-and post- contact eras (Barrera and Kelly 1974, Clark and Kirch 1983, Clark 1987). The Trail Corridor intersects a number of features, such as, 'auwai and field walls. The corridor was not staked in Section 1; thus a precise inventory of possibly affected sites and features was not undertaken for this assessment.

Based on the background studies and field inspection Cultural Surveys Hawai'i recommended an inventory-level survey for the entire route. The field inspection indicated that the focus of the inventory survey should be in the area west of the County Refuse Transfer Station (i.e. Section 1). It was recommended that an inventory survey should await a staked alignment so that sites can be accurately located in relation to the alignment. It was also suggested that alternatively, the inventory survey results could be utilized to create an alignment with less impact to archaeological resources.

3.3.2 2009 Archaeological Inventory Survey (Yucha et al.)

In 2009, Cultural Surveys Hawaii conducted an archaeological inventory survey of an 8.96-acre portion of the Waimea Trails and Greenway Project (Yucha et al. 2009). This portion, measuring approximately 1.1 miles, is within the current project area's east end of the preferred alignment. A complete pedestrian survey identified three historic properties consisting of four features within or adjacent to the 8.96-acre project area along Waikōloa Stream (Figure 11; Table 4). These historic properties consisted of a collapsed and severely damaged concrete ford or bridge (SIHP # -26871 Feature A), a remnant portion of paved road (SIHP # -26871 Feature B), an earthen ditch segment (SIHP# -26872), and an intact concrete ford and adjoining roadway (SIHP# -26873). SIHP# -26871 Features A and B were determined to be WWII-era constructions associated with Camp Tarawa. SIHP# -26872 was determined to be a remnant portion of "Akona's 'Auwai", a mid-19th century irrigation ditch used for irrigating sugar cane fields and supplying the Līhu'e Sugar Mill (Burtchard and Tomonari Tuggle 2003). SIHP# -26783 was determined to be an early- to mid-20th century concrete ford and adjoining roadway that was used throughout the 20th century as a route between the Māmalahoa Highway and Kawaihau Road that bypassed the town of Waimea.

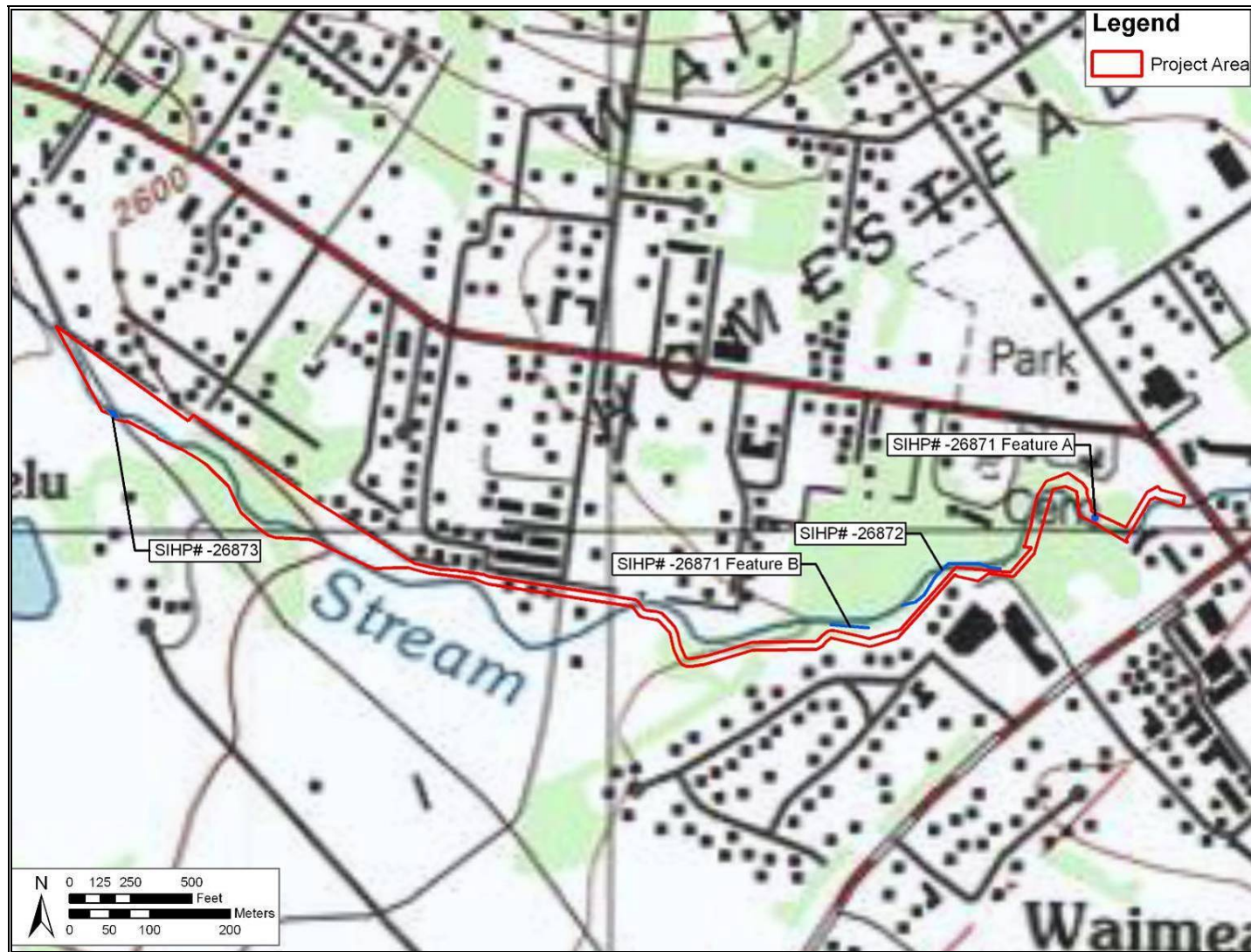


Figure 11. Portion of the 1995 Kamuela USGS 7.5-minute topographic quadrangle showing historic properties located during the Yucha et al. 2009 inventory survey

Additionally, two modest and generally modern modifications were observed, consisting of a basalt stone and concrete terrace and a pipeline support. Both of these modifications were determined to lack site integrity.

SIHP# -26871 consisted of two features (Feature A and B) related to WWII-era infrastructure associated with Camp Tarawa. Feature A is a collapsed ford or bridge with an etched date of July 1942. Feature B is a remnant portion of roadway likely part of Abemama Road of the former Camp Tarawa. SIHP# -26871 was recommended significant under Hawai'i Register Criteria A due to its direct association with WWII and Criteria D due to its information content.

SIHP# -26871 Feature A would not be adversely affected by the proposed trail and greenway project and therefore is was recommended for preservation in the form of avoidance and protection. If, in the course of future development, SIHP# -26871 is potentially affected, "the portion of the ford containing the written name and date be recovered for use in a permanent interpretive marker at this location" (SHPD Correspondence LOG# 2009.3224, DOC# 0908MD07; See Appendix C). It was suggested that interpretive signage at the location of SIHP# -26871 Feature A may be developed in consultation with SHPD to provide Waimea residents and pedestrians using the trail with information on the history of the area. Interpretive signage at SIHP# -26871 Feature A may include a short synopsis of Camp Tarawa and how the camp transformed the lives of Waimea residents during and after World War II.

SIHP# -26871 Feature B is recommended for no further work. Sufficient information regarding location, function, age, and construction had been generated by the inventory survey investigation.

SIHP# 50-10-06-26872 (CSH 2), an early post contact irrigation ditch (Akona's *'Auwai*), was recommended significant under Hawai'i Register Criteria A due to its association with the advent of commercial sugarcane agriculture on Hawai'i Island as a major agricultural trend lasting for over a century and D due to its information content. SIHP# 50-10-06-26872 was recommended for preservation in the form of avoidance and protection. It was recommended that any proposed alteration to SIHP# 50-10-06-26872 would require prior consultation with, and approval of, SHPD.

SIHP# 50-10-06-26873 (CSH 3), a historic-era concrete ford and associated roadway, was recommended significant under Hawai'i Register Criterion D due to its information content. Sufficient information regarding location, function, age, and construction was generated by the inventory survey investigation and no further work was recommended for SIHP# 50-10-06-26873.

The Yucha et al. (2009) project area is located within Section 3 and Section 4 of the Kikiloi et al. (2002) survey area. Kikiloi et al. (2002) observed no archaeological resources within Section 3, though an intact concrete ford and adjoining roadway (SIHP# -26873) was observed during the Yucha et al. (2009) inventory survey. Within Section 4, Kikiloi et al. (2002) identified multiple "remnant structures" including a large concrete slab remnant with an imprinted date of "194_". This slab was relocated during the Yucha et al. 2009 survey and recorded as having the name "A BASTIN" and the date "JULY 1942" printed on it and was designated SIHP# -26871. Other remnant structures were observed within Section 4 and it is likely that they are the same historic properties located and recorded by Yucha et al. (2009) as SIHP # -26871 Feature A,

SIHP # -26871 Feature B and SIHP# -26872, as well as the two modifications observed but not recorded as sites based on their lack of site integrity.

The findings of the inventory survey were largely as expected when compared to land use in the vicinity of the project area. No pre-contact or traditional Hawaiian historic properties were identified within the project area. Previous archaeological research (Clark 1981; Barrera Jr. 1993; Haun et al. 2002) suggests that pre-contact land use associated with the Waimea agricultural field system was generally located to the west and south of the project area. It seems likely however, that the area along Waikōloa Stream within the project area could have served a similar purpose. Historic and modern development beginning in the mid-19th century may have impacted or completely destroyed any pre-contact historic properties located on the surface of the project area.

Table 4. Summary of historic properties located within the current project area

SIHP# 50-10- 06-	Feature	Type	Function	Probable Age	Significance	Recommendations
26871	A	Ford	Transportation	WWII-Era	A, D	Preservation (avoidance and protection)*
	B	Road	Transportation	WWII-Era	A, D	No Further Work
26872	-	Ditch	Agriculture/ Water Control	Post- Contact	A, D	Preservation (avoidance and protection)
26873	-	Ford	Transportation	Post- Contact	D	No Further Work

3.4 Predictive Model

A thorough review of historical records, previous archaeology, and modern land use, suggest that the area surrounding the current project area has been significantly impacted during historic times, specifically during the construction of modern subdivisions. Much of the project area has likely been graded to support the subdivisions and associated roadways, and some evidence of bulldozing was apparent during the field inspection. One area of interest is the location of Akona's *'Auwai*, which according to historic maps originates at a large meander on the south side of Waikōloa Stream within or adjacent to the preferred alignment for the current project area and

continues west, parallel to the main stream channel. The eastern half of the alternate alignment as well as the eastern half of the preferred alignment borders several modern subdivisions and residential areas suggesting possible impacts to any historic properties in these locations. Historic properties located within the margins of Waikōloa Stream will likely be associated with vehicular or utility stream crossings including fords, bridges, or pipeline supports.

Based on studies within the alternate alignment corridor (the majority of the area inspected during the current study), the majority of this area should contain extensive historic properties in the form of pre-Contact as well as Historic features. The pre-Contact historic properties are most likely associated with agriculture (terraces, walls, mounds), though permanent habitation sites as well as burials have also been reported in the area (Franklin et al. 1994; Rechtman 2000; Haun 2002). Some areas of post-Contact disturbance and modification to pre-Contact historic properties has occurred in the area (Rechtman 2000) and the current study found some evidence of this within the western portion of the alternate alignment.

Section 4 Results of Fieldwork

4.1 Survey Findings

The field inspection consisted of a limited pedestrian survey of the Waimea Trails and Greenway project's proposed alternate alignment, where access was available, and three of the signed shared roadways; Opelo Rd., Kahawai St., and South Kohala Distribution Rd. The portions of the project area (i.e. preferred and alternate alignments) subject to previous studies (Kikiloi et al. 2002; Yucha et al. 2009) were not revisited during this fieldwork portion of this study. The signed shared roadways were largely along existing roads and access was not an issue. The route along the South Kohala Distribution Road goes through the Future County Park and access into this area was also available. The eastern half of the alternate alignment is above a large neighborhood and access to the area was limited (Figure 12). For the most part, this area was inspected from side streets and the main road with limited to no pedestrian inspection occurring. The western portion of the alternate alignment, located west of Hawaii Preparatory Academy, was accessible without disturbance to the surrounding residences. The findings from this area are representative of the entire alternate alignment (Figure 13).

The pedestrian inspection identified 14 historic properties: seven previously identified historic properties or historic property concentrations, and 7 newly identified historic properties, consisting of multiple features within or adjacent to the current survey area (Table 5; Figure 14). In general, the purpose of the field inspection was to develop data on the nature, density, and distribution of archaeological sites within the project area and did not include thorough documentation or an application for SIHP #'s. The field inspection consisted of a walk-through reconnaissance within the accessible areas of the project area. Potential archaeological sites or site areas were documented with written descriptions and photographs and located with a GARMIN GPSMAP60Cx unit (accuracy +/- 2-5 m).

4.2 Description of Previously Identified Historic Properties

During the course of the field inspection, CSH relocated seven previously identified historic properties or historic property concentrations: SIHP – 18568, SIHP – 18581, SIHP - 18587, SIHP - 18588, SIHP - 18590, SIHP – 18593, and a historic property concentration containing six previously identified historic properties (SIHP -18569, -18583, -18584, -18585, -18586, and -18597) (Barrera 1994; Rechtman 2000). The historic properties were photographed, the descriptions were updated and GPS points were taken. Figure 15 depicts the identified historic property's locations in association with the Barrera 1994 site map.

SIHP – 18568 was first recorded in 1994 by Barrera as "...a concentration of free standing stone walls located adjacent to the south end of Ouli Gulch, covering an area of 50 by 100 meters... The position of the walls and their construction technique suggest that they are animal barriers dating from the prehistoric period" (Figure 16 and Figure 17). CSH relocated the historic property and updated the description to add that the alignments appear to represent multiple large enclosures with the southern boundary located near the western end of the alternate alignment. SIHP – 18568 contains multiple enclosures, terraces, a rock shelter/overhang, a stone lined fire pit, and additional alignments. The complex is likely extensive and connects to other complexes



Figure 12. Eastern half of the alternate alignment corridor with houses and neighborhoods blocking access; view to northeast.



Figure 13. Western half of the alternate alignment corridor; view to north. Note the alignments and complexes on the hills in the background

Table 5. Summary of Historic Properties Identified by the Field Inspection and Previous Archaeological Studies (Barrera 1994; Rechtman 2000)

SIHP # (50-10- 06)	CSH Site #	Type	Function	Age	Mitigation Recommendations
18568		Wall Complex	Animal Husbandry	Pre- Contact	Unknown
18581		Agricultural Complex	Agriculture	Pre-Contact	No Further Work
18587		Wall	Boundary Marker	Post-Contact	No Further Work
18588		Mound	Burial	Pre-Contact	Preservation
18590		Enclosure	Permanent Habitation	Pre-Contact	Preservation
18593		Wall	Ranch Wall	Post-Contact	No Further Work
18569, 18583, 18584, 18585, 18586, 18597		Walls, enclosures, walls, mounds and a trail segment	Multi-Function	Pre- and post- Contact	Unknown
	001	Alignment	Not Determined	Not Determined	Further Documentation
	002	Enclosure	Not Determined	Not Determined	Further Documentation
	003	Wall	Not Determined	Not Determined	Further Documentation

SIHP # (50-10- 06)	CSH Site #	Type	Function	Age	Mitigation Recommendations
	004	Terraces	Not Determined	Not Determined	Further Documentation
	005	Alignment	Not Determined	Not Determined	Further Documentation
	006	Enclosure	Not Determined	Not Determined	Further Documentation
	007	Alignment/ Enclosure	Not Determined	Not Determined	Further Documentation

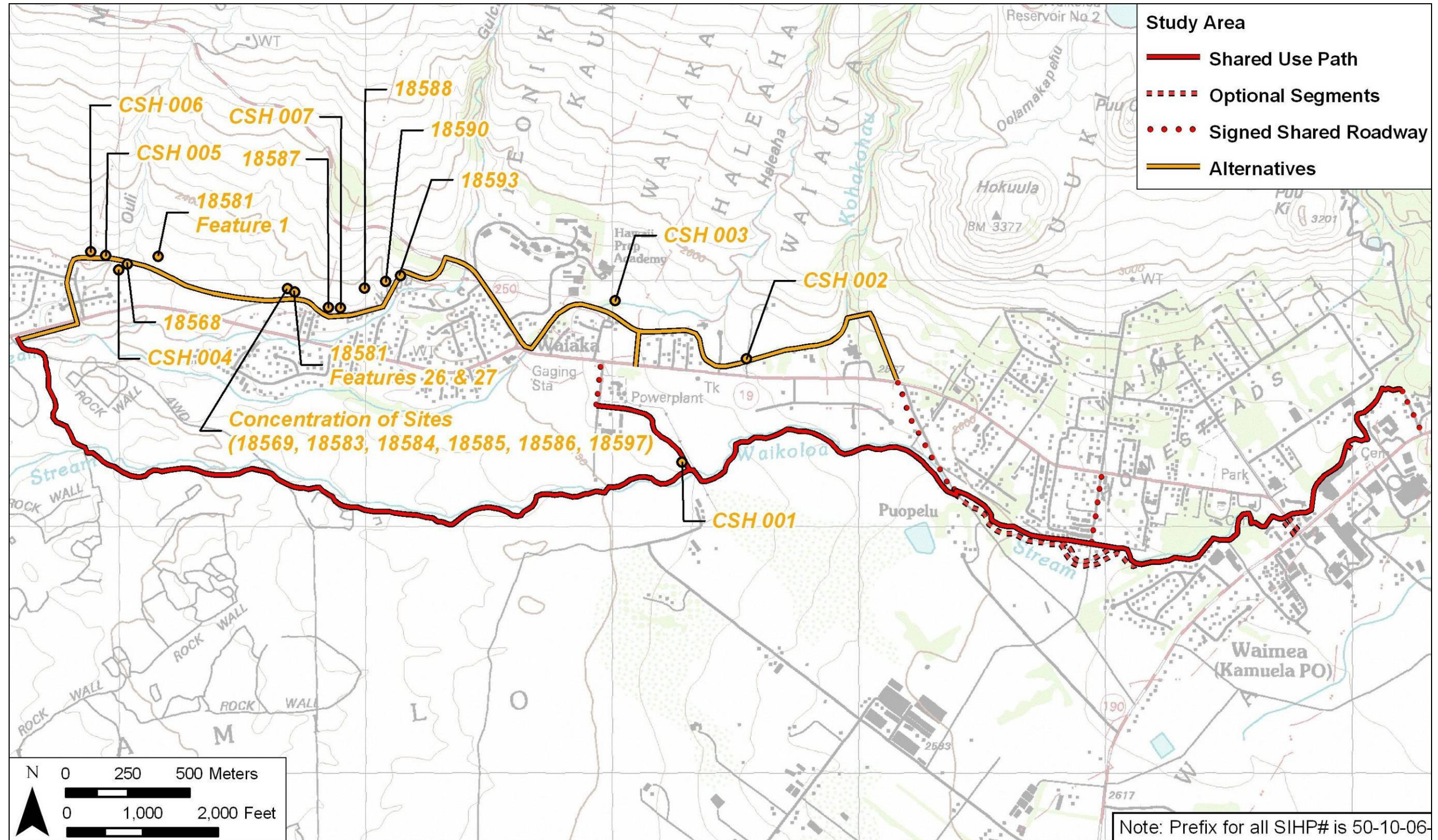


Figure 14. Portion of the 1995 Kamuela USGS 7.5-minute topographic quadrangle showing the historic properties identified during the current field inspection

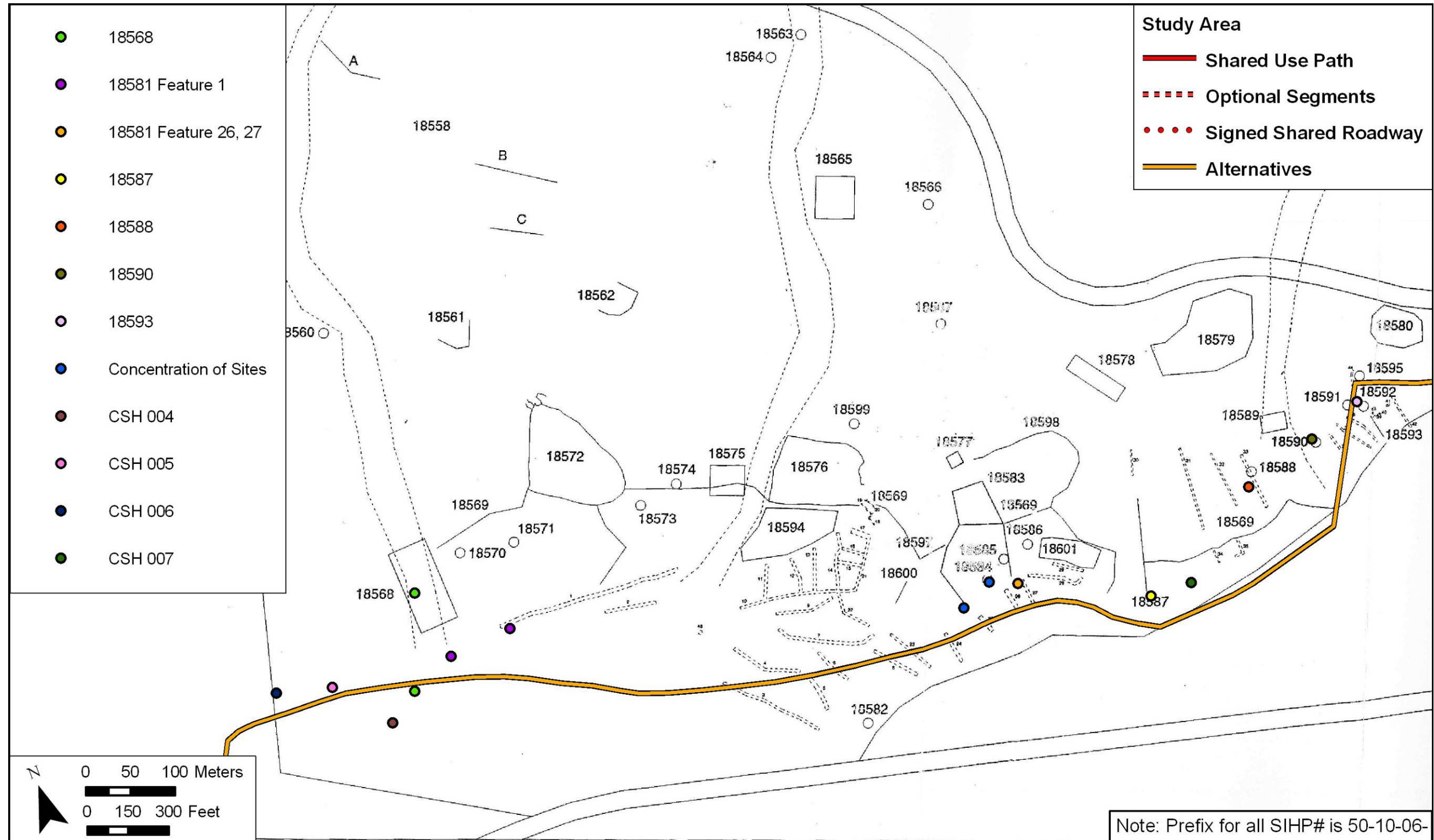


Figure 15. The Barrera 1994 site map depicting the surveyed portion of the alternate alignment and the historic properties identified and relocated. Note the historic property density throughout the area north of the project area's alternate alignment.



Figure 16. SIHP # -18568, north eastern corner of a large enclosure; view to north



Figure 17. SIHP # -18568, rock shelter; view to west

with a series of walls and alignments. It is constructed of cobbles and boulders stacked 2-3 courses high and heads in a N/S – E/W direction. Along the alignment to the north is a second enclosure in the northeast corner with a small opening into the larger SIHP – 18568 enclosure. To the east of the enclosure, near the outside of the entrance, is a stone lined fire pit, consisting of an excavated pit with 4 upright pahoehoe slabs lining the sides. This fire pit was located on the upper tier of 2-3 terraces leading to a clearing under a tree. Above the enclosure is a rock shelter with soot on the ceiling suggesting a small shelter.

SIHP – 18581 is an agricultural complex consisting of 46 formal agricultural features located along Lanikepu Stream first recorded by Barrera in 1994 (Figure 18). Some of the features recorded by Barrera (1994) were relocated by Rechtman in 2000 and 12 new features were identified, bringing the feature total to 58. The agricultural features include earth and rock embankments, retaining walls, earth and rock berms, areas of erosion, water channels, a field well, terraces, mounds and stone piles. CSH relocated some of the SIHP – 18581 features, including: Feature 1 an earth and rock embankment and Features 26 and 27, earth embankments. Many features were located within the alternate alignment (Features 3, 4, 5, 6, 8, 23, 24, and 25) but this area appeared to have been disturbed by bulldozing and it is likely that these features have been destroyed.

During the course of the field inspection, CSH located an area with a large concentration of historic properties, recorded in 1994 by Barrera (Figure 19 and Figure 20). This area appears to be a large site complex which has been split into multiple historic properties in the 1994 Barrera report, SIHP #'s -18569, -18583, -18584, -18585, -18586, and -18597. These historic properties consist of multiple walls, enclosures, retaining walls and sections of a trail, all of pre-Contact and post-Contact origins. CSH relocated the site complex and updated the description. The historic property is a large complex of walls and mounds that extend both N-S and E-W. The southern end of the wall, (likely part of SIHP -18583) is the point nearest to the location of the alternate alignment. The wall begins near the base of the hill and extends upslope (north), the extent of which is unknown, and additional walls can be seen running E-W, connecting to this wall. Upslope from the base of the site complex is a rock mound (SIHP -18586) on the SW side and an upright stone to the north on a hill top in the corner of a wall. A three-tiered platform (SIHP -18584) is located just east of the wall and consists of leveled platforms continuing downslope towards the project area. The level platforms are approximately 5 m wide and each terrace is approximately 50 cm in height.

SIHP – 18587 is a boundary wall located in the western half of the project area corridor, north of the alternate alignment (Figure 21). This wall was first recorded by Barrera (1994) and was updated by Rechtman (2000) as a stacked boundary wall located along the Lanikepu/‘Ōuli Ahupua‘a boundary. Rechtman record that the wall remains intact for 118 meters and measures 1.2 m wide by 1.2 meters high and is likely a post-Contact boundary wall and post dates the surrounding fields (Rechtman 2000:12). CSH relocated this wall during the current field inspection and added that the wall extends upslope in a NE-SW direction. The wall is faced and stacked about 5 courses high and appears to have two stages of construction. The first 1-2 courses appear to be older and consist of medium basalt boulders partially inset into the slope. The remaining 3-4 courses are added onto the first portion of the wall and consist of smaller basalt cobbles and boulders.



Figure 18. SIHP # -18581 Feature 1, single stone alignment; view to north



Figure 19. Looking upslope to the interconnecting walls and complexes of SIHP #'s -18569, -18583, -18584, -18585, -18586, and -18597; view south



Figure 20. What is likely the southern portion of SIHP # -18583, 'garden area' walls, looking downslope towards the project area below; view south



Figure 21. SIHP # -18587, wall. Note the two stages of construction; view to northwest

SIHP – 18588 consists of two mounds (Feature A and Feature B) first recorded by Barrera in 1994 as a pre-Contact burial location (Figure 22 through Figure 24). Barrera reported that Feature A is

“...a rectangular stone mound measure 1.20 by 1.80 meter... and standing to a height of 0.60 meter. Because the feature’s external characteristics resemble other structures on Hawaii Island known to be human burials, it was partially dismantled to determine whether this was the case. The excavation revealed a large capstone weighing several hundred pounds covering a dirt filled cavity in the bedrock. This dirt deposit was partially excavated to a depth of 0.50 meter, at which point excavation ceased, the high likelihood that the feature is a grave having been established. (Barrera 1994:18)

Feature B was situated 14 meters north of Feature A and was felt to have a similar function and so was not disturbed. SIHP – 18588 was updated by Rechtman (2000) who also excavated a test unit in Feature A. During the course of the excavation, coffin fragments were encountered, confirming the interpretation of the mounds’ function as burial. CSH relocated the mounds and added that they are contained within a large stone enclosure and the walls are stacked 4-5 courses high. A small entrance is located on the north (upslope) side and the interior of the walls are faced, though the exterior is collapsed with no apparent facing. Feature A mound is located in the center of the enclosure on the south side, constructed from small boulders and cobbles, and is faced on the east side. Feature B is located in the center of the north side of the enclosure, near the enclosure’s entrance. The enclosure likely functions as protection as part of a preservation measure for the burial mounds, as there is one new house currently being built approximately 50 meters north of this enclosure.

SIHP – 18590 is a pre-Contact permanent habitation located in the western half of the project area corridor, north of the alternate alignment, near the Old Kohala Mountain Road (Figure 25). Barrera originally recorded this historic property as “...a roughly square terraced enclosure measuring 10.2 by 10.6 meters...” (Barrera 1984:19). Rechtman updated the historic property as having stacked walls measuring approximately 1.5 meters wide by 1.2 meters high (2000:14). Rechtman agreed with the permanent habitation function, but felt that it was in fact associated with the historic period burials located nearby (SIHP – 18588). CSH relocated the enclosure and added that the enclosure is on an E-W sloping hillside and is largely unlevelled. It measures approximately 1m high in the SE (upslope) corner, sloping down to approximately 50cm high in the SW (downslope) corner. The upslope (east) side has interior facing of the walls, mainly in the NE and SE corners. The SE corner contains an inset faced area with a thicker faced wall running north. The inset area contains a basalt outcrop and placed semi-circle of basalt boulders stacked 1-2 courses. A partially upright boulder is placed in the center of the western wall, propped up with several cobbles, which is likely a modern addition.

SIHP – 18593 is a wall first recorded by Barrera in 1994 and updated by Rechtman in 2000 (Figure 26). It is a freestanding wall that is approximately 40 meters long, 1 meter wide and 1 meter high. It is thought to be a remnant of a historic period ranch wall (Barrera 1994; Rechtman 2000). CSH relocated the wall and added that the wall was stacked 4 courses high and the



Figure 22. SIHP # -18588, large protective enclosure containing two burial mounds; view to west



Figure 23. SIHP # -18588 Feature A, faced burial mound; view to west



Figure 24. SIHP # -18588 Feature B, burial mound, with entrance into the enclosure in the background; view to north



Figure 25. SIHP # -18590, permanent habitation enclosure; view to southwest



Figure 26. SIHP # -18593, wall; view to southeast

construction of a house that is located just upslope of this wall likely destroyed a portion of this wall.

4.3 Description of Newly Identified Sites

The field inspection also identified seven sites that had not been recorded previously. These sites were given temporary CSH numbers, locations were recorded with GPS, photographed and described but no further work was conducted. SIHP #'s have not been requested for these sites and further documentation is required if the project moves forward in this area.

CSH 001 is an L-shaped alignment within a field adjacent to the Waimea Transfer Station (Figure 27). This area appears to have been heavily disturbed by bulldozer activities, likely associated to the transfer station and industrial buildings in the area. The alignment consists of small boulders stacked 1-2 courses high. The area upslope of the alignment is raised slightly suggesting a possible terrace, but based on the level of disturbance surrounding the alignment it is likely the result of bulldozer push. Haun et al (2002) conducted an archaeological inventory survey of a 266.4-acre area, which included the 17-acre Future County Park which contains a portion of the current project area. Haun identified an agricultural complex, SIHP – 22632, that consisted of 700 agricultural features, 15 of which were within the Future County Park area (Haun et al. 2002). CSH 001 appears to be further southeast than the southernmost feature recorded by Haun, but may be an additional feature of SIHP -22632.



Figure 27. CSH 001, L-shaped alignment adjacent to the Waimea Transfer Station; view to west

CSH 002 is a large enclosure, located in the northeastern portion of the alternate alignment (Figure 28). This area was not accessible during the field inspection and was viewed from an area approximately 150 meters to the west. A GPS point was taken from the location the historic property was viewed from, to the west of the enclosure within the driveway of 65-1508 Kawaihae Road, on the north side of Kohākōhau Stream. The enclosure is located just north of a private property and appears to be fenced in as part of that property. The walls appeared to be approximately 1.5 – 2 m high, and looked to be slightly collapsing. Only the northwest corner could be seen and it is possible that it functioned as a post-Contact animal enclosure. It may also be a pre-Contact structure modified for post-Contact use.

CSH 003 is a wall located just west of the Hawaii Preparatory Academy (HPA) campus, on the south side of Kohākōhau Stream (Figure 29). The wall was observed from the north side of the stream and appears to be approximately 50 cm high, 4-5 courses, with an associated barbed wire fence. It is likely that this wall is a post-Contact in origin, based on the barbed wire, though it could be a modified pre-Contact wall. CSH 003 borders the stream and the residences that are located along the stream and is oriented E/W. The total length is unknown.

CSH 004 consists of two terraces located just south of the alternate alignment on its western edge (Figure 30). The terraces are constructed from basalt boulders and cobbles and measure approximately 50 cm wide 4 m long and 40 cm high. One terrace is oriented E/W while the other



Figure 28. CSH 002, enclosure, located in the northeastern portion of the alternate alignment; view to east



Figure 29. CSH 003, wall, on the south side of Kohākōhau Stream; view to south



Figure 30. CSH 004; two terraces; view to east

is oriented N/S and they form a shape similar to an L-shaped alignment. The terraces appear to have been previously disturbed and are likely remnants. This historic property is likely an additional feature to SIHP – 18581, an agricultural complex recorded by Barrera in 1994.

CSH 005 is an L-shaped alignment located in the western edge of the alternate alignment to the north of the alignments location (Figure 31). There is an area to the east of the alignment that may have been a third wall, but it appears to be heavily disturbed. CSH 006 measures approximately 1 m wide and contains no facing. The function of this alignment was not determined.

CSH 006 is a large enclosure with associated terracing and platforms (Figure 32). The enclosure extends north (upslope) and is situated so that the central upslope (north) half is within a small gulch, acting as a sort of bowl which may have been used as a windbreak. The walls are low with no facing. The two terraces are located on the southeast side (downslope) of the enclosure and are stacked 3 courses high, measuring approximately 70cm high and 80 cm wide with no facing. The terraces create large level areas approximately 5 m wide. East of the enclosure is a natural rock formation/crevice, with some minimal cobble filling. The function of this historic property was not determined.

CSH 007 consists of a single boulder alignment/enclosure in a semi-circular design on the south side of a natural grouping of large basalt boulder bedrock outcrops (Figure 33). The alignment consists of a single row of large boulders and is very informal in nature. It is likely post-Contact and modern trash was observed in and around the enclosure.



Figure 31. CSH 005, L-shaped alignment; view to southwest



Figure 32. CSH 006, large enclosure with associated terracing and platforms; view to north



Figure 33. CSH 007, semi-circular single boulder alignment/enclosure; view to north

Section 5 Summary and Recommendations

5.1 Summary

Two CSH archaeologists, Michelle Pammer, B.A. and Rosanna Runyon B.A., completed the field inspection on August 18, 2010, which required two person-days. All fieldwork was conducted under CSH's annual archaeological permit No. 10-10 issued by SHPD per HAR Chapter 13-282, and under the general supervision of Hallett H. Hammatt, Ph.D. (principal investigator). The field inspection served to confirm the presence and density of archaeological sites within the proposed corridors for the Waimea Trails and Greenway Project alternate alignment.

The field inspection consisted of a limited pedestrian survey of the alternate alignment, where access was available, and three of the signed shared roadways; Opelo Rd., Kahawai St., and South Kohala Distribution Rd. The preferred alignment, including the location of the possible future equestrian trail, has been subject to multiple archaeological studies, therefore a field inspection was not required for this area (Clark 1981; Kikiloi et al. 2002; Yucha et al. 2009). The signed shared roadways are mainly along existing roads and access was not an issue into these areas. The eastern half of the alternate alignment was largely inaccessible as it was located above a large neighborhood. For the most part, this area was inspected from side streets and the main road with limited to no pedestrian inspection occurring. The western portion, located west of Hawaii Preparatory Academy between the Old Kohala Mountain Road and Kawaihae Road, was accessed without disturbance to the surrounding residences. The findings from this portion of the alternate alignment are considered a representative sample for the entire length of this alignment.

The findings of the current field inspection are largely as expected when compared to land use and previous archaeological studies in the vicinity of the current project area. A total of 14 pre and post-contact historic properties were identified: seven previously identified historic properties or historic property concentrations, and seven newly identified historic properties. Previous archaeological research (Clark 1981; Barrera Jr. 1993; Barrera 1994; Rechtman 2000; Haun et al. 2002) suggests that pre-contact land use associated with the Waimea agricultural field system was located largely within the current project area and its surrounding area. Historic and modern development, beginning in the mid-19th century, have likely impacted or completely destroyed many pre-contact historic properties located near or within the current project area.

Seven of the historic properties, and one historic property concentration, identified during the current field inspection were previously identified and described by two separate studies (Barrera 1994 and Rechtman 2000). These studies were located within the central to western portion of the proposed corridor for the alternate alignment of the Waimea Trails and Greenway Project. These historic properties are both pre-Contact and Historic in age and represent agricultural, habitation and boundary functions. Additionally, seven newly identified historic properties were observed, mainly within the alternate alignment's western portion. Three of the newly identified historic properties were observed in the eastern portion of the alternate alignment and along one of the shared use paths. Most of the observed historic properties were not directly within the alternate alignment corridor, but it is likely that they would be impacted by this project. Due to limited access within the eastern portion of the proposed alternate alignment location, the

findings within the western portion are to be representative of the entire length of the alternate alignment. The eastern half of the proposed alternate alignment was mainly observed from a distance. This portion had evidence of extensive terracing and walls that were easily visible from the main highway, as well as at least one large enclosure (CSH 002) which was observed from a property approximately 150 meters west of the enclosure. This suggests that the eastern half of this alignment has a similar density of historic properties and historic property types as the western half.

Two previous studies have been conducted for the Waimea Trails and Greenway Project along the project area's preferred alignment: a 2002 literature review and field inspection along 6 miles of the trail (Kikiloi et al 2002) and an inventory survey of a 1.1 mile portion located between Lindsey Road and Kahawai Street (Yucha et al 2009). The Kikiloi et al 2002 project was a literature review and field check level project, consisting of a pedestrian inspection along a route roughly following the preferred trail alignment for the current project. It was found that most of the alignment had been urbanized to such an extent that no surface historic properties existed, except for concrete and boulder stream crossing structures. The western portion, which aligns with the southern edge of the Haun et al. study (2002), west of the County Refuse Transfer Station, has been altered little during the modern urbanization of Kamuela town. This portion contains site complexes associated with agriculture and habitation from the pre-and post- contact eras.

Kikiloi et al. (2002) recommended an inventory-level survey for the entire route with the focus of the inventory survey on the area west of the County Refuse Transfer Station. It was recommended that an inventory survey should await a staked alignment so that sites can be accurately located in relation to the alignment. It was also suggested that alternatively, inventory survey results could be utilized to create an alignment with less impact to archaeological resources.

In 2009, Yucha et al. conducted an archaeological inventory survey of Increment 1, an 8.96-acre portion of the Waimea Trails and Greenway Project within the east end of the current project area's preferred alignment. The Yucha et al. (2009) project area is located within Section 3 and Section 4 of the Kikiloi et al. (2002) survey area. A complete pedestrian survey identified three historic properties consisting of four features within or adjacent to the 8.96-acre project area along Waikōloa Stream. These historic properties consisted of a collapsed and severely damaged concrete ford or bridge (SIHP # -26871 Feature A), a remnant portion of paved road (SIHP # -26871 Feature B), an earthen ditch segment (SIHP# -26872), and an intact concrete ford and adjoining roadway (SIHP# -26873). Two historic properties were recommended for preservation by avoidance (SIHP# 50-10-06-26871 Feature A and SIHP# 50-10-06-26872) while no further work was recommended for the remaining two historic properties.

These two studies suggest that the eastern portion of the project area's preferred alignment has been significantly disturbed by modern urbanization and very few historic properties are likely to be present within this area. However, the western portion of the preferred alignment will likely contain a similar site density to that found by Haun et al (2002). This is supported by the site density also observed during the course of fieldwork for the current project. Based on these findings, the preferred and alternate alignments should be expected to contain a consistently high density of sites in areas that have not been previously disturbed by modern land use.

5.2 Recommendations

A thorough review of historical records, previous archaeology, and modern land use, suggest that the area surrounding the current project area has been significantly impacted during historic times, specifically during the construction of modern subdivisions. Much of the project area has likely been graded to support the subdivisions and associated roadways, and some evidence of bulldozing was apparent during the field inspection. However, previous archaeology as well as results from the current project suggests that a significant number of historic properties remain within the area despite the surrounding land disturbance.

The field inspection revealed a large number of both pre and post-contact historic properties that will be affected by the proposed project. These findings are consistent with previous surveys of the surrounding area.

Of the previously identified historic properties located within the project area that would be affected by the proposed alternate alignment corridor, at least two of the historic properties have been recommended for preservation, SIHP #'s -18588, burial mounds, and -18590, permanent habitation (Rechtman 2000:20). Preservation measures have been taken for SIHP # -18588, which now has a large enclosure encircling the two mounds. The remaining previously identified historic properties are either recommended for no further work or have no specific recommendations due to the standards at the time of the original study (Rechtman 2000; Barrera Jr. 1994). Within the preferred alignment, two historic properties have also been recommended for preservation by avoidance: SIHP# 50-10-06-26871 Feature A, a collapsed and severely damaged concrete ford or bridge, and SIHP# 50-10-06-26873 (CSH 3), a historic-era concrete ford and associated roadway (Yucha et al. 2009).

Because this report is only a literature review and field inspection and not an inventory survey, the newly identified historic properties (CSH 001 – 007), have not been fully documented. Therefore, a full archaeological significant assessment per HAR Chapter 13-276 is not part of this study. Thus, if the alternate alignment is chosen for the Waimea Trails and Greenway project, further documentation in the form of an archaeological inventory survey is recommended for its entire length. Increment 1 of the current project area's preferred alignment was previously subject to an inventory level survey (see Figure 9; Yucha et al. 2009). If the preferred alignment is chosen for the Waimea Trails and Greenway Project's final location, an archaeological inventory survey is recommended, though an additional inventory survey would not be required for the Increment 1 portion.

Previous archaeological studies have shown a high density of historic properties, similar to the findings for the current study, within the preferred alignment corridor. Two previous studies have been conducted for the Waimea Trails and Greenway Project along the preferred alignment, a 2002 literature review and field inspection along 6 miles of the trail (Kikiloi et al 2002) and an inventory survey of a 1.1 mile portion located between Lindsey Road and Kahawai Street (Yucha et al 2009). Additionally, in 1993, Chiniago Inc. conducted an archaeological inventory survey of approximately 50 acres for the Sandalwood Estates, which borders the northern edge of the central portion of the preferred alignment (Barrera Jr. 1993) and in 2002, an inventory survey was also conducted of an approximately 266 acre area bordering the north edge of the preferred alignment's western half (Haun et al 2002). Though the eastern half of the alternate

alignment has not been inspected, based on the findings from previous archaeological studies within the area, it is likely that the historic property density is similar to that found within the western portion.

Based on the background studies and field inspection, Cultural Surveys Hawai'i recommends an inventory-level survey for the entire chosen alignment, preferred or alternate, including the proposed location for the possible equestrian trail. No further work is required for Increment 1, surveyed by Yucha et al. in 2009. The field inspection indicated that the alternate alignment has a concentration of sites similar to that of the preferred alignment. It is recommended that an inventory survey should await a staked alignment so that historic properties can be accurately located in relation to the alignment.

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Appendix A TMK's and Land Owners

Table 6. Client Provided Table of the TMK's and Land Owners within the Project Area's Preferred and Alternate Alignment

Div	TMK	Parcel	Owner(s)	Size
PARCELS ALONG TRAIL (Preferred Alignment)				
3	6 5 03			
		1	Bank of Hawaii Trust	1.7--- ac
			The Easley Corporation	
		2	GREENWOOD CENTER LLC	5.068 acs
		4	County of Hawaii	1.149 ac
		44	CARTER PROFESSIONAL CENTER	
		45	Canada France Hawaii Telescope Corp.	3.22580 acs
		7	Episcopal Church of Hawaii	74,968 sf
		6	Episcopal Church of Hawaii	25,901 sf
		29	FHB TRUST RE SVC	
		12	Ronald Robert Young Revocable Living Trust	30,262 sf
		15	Norma M Matsumoto	46,250 sf
			HAYASHI,RICHARD I	
			HAYASHI,THOMAS K	
		18	Hiroko Tanaka Trust	
			George Tanaka	
			Naomi Harper-Tanaka	
			Hiromi Tanaka	
			Tamiko Buckley	
		47	Kimberly A Young	19,931 sf
		17	Hiroko Tanaka Trust	
			George Tanaka	
			Naomi Harper-Tanaka	
			Hiromi Tanaka	
			Tamiko Buckley	
		41	NAKAMURA,FAMILY TRUST	
		19	Hiroko Tanaka Trust	
			George Tanaka	
			Naomi Harper-Tanaka	
			Hiromi Tanaka	
			Tamiko Buckley	
		34	WAIKII-KAMUELA COTTAGES	
		30	Bank of Hawaii Trust	23,871 sf

			The Easley Corporation	
		40	RAPOZA,FRANK C	
		35	LEWI,CLINT L K	
		39	Isami Nishie & Wf Dorothy E. Trust	
		36	KILGORE,MATTHEW	
			KILGORE,PATRIZIA R	
		13	WAIMEA PROPERTIES LLC	
		38	SANBORN,JEVON W	
		37	PUHI,WALTER L JR	
			PUHI,LEILA A K	
		32	CHOCK WAIMEA PARTNERS	
			C & T RESTAURANTS LLC	
		46	Episcopal Church of Hawaii	
		5	Parker Land Trust	1.040 ac
		8	LPSR PROPERTIES, LLC	
		9	MAXIM INTEGRATED PRODUCTS INC	
3	6 5 04			
		12	HAWAII BAPTIST CONVENTION	
		99	Parker Ranch Foundation Trust	
		10	Marcelle Francoise Loren Trust	
		15	State of Hawaii	
		14	California INSTITUTE OF Technology	
		63	Parker School	
		25	Parker School	
		79	State of Hawaii	
		56	Hawaii Conference Foundation	
		16	Ida Iliff Perkins Revocable Living Trust	
		8	Church of the Living God	
		13	FHB TRUST RE SVC	
		6	State of Hawaii - Waimea Public Park	
		11	Walter Kihoi	
		63	Parker School	
3	6 5 05			
		20	YIM,ROWELL A TRST	38,825 sf
			WAIMEA INN INC	
			YIM,LILA-ANNE K TRST	
		1	Puna Plantation Hawaii, Ltd	55,525 sf
		2	Puna Plantation Hawaii, Ltd, et al	1.434 ac
		3	Puna Plantation Hawaii, Ltd	2.68 acs
		18	Parker School	1.205 ac

		4	Puna Plantation Hawaii, Ltd	18,347 sf
		15	Puna Plantation Hawaii, Ltd	11,882 sf
		13	DAHLBERG,CHARLES W TRST	0.077 ac
			DAHLBERG,SHEA ELIZABETH MANUKIAILANI	
			DAHLBERG,JAMES LEE KAWOHIKIAILANI	
		14	DAHLBERG,CHARLES W TRST	0.180 ac
			DAHLBERG,SHEA ELIZABETH MANUKIAILANI	
			DAHLBERG,JAMES LEE KAWOHIKIAILANI	
		5	ALII COCONUT INC	
		6	WONG 2006 TRST	11,409 sf
			DAHLBERG,SHEA ELIZABETH MANUKIAILANI	
			DAHLBERG,CHARLES W	
			DAHLBERG,JAMES LEE KAWOHIKIAILANI	
		21	Bank of Hawaii Tr/Himin Inc	18,512 sf
		10	Mrs. Miriam W. Koki	
		19	Parker School	45,694 sf
		23	County of Hawaii	745 sf
		7	Puna Plantation Hawaii, Ltd	
3	6 05 09			
		24	Edith S. Mitsunaga Trust	
		41	PA'A AINA TRUST	
		63	Michael and Jennifer Bryan	
		16	BOYETT,JAMES CASEY	
			BOYETT,BLOSSOM CHING TRST	
		18	WILLMAN,MARK G	
			WILLMAN,GINA L	
		84	UYEDA,YOSHIMI	
			UYEDA,FAMILY TRST	
		85	COOK,MARY ANN TRUST	
		86	JOHNSON,SCOTT CARL	
			JOHNSON,ZOE CHRYSSEMA	
		92	Cynthia M Akana	
		93	Benjamin and Nancy Alvord	
		87	ELARIONOFF,PAULA E	
		64	ELARIONOFF,PAULA E	
		73	NORMAN,DENNIS	

			NORMAN,MARY	
		72	KIMURA CONDO	
			KIMURA,SAMUEL	
			KIMURA,ELLA	
		63	Michael and Jennifer Bryan	
		24	Edith S Mitsunaga Revocable Living Trust	
		17	VARNEY,MICHAEL L	
			VARNEY,VIVIAN R	
		19	Ernestine Young	
		20	Joseph A. Patterson Trust	
		87, 64	ELARIONOFF,PAULA E	
		73	NORMAN,DENNIS	
			Mary Norman	
		96	James W Steckling	
		95	HEWETT,MELVIN B	
			SORENSEN,JULIE	
		44	Shigaru and Emily Sakata	
		43	Yaroku and Elaine Dochin	
		42	Minaru Matsuura & Wf Thelma	
		2	HALL,HOWARD TRUST	
			HALL,PATRICIA TRUST	
		97	David amd Stacey Porteus	
		98	Sheila Darlene Cooper	
		99	James H Nelson IV	
			Christine Cash	
		2	KEANAAINA,LUANA	
			KATO,LIVIA	
		94	KAMISATO,KERRY K	
			KAMISATO,MARY M	
		95	HEWETT,MELVIN B	
			SORENSEN,JULIE	
		96	STECKLING,JAMES W TRST	
		97	David amd Stacey Porteus	
		98	COOPER,SHEILA DARLENE	
		99	James H Nelson IV	
			Christine Cash	
		100	KEANAAINA,LUANA	
			KATO,LIVIA	
			NAKAMOTO,SHIRLEY P	
3	6 06 01			

		40	State of Hawaii Dept of Public Works Corporation Yard	2.41 acs
		16	Hawaii Elec. Light Co., Inc.	3.0 acs
		77	Hawaiian Home Lands	
		56	County of Hawaii - PROR Rd Easement	
		50	State of Hawaii (County of Hawaii Kamuela Rubbish Dump)	
		48	Charles M Hutchison	
			Betty C. Hutchison	
			Charles Hutchison	
			Charles Hutchison	
			Henry K Mika, Jr.	
			Henry Hutchison	
			Lucy K Mata	
			Ernest K Mika	
			Eugene Mika	
			Mary Ann Dudoit	
			Frederick Hutchison	
		2	State Of Hawaii	
			RICE,HAROLD F JR	
		9	State of Hawaii	
			DAVIS,GARY L	
		10	State of Hawaii	
		38		
3	6 06 03			
		7	State of Hawaii (The Outdoor Circle)	
		6	State of Hawaii	
		10	Parker Land Trust	
		13	Parker Land Trust	
		2	Parker Land Trust	
		11	Parker Land Trust	
		8	Parker Land Trust	
		3	Parker Land Trust	
		4	Parker Land Trust	
3	6 06 04			
		1	LONG,WILLIAM FLOYD	1.453 ac
			LONG,LYNDA ARTHUR	
		2	TUREK,SUE	1.230 ac
		121	VU,DAVID	
		122	KIMOKEO,CHARLES Y K	
			KIMOKEO,DEBRA A S	

		123	MIELKE,MARC	
		12	State of Hawaii	
3	6 06 05			
		35	RIOPEL,RICHARD/HARRIET TRST	
		25	Kiyotsugu and Shizuko Hirako	
		27	YAGI,ROANNE H	
			ROBB,CHRISTOPHER J	
			ROBB,VIRGINIA S	
3	6 06 08			
		31	Irma I Loper	
		28	Theodore Bell Jr	
			TAYAN,ROSALIND K	
		32	Peter A In	
		30	Beverly Louise SKLADZIEN	
		29	Amy Shioji Trust	
			REMOVED FROM MAP - NOT ON PROPERTY	
		33	Michelle Kim Hanano	
		35	Takako Ota	
			OTA,ELMER SHOJI	
			OTA,MICHELE SACHIKO	
		36	Reid and Nu Daeng Finch	
		37	Frank N Tanaka Trust	
			TANAKA,YAEKO TRUST	
			TANAKA,DEE ANN	
		38	Elmer Ota	
			Joy Ota	
		34	SERRAO,DONALD/MARILYN TR	
			SERRAO,STEPHANIE A	
			SERRAO,DOUGLAS A	
3	6 06 09			
		1	MONAHAN,DAVID JAMES	
			MONAHAN,LAURA ELIZABETH SIMPSON	
		2	SHEPARD,MARIEROSE M	
		3	FERREIRA,MANUEL U	
		4	SHIMIZU,WAYNE	
			SHIMIZU,HELEN HOOKE	
		5	HAWAII PREPARATORY ACADEMY	
		6	MAR,THOMAS W	
			ZALESKI,JUDITH MAR TRST	

			ENGBRECHT,PATRICIA M TRST	
		7	DOI,NELSON K TRUST	
			DOI,EIKO TRUST	
3	6 06 10			
		10	PETERSEN,HUGH G III	
			PETERSEN,JUDITH A	
		11	GARON,STEVE	
		12	GRECO,JOAN	
		13	HARRIS,ROGER A	
			HARRIS,KADIE F	
		25	MEHRING,JEFFREY GERALD	
		17	BRKLACICH,RICHARD S	
			ALDERSON,ANDREA	
		23	NIELSEN,KURT R	
			NIELSEN,KATE B	
		26	RICHARDS,SARAH MARKS TR	
		28	DELMER,PHILIP RONALD	
			DELMER,DIANE CORRINE	
		16	JOHNSON,NANCY N	
		24	DOUGLAS,RANDY E	
			LANGTON,CHERYL ANN	
		21	BIRNBAUM,MARCIA ANN	
		27	CARNETT,WILLIAM G TR	
			CARNETT,JEWEL T TR	
		20	PERRY,STEPHEN LAURENCE	
			PERRY,ROBYN MARY	
		15	FUJIMOTO,MICHAEL K	
			FUJIMOTO,THUY N	
		18	BROOKS,BURTA A TR	
		14	MAUKA HOLUALOA IV PARTNERSHIP	
		19	MOYNAHAN,BRENDAN G TR	
3	6 06 11			
		1	MALONEY,TR	
		2	THURSTON,CHARLES PAUL K JR	
			THURSTON,KATHLEEN K S L	
		3	BRILHANTE,WILLIAM V TRST	
		4	WIESMANN,KEVIN M	
			BUDDENHAGEN,JENNIFER M M	
		5	ANDERSON,DALE L	

			ANDERSON,DOROTHY S	
			AIONA,DAWN E	
			AIONA,WILLIAM T JR	
		6	MARYL GROUP INC	
		7	TABOR,FRAN L TR	
		8	MULLI,CHRIS	
INT'L ADDRESS			MULLI,EVELYN Q	
		9	KUME,MASAHIRO	
			KUME,KUNIKO	
		10	DIPRONIO,CARMINE III	
		17	STACY,BRET H	
			HEVERLY,DORE-JEAN	
		18	BAYBROOK GEORGE W	
			BAYBROOK-HECKENBACH,REBECCA	
			HECKENBACH,JAMES	
			BAYBROOK,MARGIE A	
3	6 07 02			
		30	US Reif/MJW Waimea Fee LLC	
		27	US Reif/MJW Waimea Fee LLC	
			BANKOH CORPORATION	
		32	US Reif/MJW Waimea Fee LLC	
		21	US Reif/MJW Waimea Fee LLC	
		46	US Reif/MJW Waimea Fee LLC	
			Campbell & Sims	
3	6 02 01			
		2	State of Hawaii - Palekoki Ranch Inc.	
PARCELS ALONG ALTERNATE ROUTE				
3	6 05 06			
		15	Parker Ranch Foundation Trust	3.635 acs
			MARY E REVANA	
		18	Richard Smart Trust	0.5802 ac
			William White III Trust	
		1	Parker Ranch Foundation Trust	1.7576 ac
			Ryan White Trust	
			William White III Trust	
			Paul White Trust	
		16	Parker Ranch Foundation Trust	1.759 ac
			Campbell Family Trust	

			William White III Trust	
3	6 01 03			
		25	State Of Hawaii (Kawaihae Harbor Project)	20.165 acs
3	6 05 01			
		10	DEPT OF HAWN HOME LANDS	230.127 acs
			SOLOMON FLORA	
		9	Parker Land Trust	
		54	ANDRADE,JADELYN HOONANEA	1.928 ac
		53	KEKAMALEI FAMILY LTD PARTNERSHIP	0.616 ac
		45	Waimea Gardens (Condominiums)	
		55	BEERMAN,LEE BRUCE	0.50 ac
		51	Hawaii Preparatory Academy	1.204 ac
		33	Hawaii Preparatory Academy	101.616 acs
3	6 06 04			
		56	BATES GALE R	0.064 ac
			BATES MICHAEL K	
			VAN DER OORD CHAREE L	
			VAN DER OORD WILLEM J	
		57	KOPRA BARBARA S	13,235 sf
			KOPRA DAVID L	
		117	MONAHAN,DAVID	20,644 sf
			MONAHAN,LAURA	
	INTL ADDRESS	85	LANG BERNADETTE BOUVET TR	
		114	PURELL KEVIN F E	0.585 ac
			PURELL MELORA K	
		115	MONAHAN DAVID J	0.775 ac
			MONAHAN LAURA E	
		112	COX FAMILY TRUST	0.506 ac
3	6 02 01			
		9	Parker Land Trust (Kamuella View Estates)	166.665 acs
		8	Parker Land Trust	894.742 acs
		5	State of Hawaii, Parker Ranch Inc.	
3	6 05 01			
		6	State of Hawaii	
			Parker Ranch, Inc.	
		8	Hawaii Preparatory Academy	
		9	Parker Land Trust	
		52	Parker Ranch Foundation Trust	9.048 acs
			William White III Trust	

		2	Parker Ranch Foundation Trust	23.440 acs
			William White III Trust	
		14	PERRY-FISKE,ANNA L CHARI TR	108.98 acs
3	6 05 06			
		9	Parker Ranch Foundation Trust	
			Mary E Revana	
		3	PERRY-FISKE,ANNA L CHARI TR	3.406 acs
		8	LINDSEY RONALD	
			SMART STEFANIE LEE HAVENS	
		12	SMART,STEFANIE LEE HAVENS	3.305 acs
		5	Parker Ranch Foundation Trust	0.260 ac
			PARKS,JEROME P JR	
			PARKS,JANIS L	
		13	LINDSEY, RONALD	
			LINDSEY, RONALD C	
3	6 05 12			
		30	Michael Hale	31,995 sf
		31	State of Hawaii	12,165 sf
		29	MATSUNAGA,PETER H	43,032sf
		7	VAN DER HEYDEN,GEORGE E	1.010 ac
			VAN DER HEYDEN,GRETCHEN H	
		8	PAKO HOMEOWNERS ASSOCIATION	0.604 ac
		1	WARD,HAROLD L TR	1.587 ac
			WARD,MARY ANN TR	
		6	CHANCER,LAUREN S TR	1.106 ac
		5	CHANCER,ROBERT P TTEE	1.348 ac
		27	MORIFUJI,TOMIKO W	10,614 sf
			MORIFUJI,TOMIKO TR	
		23	BUDGE,ALEXANDER G JR TR	12,859 sf
		18	AINSLIE,SAMUEL E TR	
			AINSLIE,LAURIE T TR	
		17	JOHNSON,LILIAS J H TR EST	25,031 sf
		14	YARAWAMAI,MAXIMUS	21,371 sf
			YARAWAMAI,CYNTHIA JO	
		9	State of Hawaii	35,329 sf
		12	BRUTOCO,RINALDO S	
			BRUTOCO,LALLA S	30,844 sf
		11	BALLESTEROS,MAILE S	27,899 sf
		10	HANANO,MICHAEL Y	13,161 sf
			HANANO,MARY JANE	


3	6 05 01			
		6	State of Hawaii	135.00 acs
			Parker Ranch, Inc.	
		8	Hawaii Preparatory Academy	
		14	PERRY-FISKE,ANNA CHARIT TR	108.98 acs
		9	Paker Land Trust	
3	6 06 04			
		89	HENRICKSON,ROBERT L	0.506 ac
			HENRICKSON,BETTY Y K	
		96	PHILLIPS,JAMES S TR	28,500 sf
			PHILLIPS,NANCY J TR	
		58	TEGMAN,BRUCE A	0.18 ac
			BUSCHER,LINDA ROSE	
			TEGMAN,JANE M	
			PHILLIPS,NANCY S TR	
			BUSCHER,JOHN HARRY	
			PHILLIPS,JAMES S TR	
		91	PAULSON,DIANE	0.819 ac
		90	PHILLIPS,JAMES S TR	14,500 sf
			PHILLIPS,NANCY S TR	
		1	LONG,WILLIAM FLOYD	
			LONG,LYNDA ARTHUR	
3	6 05 09			
		25	Hawaii Housing Authority	30,000 sf
		26	Hawaii Housing Authority	30,000 sf
		27	VENTIMIGLIA,BONNIE	30,000 sf
		28	PECK,DANIEL DOUGLAS	8,460 sf
			LOREN,MARCELLE FRANCOISE	
		29	SUNAHARA,ALYSANDRA NAOMI TR	20,000 sf
		30	KANESHIRO,MELVIN T TR	20,000 sf
		31	KANESHIRO,MELVIN T TR	20,000 sf
		32	KANESHIRO,EHTEL Y TRUST	17,000 sf
3	6 05 03			
		28	HAMADA,Y OHANA LLC	1.15 ac
		12	YOUNG,RONALD ROBERT TR	
			YOUNG,BETTY SPENCER TR	
		13	Waimea Properties, LLC	30,262 sf
		15	MATSUMOTO,NORMA M	46,250 sf
			HAYASHI,RICHARD I	
			HAYASHI,THOMAS K	

		17	Hiroko Tanaka Trust	
			George Tanaka	
			Naomi Harper-Tanaka	
			Hiromi Tanaka	
			Tamiko Buckley	
		18	Hiroko Tanaka Trust	
			George Tanaka	
			Naomi Harper-Tanaka	
			Hiromi Tanaka	
			Tamiko Buckley	
		47	YOUNG,KIMBERLY A	19,931 sf
3	6 06 12			
		22	Hawaiian Home Lands	12.66 acs
		23	Hawaiian Home Lands	3.45 acs
3	6 02 01			
		2	State of Hawaii	166.665 acs
			Parker Land Trust	
		11	State of Hawaii	144 acs
			Parker Ranch, Inc.	
3	6 02 06			
		23	RYAN,GREGORY JAMES	18,569 sf
			RYAN,CECELIA ANNE	
		22	RYAN,GREGORY J	20,258 sf
			RYAN,CECELIA A	
		13	HAMADA,TERRY H TR	15,148 sf
			HAMADA,JOYCE S TR	
		12	CORDEIRO,ALBERT E TR	15,064 sf
			CORDEIRO-VIERRA,IRENE M TR	
		1	CHUTE,JOHN	15,116 sf
			CHUTE,CHRISTINA	
		21	MADONNA,ANNETTE M	15,003 sf
		14	REDISKE,ROBERT G	15,472 sf
		42	COHEN,RICHARD W	17,748 sf
		24	SEIFRIED,JOANNE G	15,415 sf
		20	SOONG,MELVIN K TRST	
			SOONG,BARBARA N TRST	
		19	HOKOANA,EVAN B K	
			HOKOANA,LESLIE N F	
		18	FARIAS,MARK K	
			FARIAS,DIANNA L	

		50	ANDERSON,BRIAN	
			CROSTHWAITE,RUBY	
			CROSTHWAITE,ANGEL	
		49	URBIC,MICHAEL S	
			URBIC,LORRAINE	
		48	KLEIN-ODA,BILLIE L	
		47	KOUKE,ROLAND T	
		46	CHENG,WOOD TR 2004	
		45	WELCH,ALISON	
		44	SANCHEZ,EUGENIO C	
			SANCHEZ,ANGELITA C	
3	6 06 01			
		77	Hawaiian Home Lands	
3	6 02 18			
		1	SCHAEFER,JERALD J/HELEN I SURVIVOR'S TR	
		2	BARLOW,ROBERTA H TR	
		3	SHIVELY,KURT B TR	
			SHIVELY,LADONNA M TR	
		4	DAWSON,JOHN	
			DAWSON,BEVERLY	
		5	MEDEIROS,DREW WILLIAMS KALANI	
			MEDEIROS,MICHELLE KAY FUJIE TAIRA	
3	6 06 06			
		3,4,5	State Of Hawaii	
			EDNIE,RICHARD D	
		6	BUTTERFIELD,ROBERT H TRUST	
			BUTTERFIELD,CHARLOT K TRUST	
		17	EDNIE,RICHARD D TRUST	
			EDNIE,SANDRA F TRUST	

Appendix B Land Commission Awards

Page 1 of 7



Articles
Information
Samples
Gallery
About Us
Contact Us

Mahele Database
Boundary Commission
Land Grants
Royal Patents
Review Cert & Checkout

DOCUMENT DELIVERY Change password Log out

Mahele Database Documents
Number: 00589B

Claim Number:	00589B		
Claimant:	Naholowaa		
Other claimant:			
Other name:	Kaholowaa		
Island:	Hawaii		
District:	Kohala, South		
Ahupuaa:	Waimea		
Ili:	Puuapehu		
Apana:	1	Awarded:	1
Loi:		FR:	
Plus:		NR:	
Mala Taro:		FT:	65v5
Kula:		NT:	
House lot:	1	RP:	6682
Kihapai/Pakanu:	3	Number of Royal Patents:	1
Salt lands:		Koele/Poolima:	No
Wauke:		Loko:	No
Olona:		Lokoia:	No
Noni:		Fishing Rights:	No
Hala:		Sea/Shore/Dunes:	No
Sweet Potatoes:		Auwai/Ditch:	No
Irish Potatoes:		Other Edifice:	No
Bananas:		Spring/Well:	No
Breadfruit:		Pigpen:	No
Coconut:		Road/Path:	No
Coffee:		Burial/Graveyard:	No
Oranges:		Wall/Fence:	No
Bitter Melon/Gourd:		Stream/Muliwai/River:	No
Sugar Cane:		Pali:	No
Tobacco:		Disease:	No

<https://www.waihona.com/purchase.asp>
6/30/2009

Koa/Kou Trees:	Claimant Died:	No
Other Plants:	Other Trees:	
Other Mammals: No	Miscellaneous:	3 fields partly under cultivation

**No. 589B, Naholowaa, Wednesday, January 30th
F.T. 65v5**

William Beckley, sworn deposed, He wrote the claim for Naholoaa and gave it into the Land Office at Honolulu and furthermore deposed, that he knows the claim of Naholoaa to consist of 3 fields, on which he has his house lot, not enclosed, partly cultivated, situated on the Ili Puuapelu, Waimea, the gift of William Beckley, konohiki, A.D. 1846. Surrounded by waste land of konohiki. I know of no counter claim.

[Award 589B; R.P. 662; Punopelu S. Kohala; 1 ap.; 4.89 Acs]

Number: 03202B

Claim Number:	03202B		
Claimant:	Bowers, Jose		
Other claimant:			
Other name:			
Island:	Hawaii		
District:	Kohala, South		
Ahupuaa:	Waimea		
Ili:	Puuopelu		
Apana:	1	Awarded:	1
Loi:		FR:	
Plus:		NR:	
Mala Taro:		FT:	62v4
Kula:		NT:	
House lot:	1	RP:	8443
Kihapai/Pakanu:	3	Number of Royal Patents:	1
Salt lands:		Koele/Poalima:	No
Wauke:		Loko:	No
Olona:		Lokoia:	No
Noni:		Fishing Rights:	No
Hala:		Sea/Shore/Dunes:	No
Sweet Potatoes:		Auwai/Ditch:	No
Irish Potatoes:		Other Edifice:	No
Bananas:		Spring/Well:	No
Breadfruit:		Pigpen:	No
Coconut:		Road/Path:	No
Coffee:		Burial/Graveyard:	No
Oranges:		Wall/Fence:	No
Bitter Melon/Gourd:		Stream/Muliwai/River:	No

<https://www.waihona.com/purchase.asp>

6/30/2009

Sugar Cane:	Pali:	No
Tobacco:	Disease:	No
Koa/Kou Trees:	Claimant Died:	No
Other Plants:	Other Trees:	
Other Mammals: No	Miscellaneous:	3 fields & house

**No. 3202B, Jose Bowers, Waimea, Monday, January 28th 1850
F.T. 62v5**

William Beckley konohiki, sworn deposed, He wrote the claim of Jose Bowers and gave it to the Board at Honolulu. Also knows the claim of Jose Bowers, to consist of 3 fields, on which is house is built. It is not enclosed, situated in the Ili Puuopelu, Ahupuaa Waimea.

The gift of Mr. Beckley, konohiki, 1847. There is no counter claim.

[Award 3202B; R.P. 8443; Puuopelu Waimea; 1 ap.; 7.6 Acs; Index lists Jose B. Bowers]

Claim Number:	03832		
Claimant:	Poolipi		
Other claimant:			
Other name:			
Island:	Hawaii		
District:	Kohala, South		
Ahupuaa:	Waimea		
Ili:	Kauniho		
Apana:	1	Awarded:	1
Loi:		FR:	
Plus:		NR:	49v8
Mala Taro:		FT:	
Kula:		NT:	36v4
House lot:	1	RP:	
Kihapai/Pakanu:		Number of Royal Patents:	0
Salt lands:		Koele/Poalima:	No
Wauke:		Loko:	No
Olona:		Lokoia:	No
Noni:		Fishing Rights:	No
Hala:		Sea/Shore/Dunes:	No
Sweet Potatoes:		Auwai/Ditch:	No
Irish Potatoes:		Other Edifice:	No
Bananas:		Spring/Well:	No
Breadfruit:		Pigpen:	No
Coconut:		Road/Path:	No
Coffee:		Burial/Graveyard:	No

8/30/2010	https://www.waihona.com/purchase.asp	
Oranges:	Wall/Fence:	No
Bitter Melon/Gourd:	Stream/Muliwai/River:	No
Sugar Cane:	Pali:	No
Tobacco:	Disease:	No
Koa/Kou Trees:	Claimant Died:	No
Other Plants:	Other Trees:	
Other Mammals: No	Miscellaneous:	Lot for cultivation with house


No. 3832, Poolipi, Waimea, Hawaii, January 7, 1848
N.R. 49v8

Greetings to the Land Commissioners: I have a small house lot at Kauniho, Waimea, Hawaii. It is 50 fathoms by 50 fathoms. It was from William Beckley, the konohiki.
 POOLIPU

N.T. 36-37v4
 No. 3832, Poolipi, September 18, 1848

William Bakle, sworn and stated, I have seen it at the ili land of Kauniho Pahale. He had asked me for a lot for cultivation to which I had agreed. The boundaries to the place for which he had asked are all mine and I have agreed willingly. No one has objected to this day.

[Award 3832; Kauniho Waimea S. Kohala; 1 ap.; 1.6 Acs]

 Number: 04513

Claim Number:	04513
Claimant:	Paukeaho
Other claimant:	
Other name:	
Island:	Hawaii
District:	Kohala, South
Ahupuaa:	Waimea
Ili:	Keanuio manu
Apana:	1
Loi:	
Plus:	
Mala Taro:	2
Kula:	
House lot:	
Kihapai/Pakanu:	
Salt lands:	

Awarded:	1
FR:	
NR:	53v8
FT:	
NT:	32v4
RP:	8158, 8454
Number of Royal Patents:	2
Koele/Poalima:	No

<https://www.waihona.com/purchase.asp> 2/5

8/30/2010		https://www.waihona.com/purchase.asp
Wauke:	Loko:	No
Olona:	Lokoia:	No
Noni:	Fishing Rights:	No
Hala:	Sea/Shore/Dunes:	No
Sweet Potatoes:	Auwai/Ditch:	No
Irish Potatoes:	Other Edifice:	No
Bananas:	Spring/Well:	No
Breadfruit:	Pigpen:	No
Coconut:	Road/Path:	No
Coffee:	Burial/Graveyard:	No
Oranges:	Wall/Fence:	Yes
Bitter Melon/Gourd:	Stream/Muliwai/River:	No
Sugar Cane:	Pali:	No
Tobacco:	Disease:	No
Koa/Kou Trees:	Claimant Died:	No
Other Plants:	Other Trees:	
Other Mammals: No	Miscellaneous:	Awarded 1 apana; 1 house; 2 taro gardens in forest


No. 4513, Paukeaho, Waimea, Hawaii, January 12, 1848
N.R. 53v8

Greetings to the Honorable Land Commissioners: I wish to explain to you that I have a houselot at Keanuimano, Waimea, Hawaii, which was from William Beckley. The length is 40 fathoms, the width is 35 fathoms. It is enclosed with a stone wall and there are two houses in it. I desire to secure this place for myself. There are two taro gardens in the forest of this land.
 PAUKEAHO

N.T. 32v4
 No. 4513, Paukeaho, September 16, 1848, Done

William Backle, sworn and stated, "I have seen the house-lot in my ili land at Keanuimano in Waimea, Hawaii. I have given my approval for this house-lot just as he has indicated in his document. It has been partially enclosed with one house in it and the entire boundary is mine. I have agreed he may have the area which he has cultivated, but I have never known its boundaries; perhaps the surveyor may know because they had this place before and when I had acquired this land, I learned then that his interest is mine, where he now is living. No one has objected to him."

[Award 4513; Land Patents 8158; Keanuimano S. Kohala; 1 ap.; 1.35 Acs]

 Number: 04886

Claim Number: **04886**

<https://www.waihona.com/purchase.asp> 3/5

8/30/2010	https://www.waihona.com/purchase.asp	
Claimant:	French, William	
Other claimant:		
Other name:		
Island:	Hawaii	
District:	Kohala, South	
Ahupuaa:	Waimea	
Ili:	Pahonu	
Apana:	1	Awarded: 1
Loi:		FR: 5v3
Plus:		NR:
Mala Taro:		FT: 167v2
Kula:		NT: 494v4
House lot:		RP: 68
Kihapai/Pakanu:		Number of Royal Patents: 1
Salt lands:		Koele/Poalima: No
Wauke:		Loko: No
Olona:		Lokoia: No
Noni:		Fishing Rights: No
Hala:		Sea/Shore/Dunes: No
Sweet Potatoes:		Auwai/Ditch: No
Irish Potatoes:		Other Edifice: No
Bananas:		Spring/Well: No
Breadfruit:		Pigpen: No
Coconut:		Road/Path: No
Coffee:		Burial/Graveyard: No
Oranges:		Wall/Fence: No
Bitter Melon/Gourd:		Stream/Muliwai/River: No
Sugar Cane:		Pali: No
Tobacco:		Disease: No
Koa/Kou Trees:		Claimant Died: No
Other Plants:		Other Trees:
Other Mammals:	No	Miscellaneous: Slaughter house, grass houses, cookhouse
No. 4886, W. Franch [French], February 2, 1848		
N.T. 494-495v2		
There is a cattle slaughter house at Waimea in Hawaii.		
S. Rice, sworn by the Word of God and stated, I have seen when Kuakini had said, "I like one of Mr. French's horses very much." After this French had given [Kuakini] one of his good horses and that is how he had received that cattle slaughtering area in Waimea. It has been enclosed with a stone wall and		
https://www.waihona.com/purchase.asp		4/5

8/30/2010

<https://www.waihona.com/purchase.asp>

French has lived there well to this time; no one has objected to him.

John G. Munn, sworn by the Word of God and stated, My testimony is almost the same as Rice's that which he has just given here because in the year 1840 Kuakini and I bought that famous horse. I have seen Kuakini give that land for that horse and since that time there was peaceful living to the present time. No one has ever objected to French.

[Award 4886; R.P. 68; Puloa Waimea S. Kohala; 1 ap.; 2.8 Acs; See No. 4884 for Foreign Register and Foreign Testimony documents]



<https://www.waihona.com/purchase.asp>

5/5

Appendix C SHPD Correspondence

LINDA LINGLE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
601 KAMOKILA BOULEVARD, ROOM 555
KAPOLEI, HAWAII 96707

LAURA H. THELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUIJ
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

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

August 5, 2009

Hallett H. Hammatt, Ph.D.
Cultural Surveys Hawaii, Inc.
PO Box 1114
Kailua, Hawaii 96734

LOG NO: 2009.3224
DOC NO: 0908MD07
Archaeology

Dear Dr. Hammatt

**SUBJECT: Chapter 6E-8 Historic Preservation Review –
Archaeological Inventory Survey of 8.96 Acres with Three (3) New Sites
Lalamilo Ahupua`a, South Kohala District, Island of Hawaii
TMKs: (3) 6-5-003:004, 005, 007 & 044 (all. por.) and 6-6-003:006 & 013 (both. por.)**

This letter reviews the aforementioned report (*Yucha, Shideler and Hammatt 2009; Draft Archaeological Inventory Survey for the Waimea Trails and Greenway Project, Lalamilo Ahupua`a, South Kohala District, Hawaii Island, TMK: [3] 6-5-003:004 por., :005 por., :007 por., :044 por., 6-6-003:006 por., :013 por; SCH Job Code: LALAMILO 1*) which we received on July 22, 2009. This report summarizes an archaeological inventory survey in which three new sites were recorded. The three sites are: SIHP 50-10-06-26871, a WWII-era infrastructure associated with Camp Tarawa, recommended as significant under criteria "a" and "d"; SIHP -26872, an early post-contact era irrigation ditch (Akona's *Auwai*), recommended as significant under criteria "a", "c" and "d"; and SIHP -26873, an historic-era concrete ford and associated roadway, recommended as significant under criterion "d."

This AIS covers Phase 1 of the Waimea Trails and Greenway Project, and follows a site reconnaissance conducted by your firm around 2000. Phase 1 is the portion of the trail that will be ADA-accessible. A site visit was conducted by SHPD Hawaii Island Section Assistant Archaeologist Morgan Davis with project engineers David and John Imata of Imata & Associates; Galen Kuba from the County of Hawaii Department of Public Works, and Bobby Command, County of Hawaii Assistant to the Mayor.

We have some general questions/comments that we are requesting be clarified:

1. Was the survey done for this Phase 1 8.96 acres, or does the acreage represent the entire area that will be ultimately surveyed as part of the entire trail? In the Management Summary on p. 1 the entire acreage is listed as the project area, but in the Environmental Setting section on p. 8 this survey is said to cover 1.1 of a total 12 miles of the project.
2. In the Background Research section, please include information on the arrival of cattle to Hawaii.
3. Please include a chart in your Summary and Interpretation section indicating your recommendations for significance etc. for the sites. This information is currently only available in the Management Summary.

Dr. Hallet H. Hammatt
Page 2 of 2

We have concerns about some of the recommended significance evaluations and treatments, as detailed below.

Site 26871: We concur with the suggested significance assessments for this site, however, we cannot at this time concur with the proposed treatment. We do not find that either the current context or condition of either feature is sufficient to warrant the avoidance (preservation) you propose as a mitigation measure. Feature A is broken and no longer functional; we suggest that the portion of the ford containing the written name and date be recovered for use in a permanent interpretive marker at this location.

The Feature B asphalt-paved roadway has been extensively modified by current landscaping as part of the Greenways project as it runs from the parking area through an interpretive garden. Signs, water lines, sewer plumbing, a park bench and wooden steps all impinge into the current roadway and associated embankment. It is therefore no longer in a setting or context that represents the World War II era. We believe that sufficient information has been obtained by this AIS, and that no further work is required to document this section of the road.

Site 26872: You recommend that the portion of the ditch within the project area is significant under criteria "a", "c" and "d". We would appreciate an expanded explanation for why you are recommending criteria "a" and "c". The ditch has apparently been repeatedly damaged (during WWII and roadway constructions in the past); we would appreciate your thoughts on its qualities as an excellent example of its type (criterion "c"). We will consider the recommended treatment for this site after the question regarding criterion "c" has been addressed.

Site 26873: We concur with the recommended significance under criterion "d" for this a post-Contact ford, and concur with your recommendation of no further work for this site.

We look forward to reviewing a revised version of this AIS. If you have questions about this letter please contact Morgan Davis of our Hawaii Island Section at (808) 933-7650.

Aloha,



Nancy McMahon, Deputy SHPO/State Archaeologist
and Historic Preservation Manager
State Historic Preservation Division

Final
Archaeological Inventory Survey
For the Waimea Trails and Greenway Project
Lālāmilo Ahupua‘a, South Kohala District, Hawai‘i Island
TMK: [3] 6-5-003:004 por., :005 por., :007 por., :044 por.,
6-6-003:006 por., :013 por.

Prepared for
Gerald Park, Urban Planner

Prepared by
Trevor M. Yucha, B.S.,
David W. Shideler, M.A.,
and
Hallett H. Hammatt, Ph.D.

Cultural Surveys Hawai‘i, Inc.
Kailua, Hawai‘i
(Job Code: LALAMILO 1)

August 2009

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Management Summary

Reference	<i>Final</i> Archaeological Inventory Survey For the Waimea Trails and Greenway Project, Lālāmilo Ahupua‘a, South Kohala District, Hawai‘i Island, TMK [3] 6-5-003:004 por., :005 por., :007 por., :044 por., 6-6-003:006 por., :013 por. (Yucha et al. 2009)
Date	August 2009
Project Number (s)	Cultural Surveys Hawai‘i, Inc. (CSH) Project Code: LALAMILO 1
Investigation Permit Number	The fieldwork for this archaeological inventory survey investigation was carried out under archaeological permit number 09-20 issued by the State Historic Preservation Division / Department of Land and Natural Resources (SHPD/DLNR)
Project Location	The project area is defined by a narrow corridor extending along and occasionally crossing Waikōloa Stream between Lindsey Road and Kahawai Street in Lālāmilo Ahupua‘a, South Kohala District, Hawai‘i Island. The project area is depicted on the 1995 Kamuela USGS 7.5-minute topographic quadrangle.
Land Jurisdiction	TMK [3] 6-5-003:004 is understood to be owned by the County of Hawai‘i, TMK [3] 6-5-003:005 and 6-6-003:013 are understood to be owned by Parker Land Trust, TMK [3] 6-5-003:007 is understood to be owned by the Episcopal Church in Hawai‘i, TMK [3] 6-5-003:044 is understood to be owned by the Carter Professional Center, and TMK [3] 6-6-003:006 is understood to be owned by the State of Hawai‘i.
Agencies	SHPD/DLNR
Project Description	The proposed project involves the development of a cleared and marked trail along Waikōloa Stream. The section of proposed trail within the current project area is part of The Waimea Trails and Greenway Project which is designed to provide a green belt through Waimea town for non-motorized transportation.
Project Acreage	The current project area consists of 8.96 acres. In its entirety the trail and green way project may extend about 12 miles, however, the current archaeological inventory survey only covers approximately 1.1 miles of the easternmost extent of the trail system.
Area of Potential Effect (APE)	For the purposes of the current archaeological inventory survey, the APE is defined as the entire, approximately 8.96-acre, project area.

Historic Preservation Regulatory Context	This document was prepared to support the proposed project's historic preservation review under Hawai'i Revised Statutes (HRS) Chapter 6E-8/42 and Hawai'i Administrative Rules (HAR) Chapter 13-13-275/284. In consultation with the Hawai'i State Historic Preservation Division (SHPD), the archaeological inventory survey investigation was designed to fulfill the State requirements for an archaeological inventory survey per HAR Chapter 13-13-276.
Fieldwork Effort	The fieldwork component of this archaeological inventory survey was accomplished on June 26, 2009 by two CSH archaeologists, Trevor Yucha, B.S. and David Shideler, M.A. under the general supervision of Hallett H. Hammatt, PhD (principal investigator). The fieldwork required approximately 1 person-day to complete.
Number of Historic Properties Identified	A total of three historic properties were identified within or near the current project area.
Historic Properties Recommended Eligible to the Hawai'i Register of Historic Places (Hawai'i Register)	<p>All of the historic properties identified within or adjacent to the current project area are recommended eligible to the Hawai'i Register:</p> <p>SIHP# 50-10-06-26871 (CSH 1), WWII-era infrastructure associated with Camp Tarawa, is recommended as significant under Hawai'i Register - Criteria A and D.</p> <p>SIHP# 50-10-06-26872 (CSH 2), an early post contact irrigation ditch (Akona's <i>'Auwai</i>), is recommended as significant under Hawai'i Register - Criteria A and D.</p> <p>SIHP# 50-10-06-26873 (CSH 3), a historic-era concrete ford and associated roadway, is recommended as significant under Hawai'i Register - Criterion D.</p>
Effect Recommendation	<p>The archaeological inventory survey investigation identified three historic properties within the current project area. All three historic properties will potentially be affected by the proposed project</p> <p>CSH's project specific effect recommendation is "effect, with agreed upon mitigation measures." The recommended mitigation measures will reduce the project's potential adverse effect on these significant historic properties.</p>

Mitigation Recommendation	<p>SIHP# 50-10-06-26871 (CSH 1), consists of two features (Feature A and B) related to WWII-era infrastructure associated with Camp Tarawa. Feature A is a collapsed ford or bridge with an etched date of July 1942. Feature B is a remnant portion of roadway likely part of Abemama Road of the former Camp Tarawa. Recommendations for SIHP# 50-10-06-26871 were developed in consultation with SHPD.</p> <p>SIHP# -26871 Feature A will not be adversely affected by the current proposed trail and greenway project and therefore is recommended for preservation in the form of avoidance and protection. If, in the course of future development, SIHP# -26871 is potentially affected, "the portion of the ford containing the written name and date be recovered for use in a permanent interpretive marker at this location" (SHPD Correspondence LOG# 2009.3224, DOC# 0908MD07; See Appendix B). Interpretive signage at the location of SIHP# -26871 Feature A may be developed in consultation with SHPD to provide Waimea residents and pedestrians using the trail with information on the history of the area. Interpretive signage at SIHP# -26871 Feature A may include a short synopsis of Camp Tarawa and how the camp transformed the lives of Waimea residents during and after World War II.</p> <p>SIHP# -26871 Feature B is recommended for no further work. Sufficient information regarding location, function, age, and construction has been generated by the current inventory survey investigation.</p> <p>SIHP# 50-10-06-26872 (CSH 2), an early post-contact irrigation ditch (Akona's <i>'Auwai</i>). Preservation in the form of avoidance and protection is recommended. Any proposed alteration to SIHP# 50-10-06-26872 will prior require consultation with and approval of SHPD.</p> <p>SIHP# 50-10-06-26873 (CSH 3), a historic-era concrete ford and associated roadway. No further work is recommended. Sufficient information regarding location, function, age, and construction has been generated by the current inventory survey investigation.</p>
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Section 1 Introduction

1.1 Project Background

At the request of Gerald Park, Urban Planner, Cultural Surveys Hawai‘i (CSH) conducted an archaeological inventory survey for the proposed Waimea Trails and Greenway Project, Lālāmilo Ahupua‘a, South Kohala District, Hawai‘i Island, TMK [3] 6-5-003:004 por., :005 por., :007 por., :044 por., 6-6-003:006 por., :013 por. The proposed project area is defined by a narrow corridor extending along and occasionally crossing Waikōloa Stream between Lindsey Road and Kahawai Street. The project area is depicted on a 1995 Kamuela USGS 7.5-minute topographic quadrangle (Figure 1), tax map (Figure 2 to Figure 4), and aerial photograph (Figure 5).

The proposed project involves the development of a cleared and marked trail along Waikōloa Stream. The section of proposed trail within the current project area is part of The Waimea Trails and Greenway Project which is designed to provide a green belt through Waimea town for non-motorized transportation. The overall trail system passes through several well-known areas of Waimea, Puopelu, and Wai‘aka and 3 separate *ahupua‘a* including Lālāmilo, Waikōloa, and ‘Ōuli, on the island of Hawai‘i.

Under Hawai‘i state historic preservation legislation, archaeological inventory surveys are designed to identify, document, and provide significance and mitigation recommendations for historic properties. Under this legislation, historic properties are defined as any “building, structure, object, district, area, or site, including *heiau* and underwater site, which is over fifty years old.” A project’s effect and potential mitigation measures are evaluated based on the project’s potential impact to “significant” historic properties (those historic properties determined eligible, based on established significance criteria, for inclusion in the Hawai‘i Register of Historic Places [Hawai‘i Register]). Determinations of eligibility to the Hawai‘i Register result when a state agency official’s historic property “significance assessment” is approved by the State Historic Preservation Division/Department of Land and Natural Resources (SHPD/DLNR), or when SHPD/DLNR itself makes an eligibility determination for an historic property (HAR Chapter 13-284).

In consultation with SHPD, this inventory survey investigation was designed to fulfill the state requirements for archaeological inventory surveys (HAR Chapter 13-276).

1.2 Scope of Work

The following archaeological inventory survey scope of work is designed to satisfy the Hawai‘i state requirements for archaeological inventory surveys (Hawai‘i Administrative Rules [HAR] Chapter 13-276 and Chapter 13-275/284):

- 1) Historic and archaeological background research, including a search of historic maps, written records, Land Commission Award documents, and the reports from prior archaeological investigations. This research will focus on the specific project area’s past land use, with general background on the pre-contact and historic settlement patterns of the *ahupua‘a* and district. This background information will be used to compile a

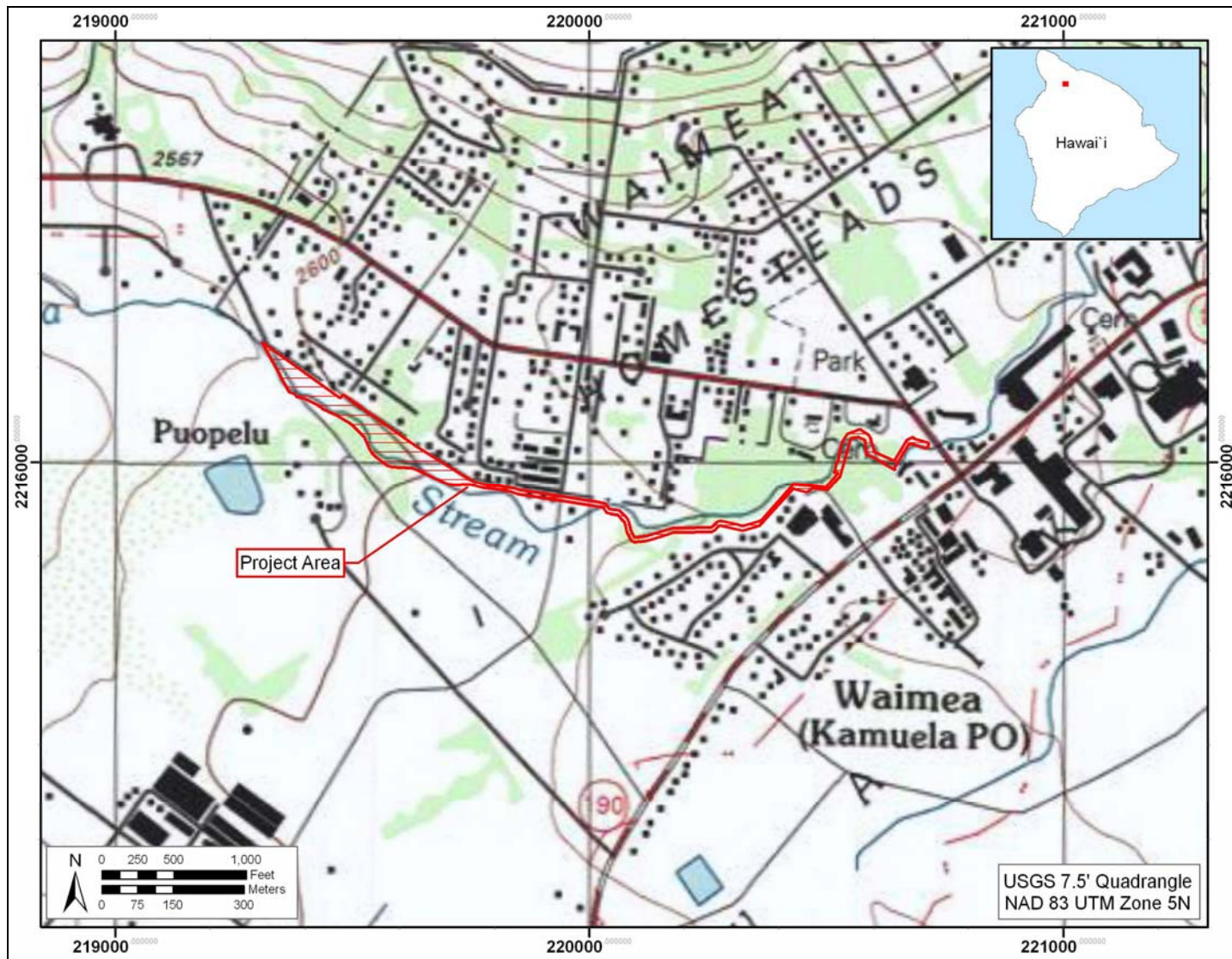


Figure 1. Portion of the 1995 Kamuela USGS 7.5-minute topographic quadrangle showing the current project area

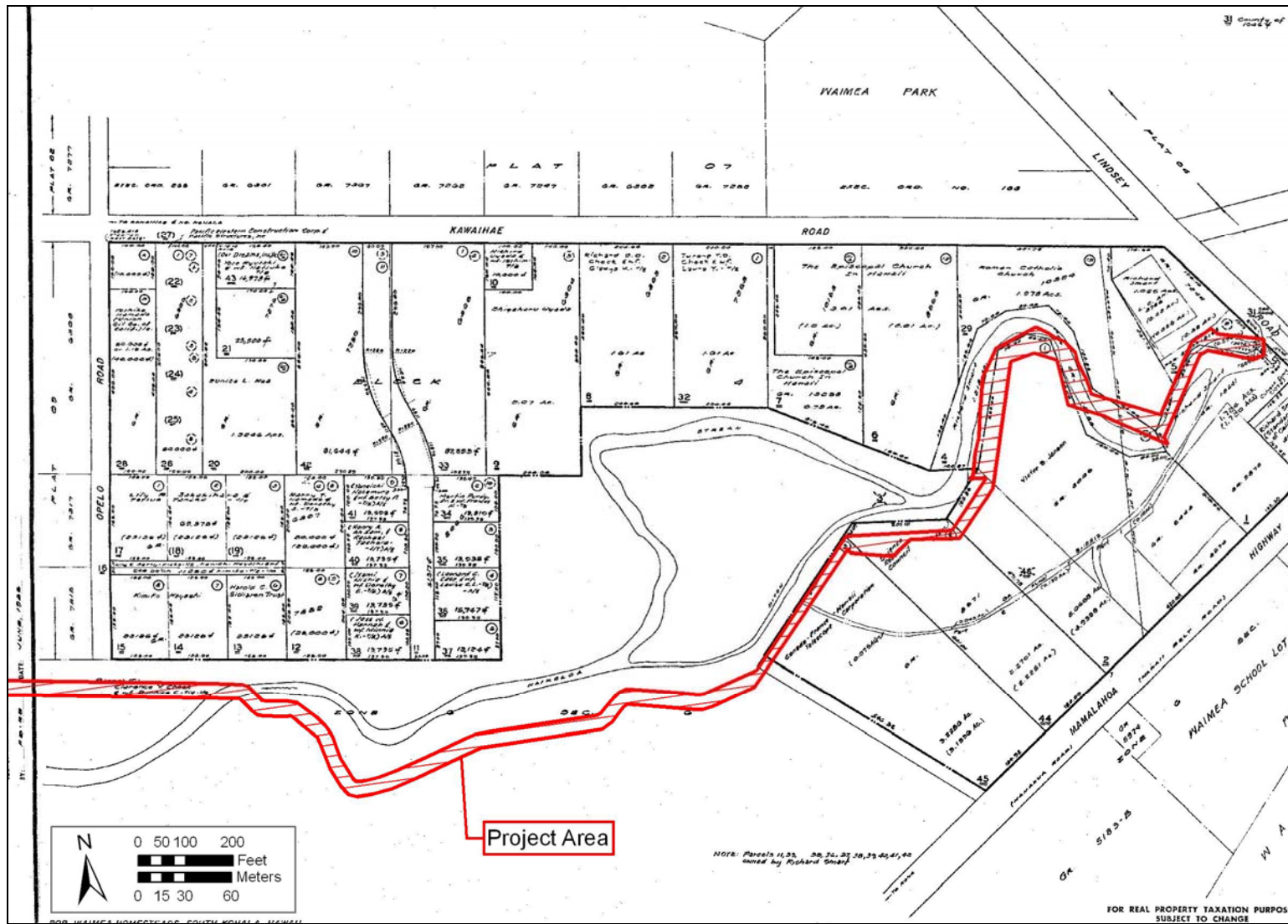


Figure 2. Tax Map Key (TMK) [3] 6-5-03 showing the eastern half of the project area

Archaeological Inventory Survey For the Waimea Trails and Greenway Project, Lālamilo, South Kohala, Hawai'i

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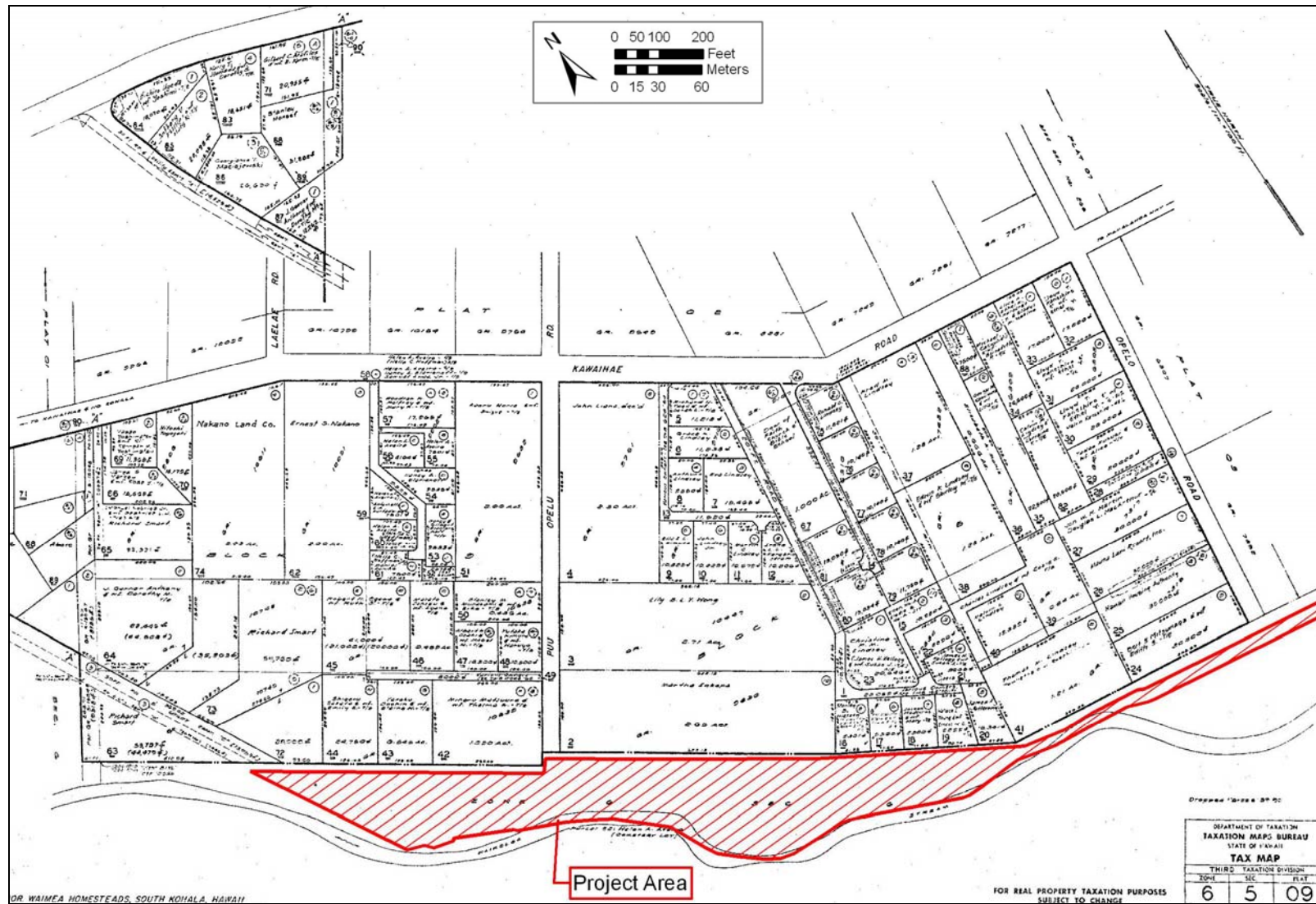


Figure 3. TMK [3] 6-5-09 showing the western half of the project area

Archaeological Inventory Survey For the Waimea Trails and Greenway Project, Lālamilo, South Kohala, Hawai'i

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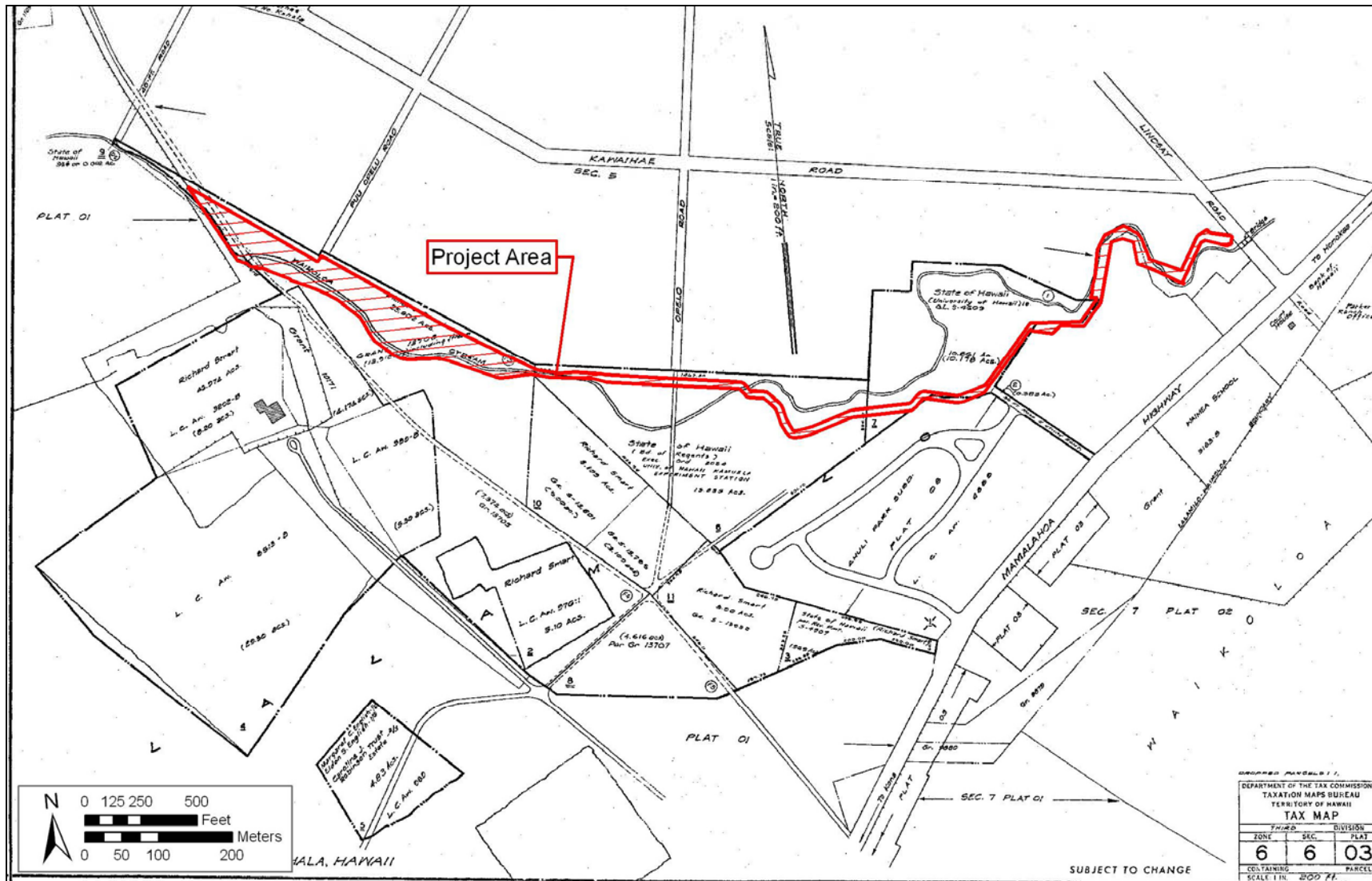


Figure 4 TMK [3] 6-6-03 showing the entire project area

Archaeological Inventory Survey For the Waimea Trails and Greenway Project, Lālamilo, South Kohala, Hawai'i

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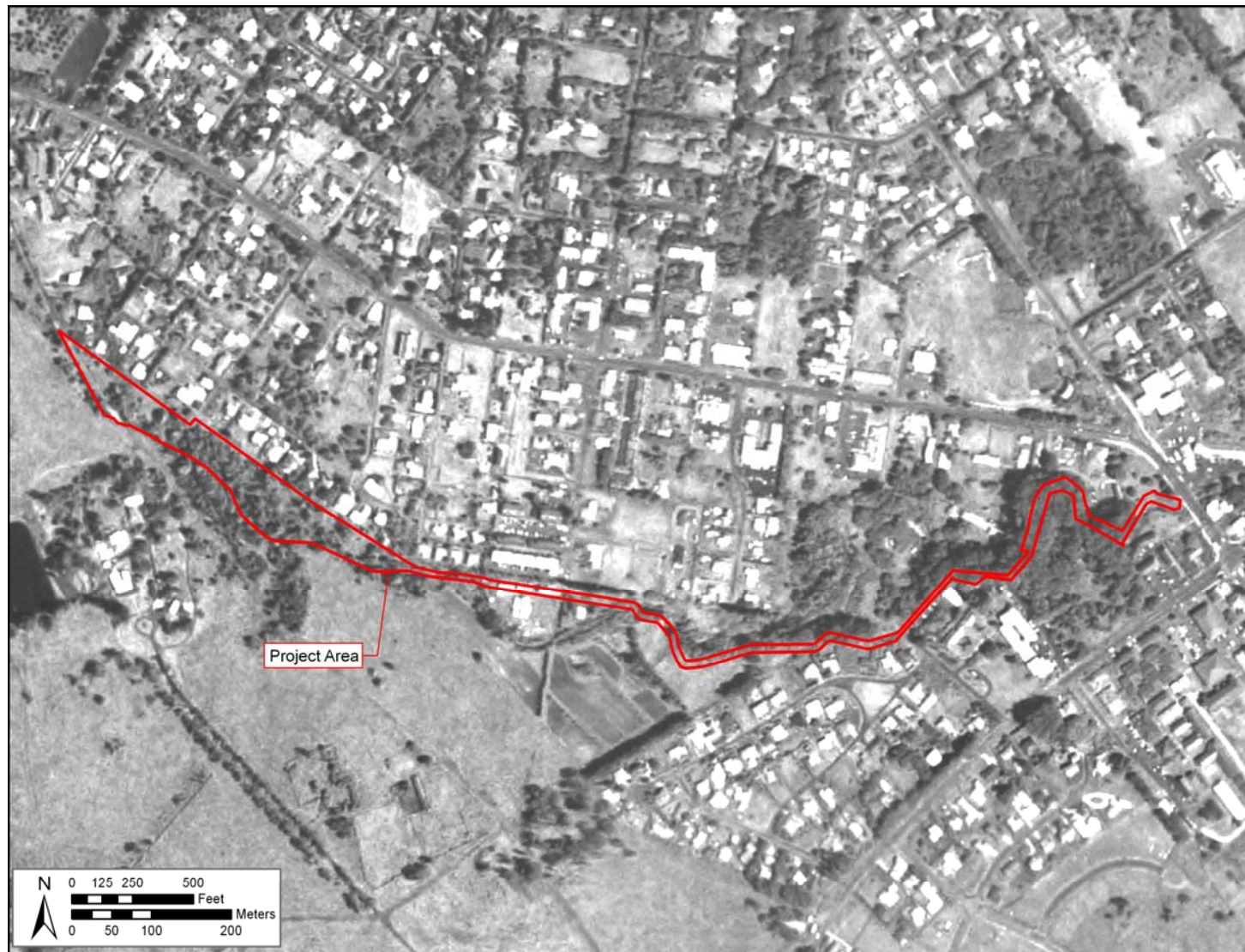


Figure 5. Aerial photograph showing the current project area (source: USDA Orthophoto 2000)

Archaeological Inventory Survey For the Waimea Trails and Greenway Project, Lālamilo, South Kohala, Hawai'i

TMK [3] 6-5-003:004 por., :005 por., :007 por., :044 por., 6-6-003:006 por., :013 por.

predictive model for the types and locations of historic properties that could be expected within the project area.

- 2) A complete (100 %) systematic pedestrian inspection of the project area to identify any potential surface historic properties. Surface historic properties will be recorded with an evaluation of age, function, interrelationships, and significance. Documentation will include photographs, scale drawings, and, if warranted, limited controlled excavation of select sites and/or features.
- 3) Based on the project area's environment and the results of the background research, subsurface testing by hand excavation to identify and document subsurface historic properties that would not be located by surface pedestrian inspection may be appropriate. Appropriate samples from these excavations will be analyzed for cultural and chronological information. All subsurface historic properties identified will be documented to the extent possible, including geographic extent, content, function/derivation, age, interrelationships, and significance.
- 4) As appropriate, consultation with knowledgeable individuals regarding the project area's history, past land use, and the function and age of the historic properties documented within the project area.
- 5) As appropriate, laboratory work to process and gather relevant environmental and/or archaeological information from collected samples.
- 6) Preparation of an inventory survey report, which will include the following:
 - a) A project description;
 - b) A section of a USGS topographic map showing the project area boundaries and the location of all recorded historic properties;
 - c) Historical and archaeological background sections summarizing prehistoric and historic land use of the project area and its vicinity;
 - d) Descriptions of all historic properties, including selected photographs, scale drawings, and discussions of age, function, laboratory results, and significance, per the requirements of HAR 13-276. Each historic property will be assigned a Hawai'i State Inventory of Historic Properties number;
 - e) If appropriate, a section concerning cultural consultations [per the requirements of HAR 13-276-5(g) and HAR 13-275/284-8(a) (2)].
 - f) A summary of historic property categories, integrity, and significance based upon the Hawai'i Register of Historic Places criteria;
 - g) A project effect recommendation;
 - h) Treatment recommendations to mitigate the project's adverse effect on any historic properties identified in the project area that are recommended eligible to the Hawai'i Register of Historic Places.

This scope of work includes full coordination with the SHPD/DLNR and county relating to archaeological matters. This coordination takes place after consent of the owner or representatives.

1.3 Environmental Setting

1.3.1 Natural Environment

The project area is located in the Waimea area of Hawai'i Island and includes a corridor running generally east-west from Lindsey Road in the east to Kahawai Street in the west. The corridor is along Waikōloa Stream. In its entirety the trail and green way may extend about 12 miles, however, the current archaeological inventory survey only covers approximately 1.1 miles of the total extent of the trail system.

In a larger context, the project area is situated in the Waimea Saddle region between the Kohala Mountains and Mauna Kea Volcano at elevations between 2,000-3,000 ft above sea level. The climate is generally cool, moist and windy. Temperatures usually range between 60-70° F, with mean maximums between 70-80 °F, and mean minimums in the upper 40° F. The mean annual rainfall ranges from 500 to 750 mm (20 to 30 in) per year (Giambelluca et al. 1986). Winds are dominated by consistent northeasterly trades. There are three major streams flowing off the Kohala slopes and onto the plains of Waimea, including Lanikepu, Waikōloa, and Kohākōhau (also known as Keanu 'i'omanō) Streams.

Soils within the project area consist of Waimea Very Fine Sandy Loam, 6 to 12 percent slopes (Figure 6). Soils of the Waimea series are described as, "...well-drained very fine sandy loams that formed in volcanic ash... on uplands at an elevation ranging from 2,000 to 6,000 feet" (Sato et al. 1973).

Vegetation within the project area consists of Ironwood (*Casuarina equisetifolia*), Christmas Berry (*Lycium carolinanum*), Yellow Ginger (*Hedychium flavescens*), 'Ape (*Alocasia macrorrhiza*), Bamboo (*Schizostachyum glaucifolium*), Spanish Needle (*Bidens alba*), Castor Bean (*Ricinus communis*), Eucalypts, Banana (*Musa paradisiacal*), Māmaki (*Pipturus albidus*), exotic plantings of conifers, and exotic grasses.

1.3.2 Built Environment

The project area is located within a narrow undeveloped corridor that borders several developed areas from Lindsey Road to Kahawai Street. The eastern end of the project area is bordered by the Lindsey Road Bridge, Waimea Country Lodge, Paniolo Country Restaurant, Lanakila Park, and portion of the adjacent Catholic Church complex. The central portion of the project area is bordered by Residential and commercial subdivisions, Waimea Nature Park, the University of Hawai'i College of Tropical Agriculture and Human Resources Lālāmilo Research Station, the Hale Waimea Apartment Complex, and small stretches of pasture land. The western end of the project area is bordered by residential subdivisions to the north and open pasture land to the south.

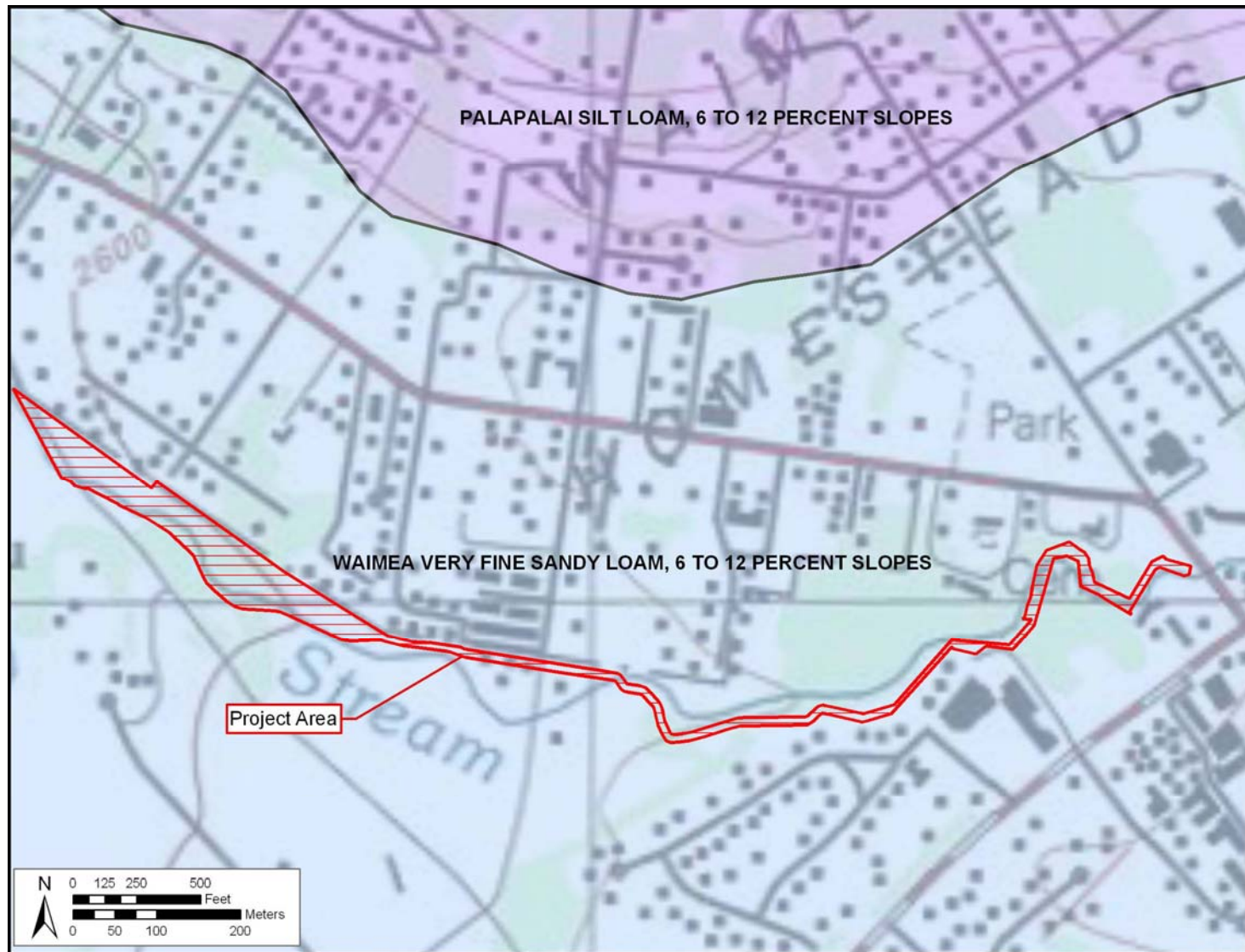


Figure 6. Overlay of Soil Survey of the State of Hawai'i (Sato et al. 1973), indicating sediment types within the project area

Section 2 Methods

2.1 Field Methods

The fieldwork component of the archaeological inventory survey investigation was carried out under archaeological research permit number 09-20, issued by the Hawai'i State Historic Preservation Division/Department of Land and Natural Resources (SHPD/DLNR), per Hawai'i Administrative Rules (HAR) Chapter 13-13-282. The fieldwork component of this archaeological inventory survey was accomplished on June 26, 2009 by two CSH archaeologists, Trevor Yucha, B.S. and David Shideler, M.A. under the general supervision of Hallett H. Hammatt, PhD (principal investigator). The fieldwork required approximately 1 person-day to complete.

A complete ground survey of the project area was undertaken for the purpose of historic property identification and documentation. The ground survey of the project area was accomplished through systematic sweeps. The interval between the archaeologists was generally between 5 to 10 m. All historic properties were documented through detailed written description, with evaluation of function, interrelationships, and significance; photographs; scale drawings using standard tape-and-compass mapping procedures; and located with a GARMIN GPSMAP60Cx unit (accuracy +/- 2-5 m).

2.2 Document Review

Background research included: a review of previous archaeological studies on file at SHPD; review of documents at Hamilton Library of the University of Hawai'i at Mānoa, the Hawai'i State Archives, the Mission Houses Museum Library, the Hawai'i Public Library, and the Archives of the Bishop Museum; study of historic photographs at the Hawai'i State Archives and the Archives of the Bishop Museum; and study of historic maps at the Survey Office of the Department of Land and Natural Resources. Historic maps and photographs from the CSH library were also consulted. In addition, Māhele records were examined from the Waihona 'Aina database (<www.waihona.com>).

Section 3 Background Research

3.1 Traditional and Historical Background

3.1.1 Place Names and *Mo'olelo*

Ke kīpu'upu'u ho'anu 'ili o Waimea

(The Kīpu'upu'u rain of Waimea that chills the skin of people)

[Puku'i 1983:188; #1748]

The project area region is generally referred to as “Waimea” which literally means reddish water, as it was thought to be tinted as it was drained through the *hāpu'u* tree fern forests or though the red soil (Elbert, Ms in Barrerra and Kelly 1974). Waimea has been poetically characterized as being “like a spear rubbed by the wind, as the cold spray is blown by the *kipu'upu'u* rain...” (Proverb from a Kamehameha *mele* quoted by Henry Judd in Doyle 1953:42) and has a rich history that is evident in its place names and proverbs.

The area is also popularly known as Kamuela (Samuel), named either for post master Samuel Spencer or for the rancher, Samuel Parker (Pukui et al. 1974). In *‘Ōlelo no‘eau* (Pukui 1983), Waimea is noted as an area of cool climate and chilling rains:

(A) *Hele po'ala i ka anu of Waimea*

Going in a circle in the cold of Waimea

Said of a person who goes in circles and gets nowhere. Waimea, Hawai'i is a cold place and when foggy, it is easy for one unfamiliar with the place to lose his way [Puku'i 1983: 83; #757].

(B) *Ka ua Kī pu'upu'u o Waimea/ Waimea i ka ua Kīpu'upu'u*

The Kīpu'upu'u rain of Waimea/ Waimea, land of the Kīpu'upu'u rain

An expression often used in songs of Waimea Hawai'i. This area is famed for its cold rain. When Kamehameha organized an army of spear fighters and runners from Waimea, they called themselves Kīpu'upu'u after the cold rain of their homeland [Puku'i 1983:169, 319; #1571 & #2913].

(C) *Ka ua paliloa o Waimea*

The Tall-cliff rain of Waimea

The rain of Waimea, Hawai'i, that sweeps down cliffs. [Puku'i 1983:172; #1593]

Ke kānoa kapu o Lono-Makahiki: 'oia ho'i 'o Hōkū'ula!

(The sacred bowl of Lono-Makahiki: it is Hōkū'ula!)

[*Ka Hōkū o Hawai'i* 4/23/1914 in Franklin et al. 1994]

Translated and interpreted by Kepā Maly (Franklin et. al 1994), the legend of Ka-Miki was published in the Hawaiian newspaper *Ka Hōkū of Hawai'i* between the years of 1914-1917. It is

a story about two brothers and their journey around the island of Hawai'i. The legend includes references to over 800 place names, and provides interesting information about Pu'u Hōkū'ula, the most prominent hill located just north of Waimea town.

Hōkū 'ula (Red Star): When Ka-Miki and Maka'iole drew near to completing their formal 'ōlohe training (fighting and competing skills) under their goddess/great grandmother Ka'uluhe, she told them to go and visit their *kūpuna* (ancestress) Lani-nui-ku'i-a-mamao-loa who dwelt at Lanimaomao (Waimea). Lani-nui-ku'i-amamao-loa was the guardian and keeper of the sacred *kānoa* ('awa mixing bowl) Hōkū'ula which belonged to Lono-Makahiki, and the *ma'au* (strainer) called Kalau-o-Kāhuli which was upon the plain of Waikōloa. These two items were to be used in 'awa ceremonies for the brothers 'ailolo (brain eating- completion of training ceremonies) [Ka Hōkū o Hawai'i 2/5/1914 in Franklin et al. 1994].

The association of the bowl, or *kānoa* of the god Lono (a provider of abundant crops and rain-laden clouds) with Hōkū'ula may refer to the agricultural lands of the region; i.e., (1) the bowl or container could symbolize a land of agricultural abundance; (b) the sprinkling of waters from the bowl could refer to the waters of the streams that flow from the uplands and spread across the plains; and (c) the importance of the rituals of Lono in agricultural endeavors, particularly in the areas of Kohala where large rain-fed field systems have been archaeologically documented. Thus the legendary account may symbolically represent actual resources of the Waimea region.

3.1.2 Accounts of Pu'u Kapu

A missionary account by Lorenzo Lyons in the 1850's tells of legends within the setting of Waimea, that may relate to the origin of the name "Pu'u Kapu":

On a nearby ridge stood another *heiau* built "...by the great Akua Makuakua who has come from far off Kahiki." from the hillside he watched the rainbows "...and there he found the beautiful goddess Wao." They lived at Hōkū'ula Each time Wao was ready to bear a child she returned to the Waimea hills, which were sacred to her. The *kapu* was proclaimed in her honor- the forbidden ground extended ..."down across the plains to whatever place a stone happened to stop rolling when started above by her servants" [Doyle 1953 in Barrera and Kelly 1974]

According to legend, Wao changed her servants into stones to guard the land during the night hours; when daylight came she transformed them back into their human forms (Barrera and Kelly 1974:1).

Lorenzo Lyons also tells of the legendary story of a Ho'opili-a-Hae, and mentions her as being the founder of a *heiau* for women in Waimea:

The earliest chiefs of Waimea of whom we have record stemmed from the same Ulu-Hema line that led to Līloa, the founder of the island dynasty. Līloa's grandson Keawe-nui-a-'Umi took as one of his wives Ho'opili-a-Hae, daughter of Līloa's *kahuna* Pae-a-Molenole. [Clark and Kirch, 1983:26]

(The *heiau*) was attended exclusively by young virgins. In the sanctity of the cool highland forest, they "...performed the sacred ceremonies, learning also the science of healing so that they might eventually minister to others. Hoapiliaha'e's children were named for the five rains of the *heiau*" [Doyle 1953: 42-43] (in Barrerra and Kelly 1974:1)

A passing reference to Pu'u kapu is made in the story of "Kai A Kahinalii" in which a fisherman of Kawaihae who fishes all day long and, setting out early, observes: "the sun has now risen, and was looking over the hills of Pu'u kapu." (Thrum 1923:229)

3.1.3 Historical Battles at Waimea

'O ke aluka koa a Kama i Waimea

(a multitude of warriors had Kama at Waimea)

[Kamakau 1961 :55-61 in Barrerra and Kelly 1974]

Hōkū 'ula, located approximately 5 kilometers west of the present project area, is famed for being the location of a prominent battle ground in which Kamalālāwalu, the ruler of Maui Island waged war against the island of Hawai'i. Deceived by misleading advice from his trusted advisors and poor strategic planning, Kamalālāwalu arrived on Hawai'i island, landing at Kawaihae only to realize that there were no people there. The Maui forces continued up to Hōkū'ula, a prominent bluff. Situated in this manner, he believed his army would be able to have the advantage in defending themselves against the Hawai'i island forces.

Upon hearing of Kamalālāwalu's arrival, Lonoikamakahiki, the Hawai'i island ruler sent armies from Kona, Ka'ū, Puna, and Hilo to Hōkū'ula, where the Maui warriors were stationed. The following morning Kamalālāwalu observed that the lowlands were literally covered with countless men. He soon realized that his Maui forces were inferior in numbers and asked his ally Kumaieau "*E Kumaieau ma, pehea kēia? He aha kēia lehulehu o lalo?*" "Kumaieau and the rest of you, how is the situation? What is the extent of their numbers below?" Kumaieau relied "*Akahi nō au a 'ike i ka nui o nā kānaka o Hawai'i nei.*" "I have never seen so many people in Hawai'i before..." After three days of negotiations, the two combating forces waged battle, with Lonoikamakahiki gaining the victory over Kamalālāwalu's army (Fornander 1916:342-350).

Another battle fought in the Waimea area was between the leeward and windward chiefs of Hawai'i Island toward the middle of the 18th century. This clash took place at Mahiki, east of Waimea and just across the district boundary in Hāmākua. Here the father of the great chief Alapa'inuiakauaua was leading his forces against the Hilo chiefs when he was killed. Alapa'inui was on Maui at the time but returned to Hawai'i and ultimately regained control of the Kona and Kohala districts (Kamakau 1961: 65). Eventually he went on to take over the whole island of Hawai'i and place it under his rule. In his later years, Alapa'inui lived first in Waipi'o, then lived for sometime in Waimea, and later moved to Kawaihae (Kamakau 1961: 77).

During Kamehameha's campaign to extend his rule to all the major islands, he stayed at Waimea and at Kawaihae for some time. There are mentions of Kamehameha's visits to Waimea in 1791 and 1792 when he rebuilt Pu'u Koholā Heiau (Clark and Kirch 1983). At that time a large work force was required and the people of Waimea were solicited. It has also been suggested by Clark and Kirch (1983:27) that food and tapas were brought from Waimea to feed

and clothe the many warriors in preparation of the *Peleleu* fleet to battle Maui and O'ahu in 1794 and 1795.

3.1.4 Post-contact Period

The Waimea area, with its favorable soils, and water from Kohala Mountain streams that could be harnessed and distributed on the fairly level plains, was an obvious area for the expansion of introduced food crop production. Waimea was very productive agriculturally in the early years following contact with the Western world. Based on early accounts, *kalo*, or taro (*Colocasia esculata sp.*) was the dominant crop with 'uala, or sweet potatoes (*Ipomoea batatas sp.*) and *kō*, or sugar cane (*Saccharum officinarum sp.*) also grown in substantial quantities.

The decline in traditional Hawaiian agriculture in the Waimea region has been attributed to factors such as 1) depopulation and the concomitant abandonment of the fields; 2) the pursuit of other commercial interests such as sandalwood and the *pulu* trade, sugarcane, and finally the introduction of cattle.

It is important to mention that after the abandonment of traditional Hawaiian agriculture in Waimea, there were two resurgences of agricultural endeavors to boost the economy of Waimea (Clark and Kirch 1983). In the late 1820's, two Chinese, Lau Ki and 'Aiko started a sugar mill at Līhu'e in upper Lālāmilo. While the mill was not successful commercially, sugar production continued in the Waimea area (Barrerra and Kelly 1974: 47).

It was during this time that an expansive irrigation system was developed consisting of several dendritic 'auwai that diverted water from Waikōloa and Lanimaumau Streams. Portions of one named 'auwai, "Akona's 'Auwai", are depicted within and in the vicinity of the current project area (Figure 7 and Figure 8). Akona's 'Auwai was used primarily to power the sugar mill at Līhu'e and to irrigate nearby sugarcane fields (Burtchard and Tomonari Tuggle 2003). "Akona was a Chinese who lived in the Waimea area in the 1840's and 50's (and perhaps somewhat before and after)" (Clark 1981:28). Historic maps depict Akona's 'Auwai as originating at the start of a large meander of Waikōloa Stream within or adjacent to the current project area and extending southwest through Land Commission Award (LCA) #0976 belonging to William Buckley (Figure 9).

In the late 1830's, cotton was grown in Waimea when Governor Kuakini ordered the planting of an "immense field of cotton in the Waimea area," (Kuykendall 1967: 183). In the late 1840's and early 1850's, both sweet and Irish potatoes were cultivated extensively, however by 1865, their crops were reported to have been greatly diminished.

3.1.5 Sandalwood and Pulu

The mountains surrounding Waimea were well known for rich sandalwood reserves. During the early part of the 19th century as contact with the West was growing, the extent of the sandalwood trade was evident as it became one of the earliest commodities of a newly formed market oriented economy.

Similar to the sandalwood trade was the exploitation of *pulu*, the soft fiber gathered from the buds of the tree fern (*Cibotium sp.*) and used for stuffing pillows, mattresses, and furniture (Thrum 1929 in Erkelens 1998: 15). The *pulu* trade began in 1851 with shipments to the West

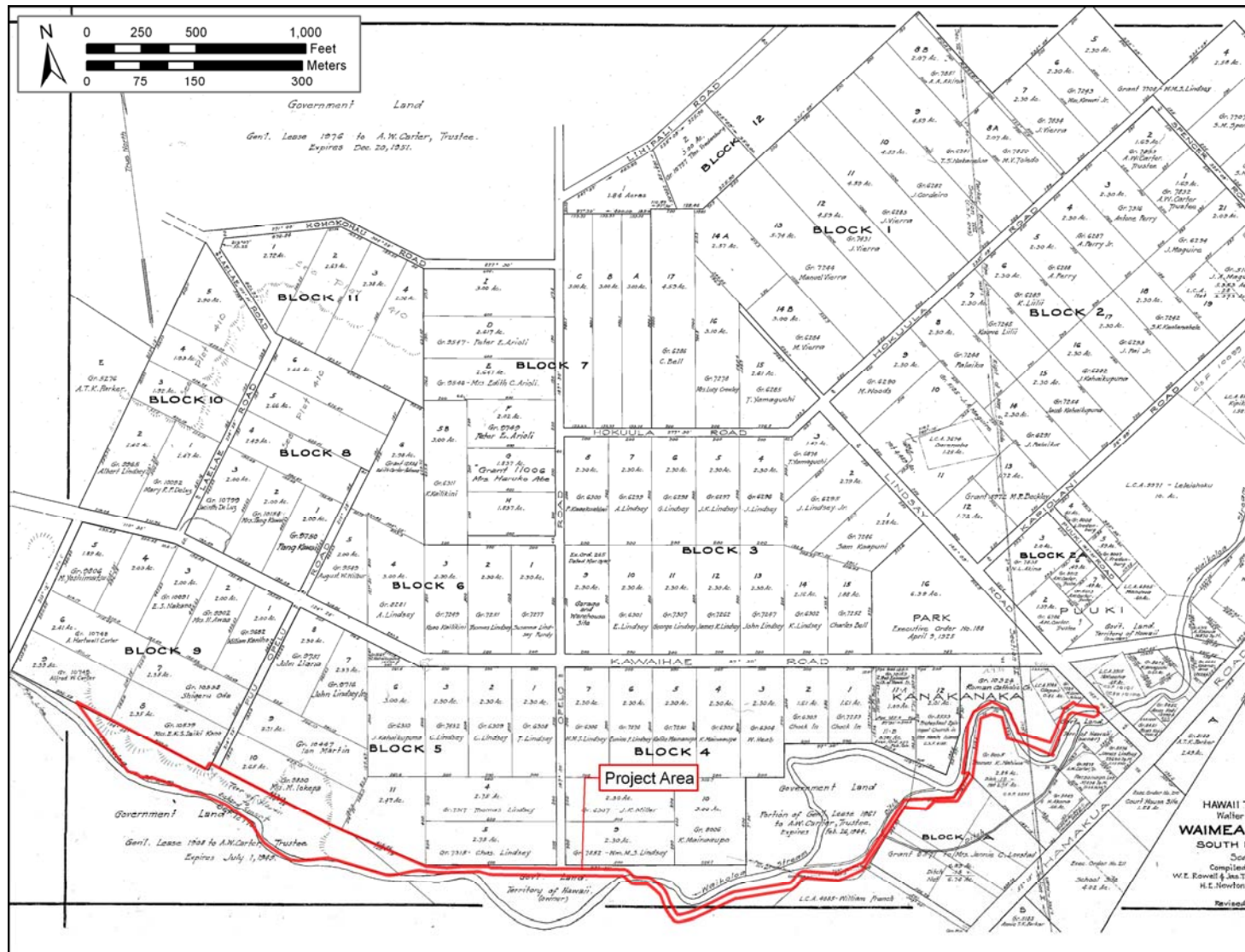


Figure 7. 1908 W.E. Wall map showing Akona's 'Auwai (labeled as "Ditch") adjacent to the current project area

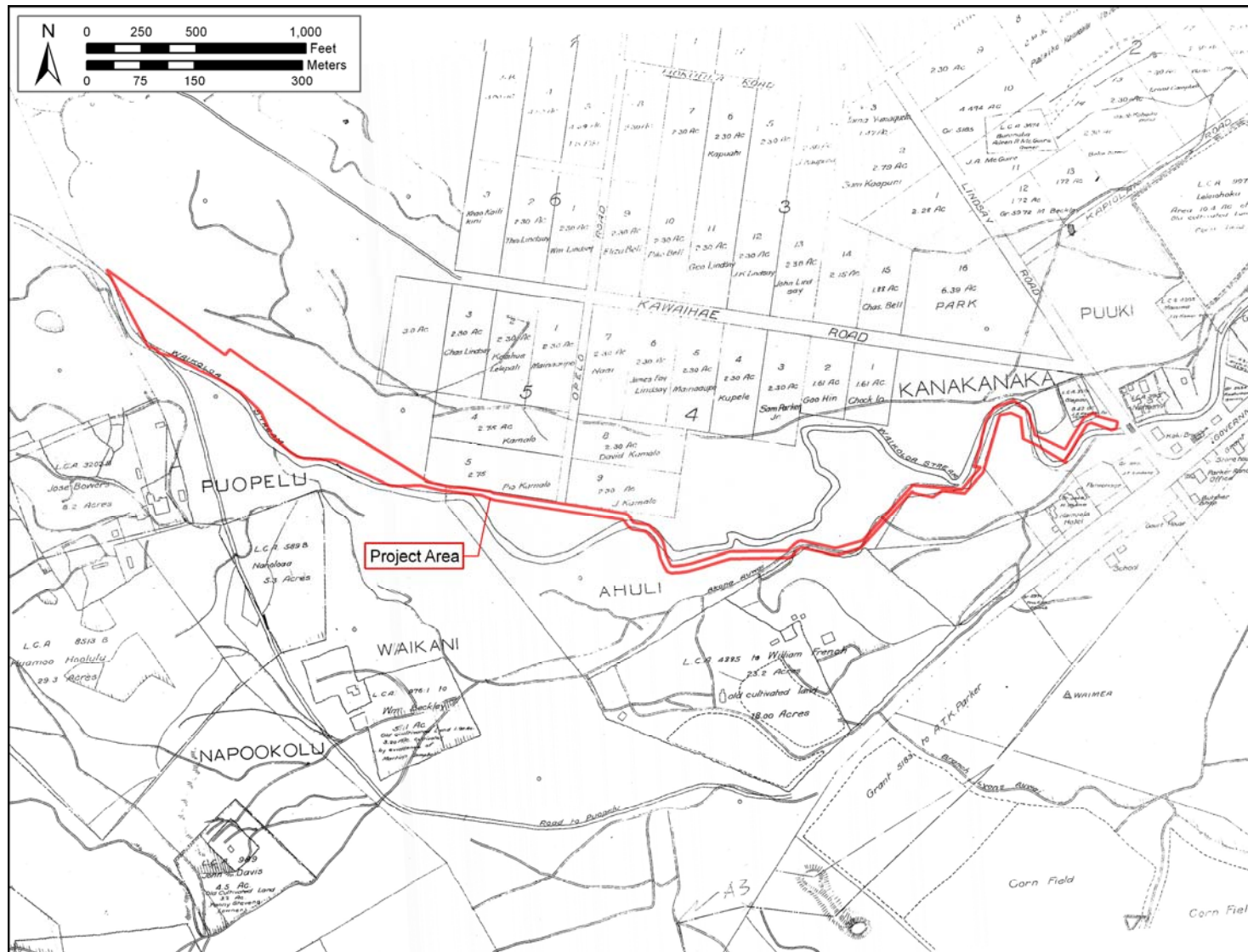


Figure 8. 1914 Newton and Adams Registered Map (2576) showing Akona's 'Auwai within and near the current project area

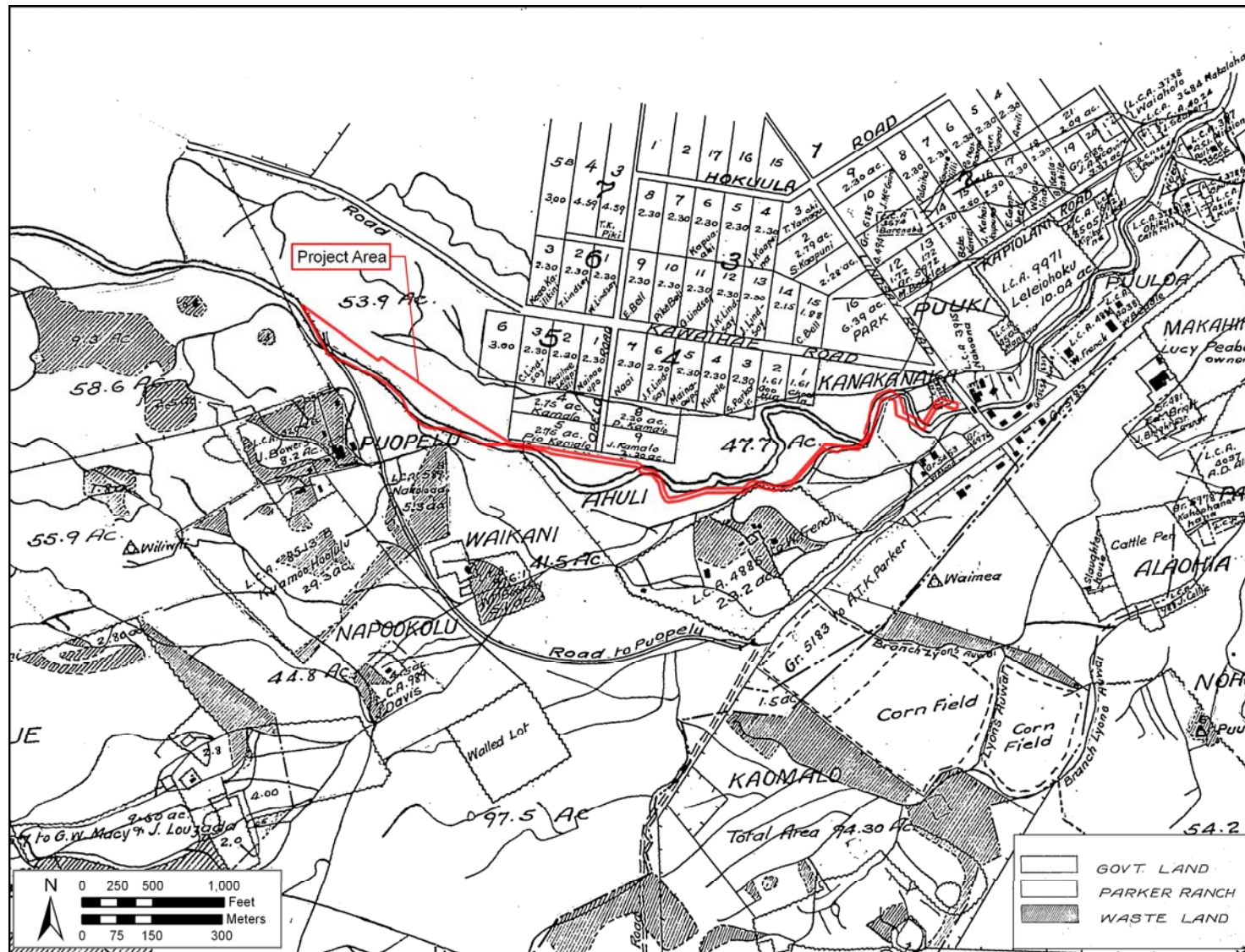


Figure 9. 1915 Classification Survey showing Akona's 'Auwai extending from Waikōloa Stream through the current project area

Coast of North America and Australia. Like sandalwood, the over-exploitation of this resource also led to its demise and by 1860, the trade had virtually ended (Doyle 1945: 182).

3.1.6 Population Estimates

The general impression of the pre-contact settlement pattern, constructed from a variety of archaeological and early historical sources, is one of scattered settlements along Waikōloa Stream (Clark 1987: 103; Erkelens 1998: 11). During subsequent decades, with the arrival of western foreigners and missionaries, impressions of the life and landscape would be recorded for 19th-century Waimea. In 1823, Asa Thurston counted 220 houses in his walk through Waimea in the section between 'Ōuli and Pu'u Kapu (a distance of approximately 4.8 km or 3 miles); this was interpreted as representing a population of 1,100 to 1,200 individuals (Ellis 1979:399 in Erkelens 1998:11). Although the population was concentrated at Kea'ali'i (located along Wai'aka Stream) at the time of Thurston's visit, a settlement of 300 to 400 individuals near the present Waimea town is a reasonable estimate (Clark 1987: 103).

It was not, however, until the 1830s that a missionary would be stationed in northern Hawai'i. On July 13, 1832 Lorenzo Lyons and his wife Betsy arrived at Kawaihae by brig from Honolulu to take up residence at Waimea. Lorenzo Lyons had a church and school (for adults) at Waimea in 1835, serving a congregation of from 100 to 500 Hawaiians. In his writings, Lyons stated:

During the past year I have taken a census of the population of this district and find it to be as follows: Waimea, 1,396; Kohala 6,175; Hamakua 4,015; total 11,586, from which it appears there has been a diminution of the people 3,500, within three and a half years. Marriages are numerous. But the progeny are wanting. Children are not in general, objects of desire. Taxes are in proportion to the number of children. My census may not be correct. Many think I am numbering them for the purpose of taxation, and conceal a part of their number. [Doyle 1945:82-83]

3.1.7 The Māhele

The Organic Acts of 1845 and 1846 initiated the process of the Māhele, the division of Hawaiian lands, which introduced private property into Hawaiian society. In 1848, the crown and the *ali'i* received their land titles. The common people (*maka'āinana*) received their *kuleana* awards (individual land parcels) in 1850. It is through records for Land Commission Awards (LCAs) generated during the Māhele that the first specific documentation of land use within the vicinity of the project area comes to light.

A total of six LCAs are located within the vicinity of the current project area (See Figure 9 and Figure 10). Documentation of these LCAs was reviewed in an attempt to reconstruct land use patterns during the mid 19th century (Table 1 and see Appendix A). Māhele documentation in the vicinity of the project area shows a presence of several house lots with associated dry land agricultural fields. Of particular note is the high frequency of prominent foreign awardees, like William French and William Beckley, who are associated with early business ventures throughout the Hawaiian Islands.

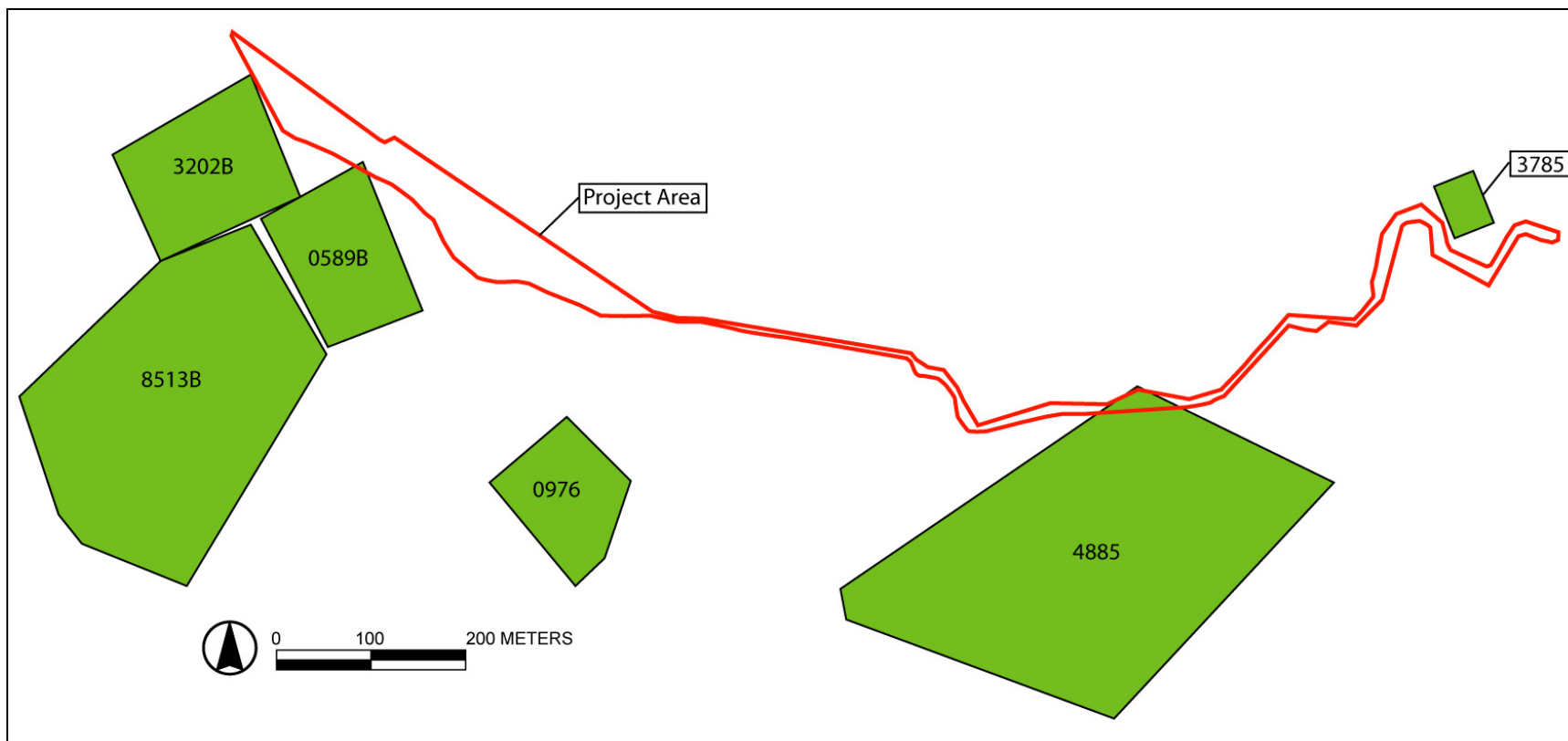


Figure 10. Map showing the approximate location of Land Commission Awards within the vicinity of the project area

Table 1. Land Commission Awards Located in the Vicinity of the Current Project Area

Land Claim #	Claimant	'Ili	Land Use
00589B	Naholowaa	Pu'uapelu	1 house lot, 3 fields partly under cultivation
00976	Beckley, William	Owahawaha (Waawaa)	1 House lot enclosed by stone wall
03202B	Bowers, Jose	Pu'uopelu	House lot, 3 fields
03785	Olepau	Kauakanaka, Opeawai, Alaohia	1 lot with 3 houses
04885	French, William	Ahuli	Dwelling house and premises
08513B	Hoolulu	Napo'oakolu	1 field partly cultivated

3.1.8 Cattle Industry

The first cattle were delivered to Hawai'i in 1793 by Captain George Vancouver aboard the HMS Discovery. The cattle were a gift to Kamehameha I, who, following Vancouver's advice, immediately placed a 10-year *kapu* on the cattle, which greatly increased their number (Brennan 1995). An examination of the cattle industry in the Waimea area clearly shows its dominant role. The cattle industry, which eventually changed the economy and lifestyle of Waimea, had its origins in bullock hunting, which was controlled by Hawaiian chiefs. The initial increase in cattle population was aided by a ten-year *kapu* placed on hunting or taking of cattle. Feral cattle multiplied rapidly and ran wild on the plains of Waimea. For some two to three decades after the lifting of the protective ban, bullock hunters were employed to hunt down the wild cattle and take them to a market.

In the 1830's, meat, hides, and tallow began to be marketed, and thus formed the true beginning of the cattle industry. By 1847, about two-thirds of Waimea area had been converted to pasture for government herds of cattle, as well as for sheep and horses (Doyle 1945). By the middle of the 1800's the Waimea region was the center of the industry.

The cattle industry had two major impacts on Waimea. The first was the effect of marauding cattle on the unprepared Hawaiian farmer (Erkelens 1998:19). As early as 1802, there were complaints concerning the destruction of gardens by feral cattle (Turnbull 1813:243, in Barrera and Kelly 1974:44). In 1836, Waimea was surrounded by a stone wall to protect it from cattle.

The second major impact on Waimea was the increase in population as a result of economic opportunities provided by the cattle industry (Erkelens 1998:19). Bishop (Bishop 1828, in Erkelens 1998:19) reports that Kuakini's arrival in Waimea marked the beginning of the cattle industry, as attendance at church services increased to approximately 1,000 individuals from a previous attendance of 200 (Doyle 1945).

Following Kuakini's construction of the road between Kawaihae and Waimea in 1830, ox carts were able to haul commercial items much more efficiently than was previously possible. Although missionary census records for the period from 1832 to 1845 suggest little overall change in population of Waimea (approximately 1,000 individuals), there was undoubtedly a change in composition of the constituency from predominantly Hawaiian to a mix of foreigners and Hawaiians.

3.1.9 Parker Ranch and the 20th Century

John Palmer Parker, an American born in Newton, Massachusetts in 1790, intended a sailing career when he left home in 1809. After several years at sea, Parker arrived on Hawai'i Island in 1815 and decided to remain there. By 1819, Parker had a Hawaiian *ali'i* wife, Kipikane, and a baby daughter, Mary. Parker and his family went to live at Waiapuka in Kohala where he farmed on twenty-one acres that had been granted to him by Kamehameha. In this era, most of the ranch work consisted of capturing wild cattle and domesticating them. As the ranching industry expanded so did responsibilities such as managing the many personnel of the Parker Ranch, building houses and growing food to feed all. Subsequently, Parker hired South American and Mexican horsemen to train his ranch hands to track, rope, brand, and bring in the wild cattle. These "vaquero", "*paniolo*," or "espangnol" not only introduced the management of cattle and horses, but also brought colorful clothes, hats and saddles that became the mark of Hawaiian *paniolo*. The first Hawaiian *paniolo* or cowboys actually predate many of the mainland western cowboys. The ranch personnel also made most of their own gear and machinery, including saw mills.

In the last years of the 19th Century, Waimea remained a small town concentrating on the shipment of cattle to export markets. The Waimea of 1881 was graced with two stores, a boarding house, lodging house, and a coffee saloon (Bowser 1881:540). Even at this seemingly late date, wild cattle were occasionally a problem. In 1888, Paul Jarrett was the first to commence fencing Parker Ranch lands to segregate the domesticated from the wild cattle (Doyle 1904). The next Parker Ranch manager, A.W. Carter, (manager 1899-1936), consolidated all the Parker family land holdings under the control of his ward, Thelma Parker. A.W. Carter then began in earnest to increase ranch lands, systematically breed for better, stronger, healthier cattle and horse stock, bought a barge to ship cattle with other Big Island ranchers, increased ditches for watering livestock and imported different grasses and feed for cattle. He provided the U.S. military branches with cavalry horses. He also ventured for a short time into training horses and horsemen for polo teams, and then became one of the major providers of horses in Hawai'i and abroad for work, pleasure, and shows. His son, A.H. Carter succeeded him in 1937. The Parker Ranch had become one of the biggest private businesses in Hawaii and remains the dominant economic force in Waimea.

3.1.10 Camp Tarawa

In 1943, the U.S. Army leased approximately 91,000 acres in Waikōloa from Parker Ranch for military training that continued until June 1946. Artillery firing and troop maneuvers by the 2nd Marine Division, the 28th Regiment, 5th Marine Division, the 6th Marine War Dog Platoon, the 31st Naval Construction Battalion, the Army's 471st Amphibian Truck Company, the Army's 6th Section of the 726th Signal Aircraft Warning Company, the 11th Amphibian Tractor Battalion,

and the 5th Joint Assault Signal Company occurred over large expanses of the leased lands (Conner 1950, Bryson 1995).

Initially named Camp Waimea, the central operations area, located on the south side of Waimea Town adjacent to the current project area, became known as Camp Tarawa (Figure 11 to Figure 13). "It consisted of tents, Quonset huts, wooden structures, and roads covering approximately 467 acres: the largest military settlement on the Big Island during World War II" (Nees and Williams 1998:16). The camp was named by marines of the 2nd Marine Division returning directly from victory at Tarawa Atoll located approximately 2,479 miles to the southwest of the small town of Waimea. The roadways within Camp Tarawa were also given names of islands and locations in and around Tarawa Atoll (See Figure 12).

A second wave of marines, those of the 5th Marine Division, was stationed at Camp Tarawa for another purpose. "Pu'u Ula'ula and Buster Brown were scaled daily so that men would be ready to climb the infamous Mt. Suribachi when the time came..." (Bryson 1995:15). The men were preparing for the fateful attack on Iwo Jima, which occurred on February 19, 1945.

The influx of up to 50,000 U.S. Marines at Camp Tarawa had profound and lasting effects on the small town of Waimea. Among these effects were the increased revenue brought to local businesses, electricity, refrigeration, and the arrival of the hamburger. At least two hamburger stands popped up around Camp Tarawa including The Magnolia Inn, located within the present boundaries of Lanakila Park, adjacent to the eastern tip of the project area (Melrose 1997). Hisa Kimura recounts of the Waimea hamburger stands:

One day, Tsugi, or "Sue" as she was called by the marines, saw a boy who looked local in the endless line of diners. When she asked him if he were local or not, he introduced himself as Ira Hayes, an American Indian. (Bryson 1995:15)

As quickly as they had appeared, the Marines stationed near Waimea had departed, and by the end of June, 1946, Camp Tarawa was abandoned, roadways were renamed, and camp infrastructure was left for ruin.

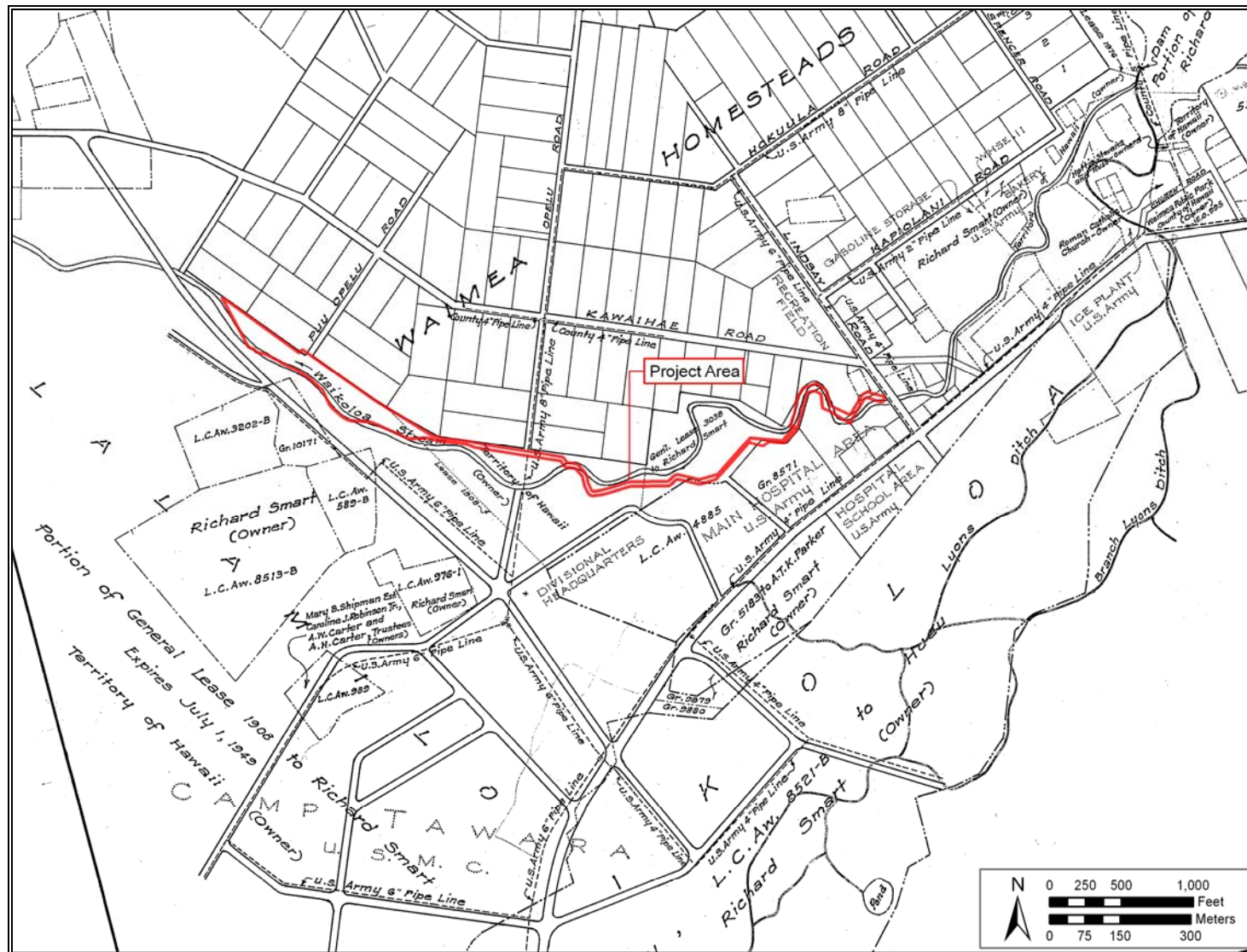


Figure 11. 1945 AI Marks Plat Map showing the location of Camp Tarawa adjacent to the current project area.

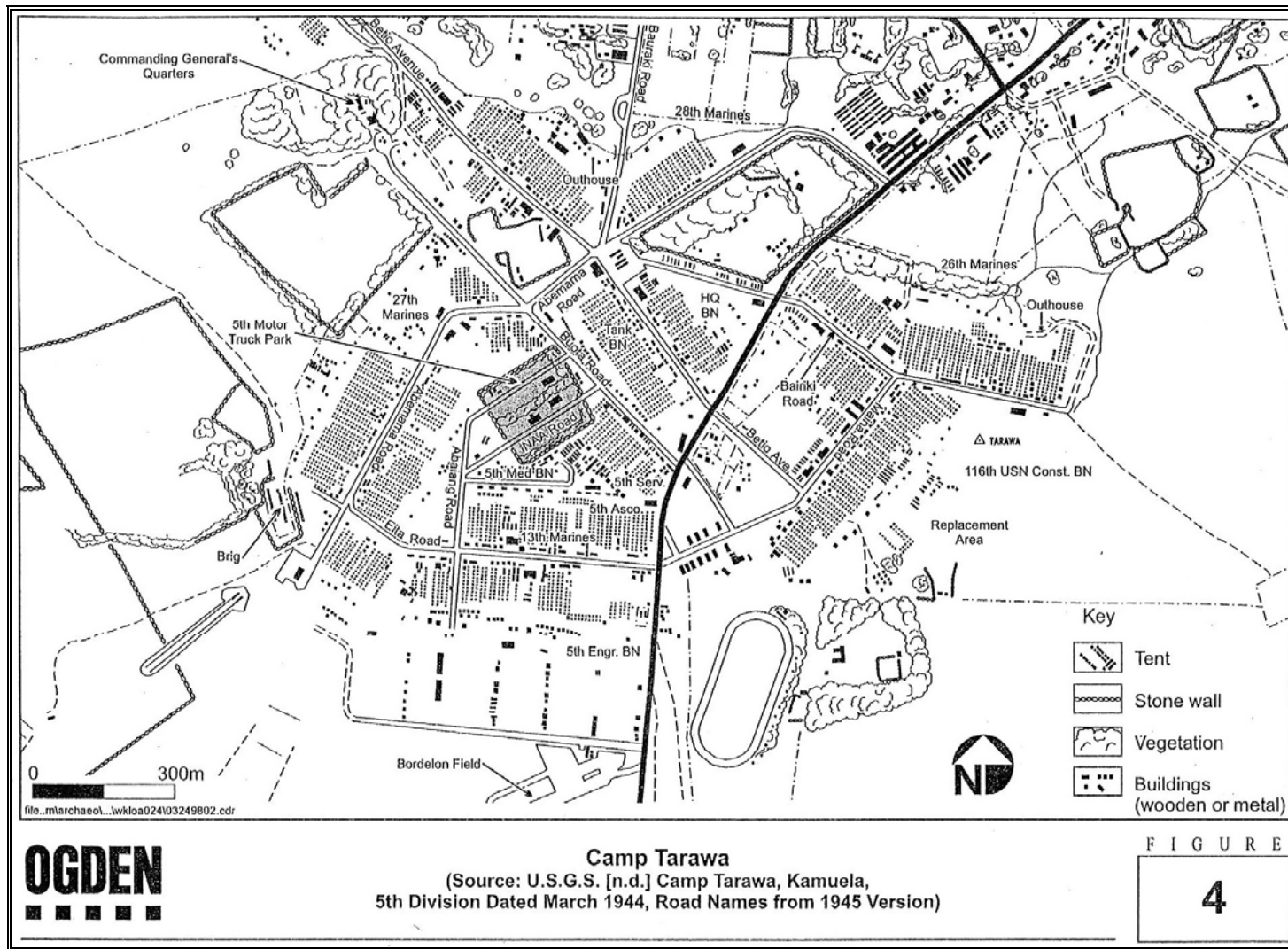


Figure 12. Map from Nees and Williams (1998:17) showing Camp Tarawa adjacent to the portion of Waikōloa Stream within the current project area

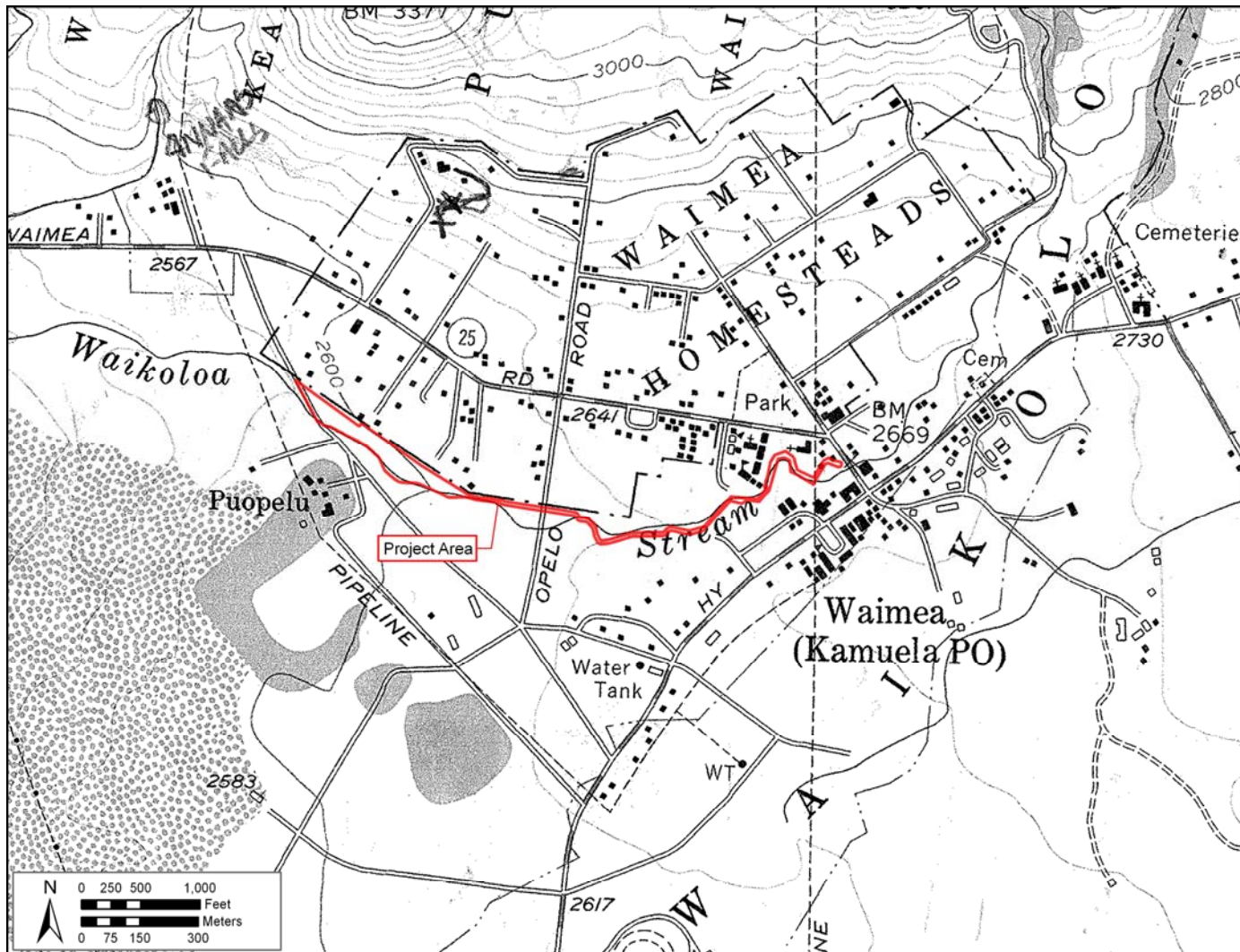


Figure 13. 1956 USGS 7.5-minute Kamuela Quadrangle Map showing remnant Camp Tarawa roadways adjacent to the current project area

3.2 Previous Archaeological Research

Previous archaeological studies conducted within the vicinity of the current project area are shown in Figure 14 and presented in Table 2. The following is a summary of these archaeological studies.

In 1981, Bishop Museum conducted an archaeological survey of the proposed Lālāmilo Agricultural Park, located approximately 1.3 km west of the current project area (Clark 1981). A total of 321 historic properties were identified and recorded. The historic properties were broadly associated with the Waimea agricultural system. On site number, SIHP# -9179, was assigned to all of the irrigation ditches (*'auwai*) within the study area including "Akona *'auwai*", portions of which are located within or adjacent to the current project area. Clark (1981:28) describes Akona's *'Auwai* as follows:

The main channel was labeled the Akona *'auwai* by Wall, thus lending its name to the entire subset...The Akona subsystem branches into a large dendritic network through the center of the survey area. It is this irrigation network which fed into the Līhu'e sugarcane fields. It also, however, extends well beyond this, indicating that it is not merely a development for the short-lived sugar industry in Lālāmilo.

In 1983, Bishop Museum conducted archaeological investigations of the Mudlane-Waimea-Kawaihae road corridor (Clark and Kirch 1983). The fieldwork, performed in 1973, identified 4,561 archaeological features. The study area, located approximately 1 km south of the current project area, recorded one dendritic *'auwai* (SIHP# -2684) that may be connected to Akona's *'Auwai* near the current project area. Additionally, numerous sites were identified, both agricultural and habitation, and the project provided a broad data base for comparing site distribution data from the coast to upland.

In 1985, Paul H. Rosendahl, Ph.D., Inc (PHRI), conducted an archaeological reconnaissance survey of the Kawaihae Reservoir No. 1 Site located approximately 1.3 km northwest of the current project area (Rosendahl 1985). No surface historic properties were encountered and no further archaeological work was recommended.

In 1989, University of Hawai'i at Hilo conducted an archaeological reconnaissance survey near the Hawai'i Preparatory Academy in Waimea located approximately 1.4 km northwest of the current project area (Bonk 1989). The study area is located within Field Complex #1 as defined by Clark and Kirch (1983). Historic properties located within the study area consisted of varying sizes of agricultural terraces. No *'auwai* or habitation structures were observed. Data recovery and additional mapping of these terraces was recommended prior to construction within the project area.

In 1989, Soil Conservation Service conducted archaeological investigations of the Lālāmilo agricultural addition irrigation pipeline corridor and the livestock distribution system and management area (Spencer 1989). The study area is located approximately 1.3 km southeast of the current project area. No historic properties were observed and no further archaeological work was recommended.

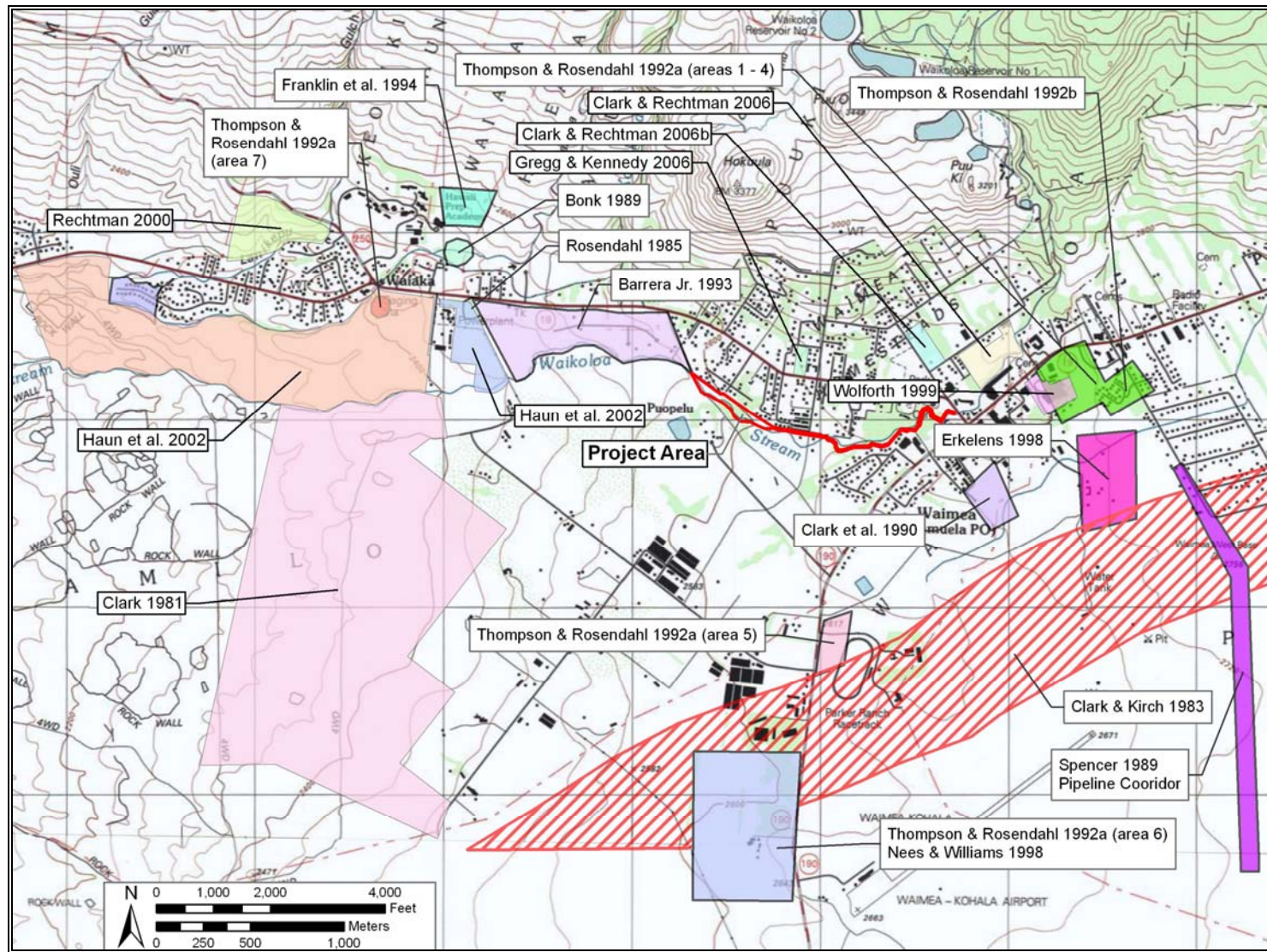


Figure 14. Map showing location of previous archaeological studies in the Waimea area relative to the current project area

Table 2. Previous Archaeological Studies in the Waimea area

Reference	Nature of Study	Location	Findings
Clark 1981	Archaeological Survey	Adjacent to existing Lālāmilo Farm Lots, bounded on the north by Waikōloa Stream	321 historic properties associated with the Waimea agricultural system. SIHP# -9179 'auwai system including Akona's 'Auwai.
Clark and Kirch 1983	Archaeological Investigations	0.61 km wide corridor extending just south of Waimea Town	Defined the Waimea agricultural system and subsystems. SIHP# -2684, dendritic 'auwai possibly connecting to Akona's 'Auwai
Rosendahl 1985	Archaeological Reconnaissance Survey	TMK [3] 6-6-001:005 por.	None
Bonk 1989	Archaeological Reconnaissance Survey	Waiaka, N side of road to Kawaihae	Agricultural terraces related to Field Complex #1 as defined by Clark and Kirch (1983)
Spencer 1989	Archaeological Investigations	30' wide 4,500' long Ag Pipeline Corridor	None
Clark et al. 1990	Archaeological Testing and Data Recovery	Waimea School Improvements TMK [3] 6-7-002:017 por.	Documentation of SIHP# 8808 part of the Waimea agricultural system as defined by Clark and Kirch (1983).
Thompson & Rosendahl 1992a	Archaeological Inventory Survey	7 parcels scattered around edge of Waimea Town	SIHP# -16095, 'auwai complex SIHP# -18054, agricultural field complex
Thompson & Rosendahl 1992b	Archaeological Inventory Survey	TMK [3] 6-7-002:017 por.	Further documentation of SIHP# -16095
Barrera Jr. 1993	Archaeological Inventory Survey	Sandalwood Estates, 50-acres	SIHP# -14948 a complex of pre-contact agricultural field borders
Franklin et al. 1994	Archaeological Inventory Survey	Hawai'i Preparatory Academy TMK [3] 6-5-001:033 por.	SIHP# -19643 to -19649 including two significant historic properties, a historic habitation terrace (SIHP# -19648) and a cemetery and associated features (SIHP# -19649)

Reference	Nature of Study	Location	Findings
Erkelens 1998	Archaeological Investigations	Waimea Town Center	SIHP# -8812 <i>kuleana</i> lots SIHP# -19416 Duncan-Lanakila Cemetery SIHP# -19417 Pukalani stables and blacksmith shop SIHP# -19418 veterinary office SIHP# -19419 breaking corral.
Nees and Williams 1998	Archaeological and Biological Monitoring of UXO Investigations	Former Camp Tarawa	SIHP# -21325 C-shape SIHP#-21326 enclosure remnant Approximately 96 WWII-era artifacts and artillery fragments
Wolforth 1999	Data Recovery	TMK [3] 6-7-002:013	Documentation of an <i>'auwai</i> within the study area
Rechtman 2000	Supplemental Archaeological Inventory Survey	TMK [3] 6-2-001:091	Assessment of previously identified historic properties. SIHP# -18579 (newly identified), historic trash dump.
Haun et al. 2002	Archaeological Inventory Survey	DHHL Residential Development	76 historic properties generally related to habitation and agricultural practices
Clark and Rechtman 2006	Archaeological Inventory Survey	TMK [3] 6--5-004:025 and -063	SIHP# -26680 historic wall SIHP# -26681 historic wall SIHP# -26682 <i>'auwai</i> SIHP# -26683 wooden structure (WWII-era)
Clark and Rechtman 2006b	Archaeological Monitoring	TMK [3] 6-5-004:029, 030, and 050	SIHP# -24168 Feature H - stone and concrete decorative element
Gregg and Kennedy 2006	Archaeological Assessment	TMK [3] 6-5-002:043	None

In 1990, Bishop Museum conducted archaeological testing and data recovery for the Waimea School improvements (Clark et al. 1990). The study area is located approximately 355 m southeast of the current project area. Surface and subsurface investigations focused on documentation of previously recorded SIHP# -8808, part of the Waimea agricultural system as defined by Clark and Kirch (1983). Three *'auwai*, were studied. Profiles suggest a historic period origin with some indirect evidence for possible pre-contact construction. A sample from the lower charcoal lens yielded a preferred range of A. D. 1449 to 1674).

In 1992, PHRI conducted an archaeological inventory survey for potential sites for the North Hawai'i Community Hospital (Thompson and Rosendahl 1992a). The study area consisted of seven individual parcels located in the general vicinity of the current project area. The survey identified two historic properties, SIHP# -16095 and -18054. SIHP# -16095 is an *'auwai* system located on the surface of Parcels 1 to 4. SIHP# -18054 is an agricultural field complex located within Parcel 7. The agricultural field complex was equated to Field Complex 2 as defined by Clark and Kirch (1983).

In 1992, PHRI conducted an archaeological inventory survey for the Waimea Elderly Housing Project (Thompson and Rosendahl 1992b). The project area is located approximately 770 m east of the current project area. The study consisted of further documentation of SIHP# -16095, an *'auwai* system. A program of archaeological monitoring was recommended.

In 1993, Chiniago Inc. conducted an archaeological inventory survey of approximately 50 acres for the Sandalwood Estates (Barrera Jr. 1993). The study area borders the western edge of the current project area. A complex of agricultural field borders was identified during subsurface testing and assigned SIHP# -14948. The agricultural field borders were determined to be located at the east of Field Complex 2 as defined by Clark and Kirch (1983). No further archaeological work was recommended.

In 1994, PHRI conducted an archaeological inventory survey for the Hawai'i Preparatory Academy Waimea campus expansion (Franklin et al. 1994). The study area is located approximately 1.6 km northwest of the current project area. During fieldwork, seven archaeological sites (SIHP# -19643 to -19649) associated with agriculture and habitation were identified. The sites comprised the formal types: water channel, cemetery, terrace, concrete foundation, and alignment. Only two sites, SIHP# 19648, a historic habitation terrace and SIHP -19649 a cemetery with associated feature were determined to be significant.

In 1998, International Archaeological Research Institute, Inc. (IARII) conducted archaeological investigations of the *kuleana* lots at Pukalani within the Waimea Town Center project area (Erkelens 1998). The study area is located approximately 795 m east of the current project area. A total of five historic properties were documented during the study; SIHP# -8812 *kuleana* lots, SIHP# -19416 Duncan-Lanakila Cemetery, SIHP# -19417 Pukalani stables and blacksmith shop, SIHP# -19418 veterinary office, and SIHP# -19419 breaking corral.

In 1998, Ogden Environmental and Energy Services Co., Inc. conducted archaeological and biological monitoring of unexploded ordnances (UXO) investigations within former Camp Tarawa (Nees and Williams 1998). The study area is located approximately 2.1 km south of the current project area. Two historic properties were documented during the study consisting of SIHP# -21325, a C-shape, and SIHP# -21326, an enclosure remnant. Additionally a total of

approximately 96 WWII-era artifacts and artillery fragments were recovered at or near the surface.

In 1999, PHRI conducted data recovery for the North Hawai'i Community Hospital with focus on investigations at an *'auwai* in the Lālāmilo field system (Wolforth 1999). The study area is located approximately 479 m east of the east end of the current project area. During the study, an *'auwai* located within the study was cross-sectioned and bulk sediment samples were collected for radiocarbon dating and palynological analysis. Several subsurface features were also identified.

In 2000, Rechtman Consulting, LLC conducted a supplemental archaeological inventory survey of TMK [3] 6-2-001:091 located approximately 2.2 km northwest of the current project area (Rechtman 2000). The study assessed previously recorded historic properties within the current project area and encountered one newly identified historic property, SIHP# -18579, a historic trash dump. Additionally, several new agricultural features of SIHP# -18581 were identified.

In 2002, Haun and Associates conducted an archaeological inventory survey for Department of Hawaiian Home Lands (DHHL) development at Lālāmilo (Haun et al. 2002). The study area is located approximately 1.2 km west of the current project area. A total of 76 historic properties consisting of 819 features were documented during the study. Site types included mounds, enclosures, walls, irrigation ditches, platforms, and field boundaries.

In 2006, Rechtman Consulting, LLC conducted an archaeological inventory survey of TMK [3] 6--5-004:025 and -063 (Clark and Rechtman 2006). The study area is located approximately 230 m east of the current project area. A total of four historic properties were documented during the study (SIHP# -26680 to -26683). These historic properties consisted of two historic walls, one *'auwai* that extends parallel to Waikōloa Stream, and a historic wooden structure likely erected by the U.S. Military during WWII.

In 2006, Rechtman Consulting, LLC conducted archaeological monitoring of development activities associated with the Waimea Parkside Residential Subdivision (Clark and Rechtman 2006b). The study area is located approximately 300 m north of the east end of the current project area. No historic properties were newly identified during the study, however, an additional feature (Feature H) was added to SIHP# -24168. Feature H of SIHP# -24168 is described as a small stone and concrete construction with a concave concrete floor. The feature was determined to function as a "former decorative garden element or a small pond" (Clark and Rechtman 2006b:6). Two adze fragments along with midden and historic trash were also recorded throughout the study area.

In 2006, Archaeological Consultants of the Pacific, Inc. conducted an archaeological assessment of a property located at TMK [3] 6-5-002:043 (Gregg and Kennedy 2006). The study area is located approximately 413 m north of the current project area. No historic properties were identified during the study.

3.3 Predictive Model

A thorough review of historical records, previously archaeology, and modern land use suggest that the area surrounding the current project area has been significantly impacted during historic

times, specifically during the construction of Camp Tarawa and modern subdivisions. The entire southern edge of the project area beyond the margins of Waikōloa Stream has likely been graded to support WWII-era infrastructure associated with Camp Tarawa including roadways and temporary buildings. Of particular interest however is the location of Akona's *'Auwai*, which according to historic maps (See Figure 7 to Figure 9), originates at a large meander on the south side of Waikōloa Stream within or adjacent to the current project area and continues west, parallel to the main stream channel. The northern edge of the current project area borders several modern subdivisions and residential areas suggesting possible impacts to any historic properties in this location. Historic properties located within the margins of Waikōloa Stream will likely be associated with vehicular or utility stream crossings including fords, bridges, or pipeline supports.

Section 4 Results of Fieldwork

4.1 Survey Findings

A complete pedestrian survey identified three historic properties consisting of four features within or adjacent to the current project area along Waikōloa Stream (Figure 15). These historic properties consisted of a collapsed and severely damaged concrete ford or bridge (SIHP # -26871 Feature A), a remnant portion of paved road (SIHP # -26871 Feature B), an earthen ditch segment (SIHP# -26872), and an intact concrete ford and adjoining roadway (SIHP# -26873). SIHP# -26871 Features A and B were determined to be WWII-era constructions associated with Camp Tarawa. SIHP# -26872 was determined to be a remnant portion of "Akona's *'Auwai*", a mid-19th century irrigation ditch used for irrigating sugar cane fields and supplying the Līhu'e Sugar Mill (Burtchard and Tomonari Tuggle 2003). SIHP# -26783 was determined to be an early- to mid-20th century concrete ford and adjoining roadway that was used throughout the 20th century as a route between the Māmalahoa Highway and Kawaihae Road that bypassed the town of Waimea.

Additionally, two modest and generally modern modifications were observed within the project area consisting of a basalt stone and concrete terrace and a pipeline support. Both of these modifications were determined to lack site integrity.

The terrace is located near the eastern end of the project area adjacent to the Lindsey Road Bridge along the edge of Lanakila Park (Figure 16 and Figure 17). The terrace measures approximately 50 m long with a maximum width of 1.5 m and a maximum height of 0.8 m. The terrace is constructed of water-rounded to sub-angular basalt cobbles to medium boulders. Concrete was observed throughout the terrace adhering to the basalt stone. A one inch metal water line was observed extending from ground surface to the top of the terrace and capped by a closed valve. Collapse was observed in several areas. The terrace was determined to be a modern landscaping modification associated with Lanakila Park. After WWII, the raised bed between the terrace and the edge of Waikōloa Stream was planted with flowers. Currently the terrace is surrounded by mowed grass and shrubbery.

The pipeline support consists of two basalt cobble and concrete wall segments built into the sides of Waikōloa Stream behind the Catholic Church complex (Figure 18). Corroded steel pipes were observed within the foundation of one of these support walls. The pipeline support wall located within the current project area appeared to have been recently and informally constructed (Figure 19). The roman numeral "IV" was observed etched into the top of the support (Figure 20). The pipeline support on the opposite edge of Waikōloa Stream, outside of the current project area, appears to be slightly older but lacked the site integrity needed for eligibility as an historic property.

Detailed descriptions of the three historic properties located within or adjacent to the current project area are presented in the following section.

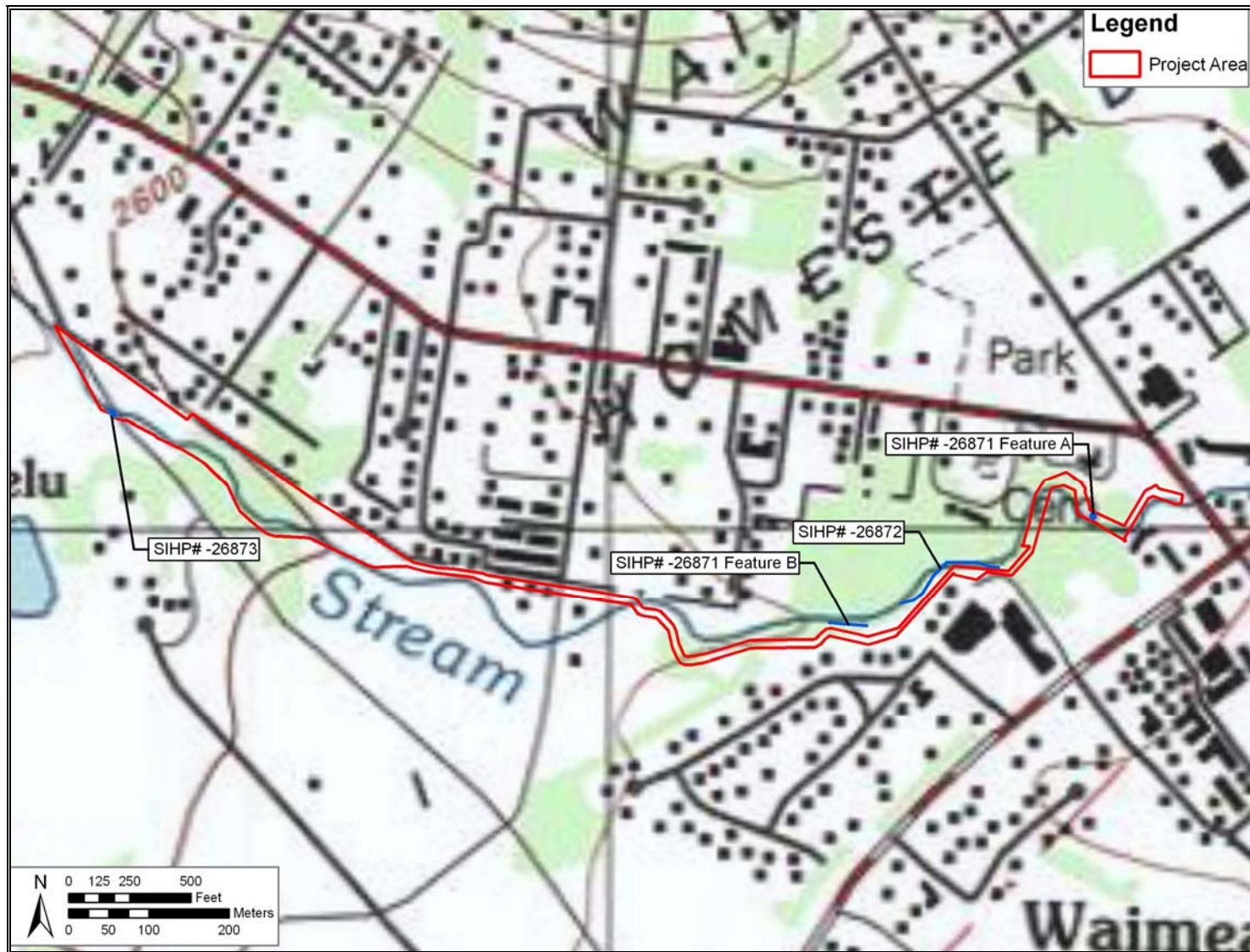


Figure 15. Portion of the 1995 Kamuela USGS 7.5-minute topographic quadrangle showing historic properties



Figure 16. Stone terrace bounding Lanakila Park near Lindsey Road Bridge, view to southeast



Figure 17. Stone terrace bounding Lanakila Park near Lindsey Road Bridge, view to east



Figure 18. Two pipeline supports along Waikōloa Stream, view to south



Figure 19. Modern pipeline support structure within the current project area, view to east



Figure 20. Roman numeral "IV" etched into the top of the pipeline support within the project area, view to east

4.2 Site Descriptions

4.2.1 SIHP# 50-10-06-26871

SITE TYPE:	Military Infrastructure
FUNCTION:	Transportation
FEATURES:	2
DIMENSIONS:	Feature A - 7.5 m by 4.2 m Feature B - 47.9 linear m
CONDITION:	Poor (remnant)
PROBABLE AGE:	WWII (1939-1945)
TAX MAP KEY:	Feature A - [3] 6-5-003:004 Feature B - [3] 6-6-003:007

DESCRIPTION:

SIHP# -26871 (CSH 1) consists of two features (Feature A and Feature B) located within the eastern half of the current project area (See Figure 15). Feature A, a collapsed concrete ford or stream crossing, is located within the Waikōloa Stream bed approximately 315 linear meters from Feature B. Feature B is a remnant portion of paved roadway located perpendicular to the southern edge of Waikōloa Stream. While geographically distant, SIHP# -26871 Features A and B are temporally equivalent. Both features are attributed to WWII-era military infrastructure associated with the adjacent Camp Tarawa.

Feature A is a collapsed and nearly destroyed ford or stream crossing consisting of a concentration of seven concrete slabs within the bed of Waikōloa Stream (Figure 21 and Figure 22). The southern edge of Feature A is located approximately 2.0 m north of the proposed trail stream crossing. Characteristics of the concrete slabs of Feature A include variable thickness (35-75 cm), uneven surfaces, and internal composition consisting of basalt gravel and water-rounded cobbles all suggesting expedient and informal construction. The name "A BASTIN" and the date "JULY 1942" were observed etched into the side of the largest slab of concrete (Figure 23). The construction techniques, function, date, and proximity to Camp Tarawa of Feature A all suggest that it was expediently constructed during the early part of WWII as a stream crossing for pedestrians and potentially vehicles moving to and from Camp Tarawa and Waimea town.

Feature B is a remnant portion of paved roadway that extends along the western edge of the Waimea Nature Park within the proposed trail alignment (Figure 24). The majority of the roadway segment is covered with mowed grass except a well-trodden central portion. The roadway is bounded in several locations by large trees and shrubbery. A tall berm (approximately 2.0 m) rises along the southern perimeter of Feature B to the edge of several private residences delineated by a stacked basalt stone wall 3 to 6 courses high (Figure 25) SIHP# -26871 Feature B is likely the remnant of Abemama Road that extended northeast to southwest through Camp Tarawa (See Figure 12).



Figure 21. SIHP# -26871 Feature A within Waikōloa Stream, view to northeast



Figure 22. SIHP# -26871 Feature A within Waikōloa Stream, view to north



Figure 23. SIHP# -26871 Feature A inscription on concrete slab, view to east



Figure 24. SIHP# -26871 Feature B remnant roadway, view to west



Figure 25. Boundary wall adjacent to SIHP# 26871 Feature B, view to south

4.2.2 SIHP# 50-10-06-26872

SITE TYPE:	Ditch (Akona's `Auwai)
FUNCTION:	Agriculture/Water Control
FEATURES:	1
DIMENSIONS:	Approximately 143.5 linear m
CONDITION:	Good
PROBABLE AGE:	Post-Contact
TAX MAP KEY:	[3] 6-6-003:007
DESCRIPTION:	

SIHP# -26872 (CSH 2) consists of an earthen ditch located within the eastern half of the project area. The ditch originates at a sharp bend in Waikōloa Stream and continues to the southwest effectively bypassing a large meander in the stream (Figure 26 and Figure 27). The ditch measures approximately 143.5 linear m with a width ranging from 3 to 6 m and a maximum depth of 1.9 m. The western end of the ditch segment has been filled in near SIHP# -26871 Feature B suggesting that this portion of the ditch was graded during construction of Camp Tarawa (Figure 28). A sediment berm has been constructed at the eastern end of the ditch where it connects to Waikōloa Stream so that water is properly diverted into the main meandering channel of the stream (Figure 29). SIHP# -26872 is bounded by house lots to the south and the Waimea Nature Park to the north.

SIHP# -26872 is depicted on historic maps as early as 1908 (See Figure 7) labeled at "ditch" and subsequently in 1914 and 1915 (See Figure 8 and Figure 9) labeled as "Akona's 'Auwai". These historic maps indicate that the remnant portion of SIHP# -26872 (Akona's 'Auwai) located adjacent to the current project area is the source of the 'auwai where it breaks from Waikōloa Stream and continues westward for at least 2.5 miles as a dendritic channel.

Historic background research suggests that Akona's 'Auwai was used primarily to power the sugar mill at Līhu'e and to irrigate nearby sugarcane fields (Burtchard and Tomonari Tuggle 2003). "Akona was a Chinese who lived in the Waimea area in the 1840's and 50's (and perhaps somewhat before and after)" (Clark 1981:28). Clark further describes Akona's 'Auwai as:

The main channel was labeled the Akona 'auwai by Wall, thus lending its name to the entire subset. The Akona subsystem branches into a large dendritic network through the center of the survey area. It is this irrigation network which fed into the Līhu'e sugarcane fields. It also, however, extends well beyond this, indicating that it is not merely a development for the short-lived sugar industry in Lālāmilo (Clark 1981:28).

During the Bishop Museum archaeological survey (Clark 1981) all 'auwai that were identified within the study area (located approximately 1.3 km west of the current project area), including portions of Akona's 'Auwai, were assigned a single site number, SIHP# -9179. While Akona's 'Auwai may be included within SIHP# -9179, the current archaeological study sought to



Figure 26. SIHP# 26872 (Akona's *'Auwai*), view to west



Figure 27. SIHP# 26872 (Akona's *'Auwai*), view to southwest



Figure 28. Western end of SIHP# 26872 (Akona's 'Auwai) showing the Waimea Nature Park, view to west



Figure 29. Eastern end of SIHP# 26872 (Akona's 'Auwai) at connection with Waikōloa Stream showing sediment berm and placed log, view to north

assign Akona's *'Auwai* an individual number, SIHP# -26872 for description and mitigation purposes. It is interesting to note that the 1956 and 1995 USGS Kamuela Quadrangle maps (See Figure 1 and Figure 13) depict the main channel of Waikōloa Stream as flowing within SIHP# -26872 and do not show the current stream meander that bends around the northern end of the Waimea Nature Park.

4.2.3 SIHP# 50-10-06-26873

SITE TYPE:	Ford
FUNCTION:	Transportation
FEATURES:	1
DIMENSIONS:	16.8 m by 11.3 m
CONDITION:	Good
PROBABLE AGE:	Post-Contact
TAX MAP KEY:	[3] 6-6-003:013
DESCRIPTION:	

SIHP# -26873 consists of an intact ford and associated roadway located at the western end of the current project area (Figure 30). The ford is constructed entirely of concrete with basalt gravels. The eastern side of the ford within Waikōloa Stream consists of a concrete ramp to the north and an open channel leading to a 0.7 m diameter culvert that has been completely filled in with alluvium (Figure 30 to Figure 33). A mortared cut basalt stone wall measuring two courses high was observed at the northeastern corner of the ford extending northward approximately 5.0 m (Figure 32). The western side of the ford consists of a vertical to slightly sloping concrete face measuring 1.2 m high with the central culvert located slightly above the current stream water level (Figure 33). The surface of the ford is generally level rising slightly along its northern and southern edges to meet the adjoining roadway. The adjoining roadway consists of highly weathered cement that has been paved over with asphalt to near the edges of the ford.

A ford or bridge and associated roadway at the location of SIHP# -26873 is depicted on historic maps as early as 1914 (See Figure 8) and is labeled as "Road to Puopelu". The 1908 W.E. Wall map (See Figure 7) depicts "Pu'u Opele" road north of Waikōloa Stream, but does not show the road extending south across the stream. It seems likely that the current ford (SIHP# -26873) at this location was constructed as a replacement for an earlier, modest stream crossing prior to WWII. A map of Camp Tarawa (from Nees and Williams 1998:17; See Figure 12) depicts the roadway adjoining SIHP# -26873 as "Betio Avenue" and shows the location of the existing ford.

Background research and historic maps suggest that the SIHP# -26873 ford and adjoining roadway were used throughout the 20th century as a route between the Māmalahoa Highway and Kawaihae Road that bypassed the town of Waimea.



Figure 30. SIHP# 26873 ford and associated roadway, view to northwest



Figure 31. Eastern side of SIHP# -26873 showing concrete ramp and sediment-filled culvert opening, view to west



Figure 32. Cut basalt stone wall at the northeastern corner of SIHP# -26873, view to northeast



Figure 33. Western side of SIHP# 26873 showing culvert, view to east

Section 5 Summary and Interpretation

The findings of the current inventory survey are largely as expected when compared to land use in the vicinity of the current project area. A total of three post-contact historic properties were identified (Table 3). No pre-contact or traditional Hawaiian historic properties were identified within the project area. Previous archaeological research (Clark 1981; Barrera Jr. 1993; Haun et al. 2002) suggests that pre-contact land use associated with the Waimea agricultural field system was generally located to the west and south of the current project area. It seems likely however, that the area along Waikōloa Stream within the current project area could have served a similar purpose. Historic and modern development beginning in the mid-19th century may have impacted or completely destroyed any pre-contact historic properties located on the surface of the current project area.

It was during the mid-19th century that SIHP# -26872 (Akona's *'Auwai*) was constructed for irrigating sugar cane fields and supplying the Līhu'e Sugar Mill (Burtchard and Tomonari Tuggle 2003). Historic maps (See Figure 7 to Figure 9) indicate that the remnant portion of SIHP# -26872 (Akona's *'Auwai*) located adjacent to the current project area is the source of the *'auwai* where it breaks from Waikōloa Stream and continues westward for at least 2.5 miles as a dendritic channel. SIHP# -26872 (Akona's *'Auwai*) was likely truncated and partially filled during development in Waimea associated with Parker Ranch, residential construction, and Camp Tarawa.

In the early 20th century, a ford or bridge was constructed at the western end of the current project area across Waikōloa Stream. The ford appears on historic maps as early as 1915 (See Figure 9) and is associated with the "Road to Puopelu". It seems likely that the current ford (SIHP# -26873) at this location was constructed as a replacement for an earlier, modest stream crossing prior to WWII. SIHP# -26873 ford and adjoining roadway were used throughout the 20th century as a route between the Māmalahoa Highway and Kawaihae Road that bypassed the town of Waimea.

In 1942, the construction of Camp Tarawa likely impacted the majority of land within the current project area. Much of the land south of Waikōloa Stream was graded and a network of roadways connecting encampments and temporary buildings was constructed. It was during this construction that a large section of SIHP# -26872 (Akona's *'Auwai*) was likely filled and destroyed. A remnant portion of roadway (SIHP# -26871 Feature B) was identified during the current survey extending parallel to the southern edge of Waikōloa Stream within the eastern half of the project area. SIHP# -26871 Feature B is likely the remnant of Abemama Road that extended northeast to southwest through Camp Tarawa (See Figure 12). Additionally a collapsed concrete ford or bridge (SIHP# -26871 Feature A) was identified near the eastern edge of the current project area. SIHP# -26871 Feature A, with an etched date of July 1942, suggests that it was likely constructed as a stream crossing access from Camp Tarawa to Waimea Town.

Table 3. Summary of historic properties located within the current project area

SIHP# 50-10- 06-	Feature	Type	Function	Probable Age	Significance	Recommendations
26871	A	Ford	Transportation	WWII-Era	A, D	Preservation (avoidance and protection)*
	B	Road	Transportation	WWII-Era	A, D	No Further Work
26872	-	Ditch	Agriculture/ Water Control	Post- Contact	A, D	Preservation (avoidance and protection)
26873	-	Ford	Transportation	Post- Contact	D	No Further Work

* See Section 7.2 Mitigation Recommendations for clarification

Section 6 Significance Assessments

The current archaeological inventory survey investigation has documented three historic properties within or adjacent to the project area (See Table 3).

Significance is determined after evaluation of the historic property in light of the five broad criteria used by the Hawai'i State Register of Historic Places (HAR 13-284-6). The criteria are the following:

- A Historic property reflects major trends or events in the history of the state or nation.
- B Historic property is associated with the lives of persons significant in our past.
- C Historic property is an excellent example of a site type.
- D Historic property has yielded or may be likely to yield information important in prehistory or history.
- E Historic property has cultural significance to an ethnic group, including, but not limited to, religious structures, burials, and traditional cultural properties.

SIHP# -26871 consists of two features (Feature A and B) related to WWII-era infrastructure associated with Camp Tarawa. Feature A is a collapsed ford or bridge with an etched date of July 1942. Feature B is a remnant portion of roadway likely part of Abemama Road of the former Camp Tarawa. SIHP# -26871 is recommended significant under Hawai'i Register Criteria A due to its direct association with WWII and Criteria D due to its information content.

SIHP# 50-10-06-26872 (CSH 2), an early post contact irrigation ditch (Akona's *'Auwai*), is recommended significant under Hawai'i Register Criteria A due to its association with the advent of commercial sugarcane agriculture on Hawai'i Island as a major agricultural trend lasting for over a century and D due to its information content.

SIHP# 50-10-06-26873 (CSH 3), a historic-era concrete ford and associated roadway, is recommended significant under Hawai'i Register Criterion D due to its information content.

Section 7 Project Effect and Mitigation Recommendations

7.1 Project Effect

CSH's project specific effect recommendation is "effect, with agreed upon mitigation measures." The recommended mitigation measures will reduce the project's potential adverse effect on these significant historic properties.

7.2 Mitigation Recommendations

SIHP# 50-10-06-26871 (CSH 1), consists of two features (Feature A and B) related to WWII-era infrastructure associated with Camp Tarawa. Feature A is a collapsed ford or bridge with an etched date of July 1942. Feature B is a remnant portion of roadway likely part of Abemama Road of the former Camp Tarawa. Recommendations for SIHP# 50-10-06-26871 were developed in consultation with SHPD.

SIHP# -26871 Feature A will not be adversely affected by the current proposed trail and greenway project and therefore is recommended for preservation in the form of avoidance and protection. If, in the course of future development, SIHP# -26871 is potentially affected, "the portion of the ford containing the written name and date be recovered for use in a permanent interpretive marker at this location" (SHPD Correspondence LOG# 2009.3224, DOC# 0908MD07; See Appendix B). Interpretive signage at the location of SIHP# -26871 Feature A may be developed in consultation with SHPD to provide Waimea residents and pedestrians using the trail with information on the history of the area. Interpretive signage at SIHP# -26871 Feature A may include a short synopsis of Camp Tarawa and how the camp transformed the lives of Waimea residents during and after World War II.

SIHP# -26871 Feature B is recommended for no further work. Sufficient information regarding location, function, age, and construction has been generated by the current inventory survey investigation.

SIHP# 50-10-06-26872 (CSH 2), an early post-contact irrigation ditch (Akona's *'Auwai*). Preservation in the form of avoidance and protection is recommended. Any proposed alteration to SIHP# 50-10-06-26872 will prior require consultation with and approval of SHPD.

SIHP# 50-10-06-26873 (CSH 3), a historic-era concrete ford and associated roadway. No further work is recommended. Sufficient information regarding location, function, age, and construction has been generated by the current inventory survey investigation.

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Appendix A Land Commission Awards



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DOCUMENT DELIVERY

Change password Log out

Mahele Database Documents
Number: 00976

Claim Number:	00976		
Claimant:	Beckley, William		
Other claimant:			
Other name:			
Island:	Hawaii		
District:	Hamakua, Hilo, Kohala South		
Ahupuaa:	Waimea, Waipio°, Punahoa°, Halawa		
Ili:	Owahawaha (Waawaa), Waikane, Muliwai°, Punahoa°		
Apana:	4	Awarded:	1
Loi:		FR:	
Plus:		NR:	574v2
Mala Taro:		FT:	201v3, 62v5
Kula:		NT:	
House lot:	1	RP:	5065
Kihapai/Pakanu:		Number of Royal Patents:	1
Salt lands:		Koele/Poalima:	No
Wauke:		Loko:	No
Olona:		Lokoia:	No
Noni:		Fishing Rights:	No
Hala:		Sea/Shore/Dunes:	No
Sweet Potatoes:		Auwai/Ditch:	No
Irish Potatoes:		Other Edifice:	No
Bananas:		Spring/Well:	No
Breadfruit:		Pigpen:	No
Coconut:		Road/Path:	No
Coffee:		Burial/Graveyard:	No
Oranges:		Wall/Fence:	Yes
Bitter Melon/Gourd:		Stream/Muliwai/River:	No
Sugar Cane:		Pali:	No
Tobacco:		Disease:	No

<https://www.waihona.com/purchase.asp>

7/9/2009

Koa/Kou Trees:	Claimant Died:	No
Other Plants:	Other Trees:	
Other Mammals: No	Miscellaneous:	S. Kohala award only

**No. 976, William Beckley, Honolulu, November 17, 1847
N.R. 574v2**

The Honorable Land Commissioners of Hawaii: We have seen the document about claiming lands, therefore I hereby write concerning my land.

One land, called Muliwai, a kupono /probably an `ili kupono, an independent `ili/, at Waipio on Hawaii, from the Mo`i, Kamehameha III.

One farm at Waimea on Hawaii, from the Mo`i, Kamehameha III.

One house lot at Waimea on Hawaii.

One house lot at Punahoa in Hilo on Hawaii, bought by us from Kaeo.

I am, with thanks,
WILLIAM BECKLEY

These are all awarded except Muliwai in Waipio taken in division

F.T. 201v3

Cl. 976, William Beckley, November 15, 1849

Cl. 812, Asa Kaeo, Eleele from page 138 [Award 387, Hilo Mission]

To the Honorable Commissioners Land at Honolulu.

Gentlemen, I hereby relinquish all claims to the lot of land in dispute between the American Board of Commissioners for Foreign Missions and myself, situated just makai of the Protestant Church in Hilo, Hawaii and beg to withdraw the same from your further consideration,

I remain, gentlemen, &c, &c,

William Beckley,

Correct copy. Resumed Page 62 volume 5

F.T. 62-63v5

No. 976, William Beckley, See Vol. III, page 201

This claim consists of 5 lots.

1. The Ili Muliwai, Ahupuaa Waipio, Hamakua, the property of His Hawaiian Majesty Kamehameha 3rd of which he is konohiki.

2. The ili of Pualoalo, Ahupuaa Halawa, District Kohala, the gift of His Hawaiian Majesty Kamehameha 3d, since reverted to the Hawaiian Government, and sold to Kaihe.

3. An house lot situated on Ahupuaa Punahou, in the district of Hilo, bought of Asa Kaeo, this lot was disputed by Kalakuaioha, now claimed by the Mission board.

4. Kanehailua, sworn deposed, I know this lot to a portion of land in kula of Waimea. Ahupuaa Kohala called Owahawaha. It is enclosed by a stone wall, has one house on it belonging to Lakapu, the man employed by William Beckley to take care of it, but he has no right in the soil, the gift of His Hawaiian Majesty Kamehameha 3. A.D. 1845.

It is bounded: on all sides by waste land of konohiki.

Kanakaole, sworn deposed, that the evidence of Kanehailua was true. They know of no counter claim.

5. James Fay, sworn deposed, knows the house lot of William Beckley, to be situated on the Ili Waikani, Ahupuaa Waimea, Kohala and that he bought it of Robert Robinson. I do not know the exact amount he paid for it.

It is surrounded on all sides by the waste or uncultivated land of konohiki. I have never heard his claim disputed.

Note: This is the piece of land Governor Adams gave to Robert Robinson in exchange. See Robinson's claim No. 231.

[Award 976; R.P. 5065; Waimea S. Kohala; 2 ap. 29.59 Acres; Waawaa S. Kohala; 1 ap.; 24.7 Acs; Waikani S. Kohala; 1 ap.; 4.903 Acs; Hilo & Waipio claims not awarded]

Number: 03785

Claim Number:	03785		
Claimant:	Olepau		
Other claimant:			
Other name:			
Island:	Hawaii		
District:	Kohala, South		
Ahupuaa:	Waimea		
Ili:	Kauakanaka, Opeawai, Alaohia		
Apana:	1	Awarded:	1
Loi:		FR:	
Plus:		NR:	48v8
Mala Taro:		FT:	
Kula:		NT:	40v4
House lot:	1	RP:	
Kihapai/Pakanu:		Number of Royal Patents:	0
Salt lands:		Koele/Polima:	No
Wauke:		Loko:	No
Olona:		Lokoia:	No
Noni:		Fishing Rights:	No
Hala:		Sea/Shore/Dunes:	No
Sweet Potatoes:		Auwai/Ditch:	No
Irish Potatoes:		Other Edifice:	No
Bananas:		Spring/Well:	No
Breadfruit:		Pigpen:	No
Coconut:		Road/Path:	No
Coffee:		Burial/Graveyard:	No
Oranges:		Wall/Fence:	No
Bitter Melon/Gourd:		Stream/Muliwai/River:	No

<https://www.waihona.com/purchase.asp>

7/9/2009

Sugar Cane:	Pali:	No
Tobacco:	Disease:	No
Koa/Kou Trees:	Claimant Died:	No
Other Plants:	Other Trees:	
Other Mammals: No	Miscellaneous:	3/2 houses on lot; claims land in Opeawai, receives land in Kauakanaka

**No. 3785, Olepau, Waimea, Hawaii, January 12, 1848
N.R. 48v8**

To the Honorable Land Commissioners, Greetings: I hereby describe my houselot at Opeawai, Alaohia, Waimea, Hawaii. The length is 36 fathoms and so is the width. Wilama Bekele /William Beckeley/, the konohiki, has consented. There are three houses in this lot, which has not been completely fenced, however, it is being done. I desire to secure this place for myself.
OLEPAU

N.T. 40v4
No. 3785, Olepau, September 16, 1848

W. Bakle, sworn and stated, I have seen in the ili land at Kanakanaka a house-lot which has been enclosed, with two houses in it. The surrounding boundaries are mine only and his /Olepau/ interest is from me. I had heard that was an old land belonging to him and when he had asked me in 1848, I consented to let him have that place without any objections.

[Award 3785; Kauakanaka Waimea S. Kohala; 1 ap.; .42 Ac.]





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Mahele Database Documents

Number: 00589B

Claim Number:	00589B		
Claimant:	Naholowaa		
Other claimant:			
Other name:	Kaholowaa		
Island:	Hawaii		
District:	Kohala, South		
Ahupuaa:	Waimea		
Ili:	Puuapelu		
Apana:	1	Awarded:	1
Loi:		FR:	
Plus:		NR:	
Mala Taro:		FT:	65v5
Kula:		NT:	
House lot:	1	RP:	6682
Kihapai/Pakanu:	3	Number of Royal Patents:	1
Salt lands:		Koele/Poalima:	No
Wauke:		Loko:	No
Olona:		Lokoia:	No
Noni:		Fishing Rights:	No
Hala:		Sea/Shore/Dunes:	No
Sweet Potatoes:		Auwai/Ditch:	No
Irish Potatoes:		Other Edifice:	No
Bananas:		Spring/Well:	No
Breadfruit:		Pigpen:	No
Coconut:		Road/Path:	No
Coffee:		Burial/Graveyard:	No
Oranges:		Wall/Fence:	No
Bitter Melon/Gourd:		Stream/Muliwai/River:	No
Sugar Cane:		Pali:	No
Tobacco:		Disease:	No

<https://www.waihona.com/purchase.asp>

6/30/2009

Koa/Kou Trees:	Claimant Died:	No
Other Plants:	Other Trees:	
Other Mammals: No	Miscellaneous:	3 fields partly under cultivation

**No. 589B, Naholowaa, Wednesday, January 30th
F.T. 65v5**

William Beckley, sworn deposed, He wrote the claim for Naholoaa and gave it into the Land Office at Honolulu and furthermore deposeth, that he knows the claim of Naholoaa to consist of 3 fields, on which he has his house lot, not enclosed, partly cultivated, situated on the Ili Puuapelu, Waimea, the gift of William Beckley, konohiki, A.D. 1846. Surrounded by waste land of konohiki. I know of no counter claim.

[Award 589B; R.P. 662; Punopelu S. Kohala; 1 ap.; 4.89 Acs]

Number: 03202B

Claim Number:	03202B		
Claimant:	Bowers, Jose		
Other claimant:			
Other name:			
Island:	Hawaii		
District:	Kohala, South		
Ahupuaa:	Waimea		
Ili:	Puuopelu		
Apana:	1	Awarded:	1
Loi:		FR:	
Plus:		NR:	
Mala Taro:		FT:	62v4
Kula:		NT:	
House lot:	1	RP:	8443
Kihapai/Pakanu:	3	Number of Royal Patents:	1
Salt lands:		Koele/Poalima:	No
Wauke:		Loko:	No
Olona:		Lokoia:	No
Noni:		Fishing Rights:	No
Hala:		Sea/Shore/Dunes:	No
Sweet Potatoes:		Auwai/Ditch:	No
Irish Potatoes:		Other Edifice:	No
Bananas:		Spring/Well:	No
Breadfruit:		Pigpen:	No
Coconut:		Road/Path:	No
Coffee:		Burial/Graveyard:	No
Oranges:		Wall/Fence:	No
Bitter Melon/Gourd:		Stream/Muliwai/River:	No

<https://www.waihona.com/purchase.asp>

6/30/2009

Sugar Cane:	Pali:	No
Tobacco:	Disease:	No
Koa/Kou Trees:	Claimant Died:	No
Other Plants:	Other Trees:	
Other Mammals: No	Miscellaneous:	3 fields & house

**No. 3202B, Jose Bowers, Waimea, Monday, January 28th 1850
F.T. 62v5**

William Beckley konohiki, sworn deposed, He wrote the claim of Jose Bowers and gave it to the Board at Honolulu. Also knows the claim of Jose Bowers, to consist of 3 fields, on which is house is built. It is not enclosed, situated in the Ili Puuopelu, Ahupuaa Waimea.

The gift of Mr. Beckley, konohiki, 1847. There is no counter claim.

[Award 3202B; R.P. 8443; Puuopelu Waimea; 1 ap.; 7.6 Acs; Index lists Jose B. Bowers]



Number: 04885

Claim Number:	04885		
Claimant:	French, William		
Other claimant:			
Other name:			
Island:	Hawaii		
District:	Kohala, South		
Ahupuaa:	Waimea		
Ili:	Ahuli		
Apana:	1	Awarded:	1
Loi:		FR:	5v3
Plus:		NR:	
Mala Taro:		FT:	167,177v2
Kula:		NT:	493v2
House lot:	1	RP:	67
Kihapai/Pakanu:		Number of Royal Patents:	1
Salt lands:		Koele/Poalima:	No
Wauke:		Loko:	No
Olona:		Lokoia:	No
Noni:		Fishing Rights:	No
Hala:		Sea/Shore/Dunes:	No
Sweet Potatoes:		Auwai/Ditch:	No
Irish Potatoes:		Other Edifice:	No
Bananas:		Spring/Well:	No
Breadfruit:		Pigpen:	No
Coconut:		Road/Path:	No
Coffee:		Burial/Graveyard:	No
Oranges:		Wall/Fence:	No

<https://www.waihona.com/purchase.asp>

6/30/2009

Bitter Melon/Gourd:	Stream/Muliwai/River:	No
Sugar Cane:	Pali:	No
Tobacco:	Disease:	No
Koa/Kou Trees:	Claimant Died:	No
Other Plants:	Other Trees:	
Other Mammals: No	Miscellaneous:	Dwelling hous & premises

[4885], No. 4882, William French, Honolulu, January 15, 1848
F.R. 5v3
 [Listed as 4882-4886]

To the Board of Land Commissioners, I hand you 6 surveys of real estate for which I claim titles: Viz.

4882, No. 1 Warehouse premises, known by the name of French's Honolulu premises, with the Butcher's shop and one half of the wharf known as Charlton's & French's wharf, and Blacksmith's shop.

4883, No. 2 Premises in Honolulu, where I now reside.

4884, No. 3 Warehouse & premises at Kawaihae, Hawaii.

4885, No. 4 Dwelling house and Premises at Waimea, Hawaii.

4886, No. 5 Slaughter house premises, and small enclosure adjoining, with grass houses and cookhouse thereon.

All the above named places have been surveyed by Mr. Metcalf, whose surveys please to find on file with this petition, and notify me when to lay them before you, with the necessary vouchers.
 Signed, &c, William French

Understanding that a native woman, Kekai, has laid in a claim to house and premises now occupied by Mr. John Ladd in Honolulu, opposite my dwelling house. I have to state that said house was built by me, with the exception of the stone work which was done by John Ebbetts, deceased, during his absence on a voyage to Canton, in which he died. I have never been remunerated in full for my outlays, and have his written instructions how to appropriate his property in case of accident to him. The land was originally purchased from Richard Fort by said Jno Ebbetts.
 Signed, William French

See claim & testimony under No. 534

F.T. 167-168v2 [part of claim 4882]
 Claim 4882 to 4886, Wm. French, February 2
 4884

Samuel Rice, sworn, I know these houses situated at Pahonu in Hawaii, They [are enclosed] with a stone wall which I think is the boundary. I heard Governor Adams say he had given eh place to claimant in 1838 on condition of his building a wharf for the boats, and that it should be his. He built the stone house and wharf and has occupied the premises ever since in peace.

John Munn, sworn, I know the place and that the account of Mr. Rice is correct. I have often heard K [uakini?] say the same [blank section of page - illegible] know claimant has [blank section of page - illegible] ?has held quiet possession of it?] since he obtained it in 1838 [blank section of page - illegible].

4885

Samuel Rice, I know [blank section of page - illegible] ..huli Waimea for his own [blank section of page - illegible] [I] always understood got the place from [blank section of page - illegible ?Kuakini?] for services as Bullock catcher in 1831 and [blank section of page - illegible] the place and the Governor [blank section of page - illegible] like only do not encroach on the main road? He then took the place and enclosed it with a stone wall. I never heard of any opposition to his occupation. Mr. French purchased it from him in 1840 and has held it in peace ever since. If the Governor had not approved of Hughes's right to it, he would have opposed the transfer to claimant, which he on the contrary approved, I believe. (See copy of Bill of Sale).

John Munn, I know Hughes built a stone house there but not the particulars of the acquisition. I should infer he would not have built a valuable stone house and wall on the premises without good authority from Kuakini. Both Hughes and claimant have always held the place undisputed during their successive terms of occupation, as far as I know.

F.T. 177v2

Claim 2885, William French, continued from page 167

Know all men by these presents that I, William Hughs, of Waimea, Hawaii have this day sold to William French, merchant of Oahu, my dwelling house and buildings & land adjoining the saem, situated in Waimea and known by the name of Hughes' place for, and in consideration of th sum of \$20.00, and do also hereby agree to guarrantee the same to himself, his heirs, executors, and administrators free from all claims or deamdns of any one person or persons from this date. In witness of which I have hereunder set my hand & seal this 25th of July 1840.

Waimea, Hawaii, 25 July 1840

H. Hughes

Witness: John P. Parker, A. Charles Davies

N.T. 493-494v2

No. 4885, W. Franch [French], February 2, 1848

S. Rice, sworn by the Word of God and stated, I have seen French's place in Waimea, Hawaii. French and Hughs had a lease with Kuakini and I had heard Hughs talking with Kuakini saying, "Where shall I build a house for me?" Kuakini answered saying, "You may build your house on the place that you desire to do so." With that answer Hughs began working for Kuakini as cowhand and sometime later Hughs built his house there and lived peacefully to the year 1840. He had a sale with French and French lived in peace since that time to this day, no one objecting to him.

John G. Munn, sworn by the Word of God and stated, "I have seen Hughs build his house, but I do not know when he had obtained it. I think Hughs would not have built an expensive house like that house had Kuakini not approved because it was very expensive. I know known that Hughs has lived there peacefully. The result of this interest is not very clear until Hughs shall come."

[Award 4885, R.P. 67; Ahuli Waimea; 1 ap. 21.9 Acs; See No. 4884 for Foreign Register, Foreign & Native Testimony documents]



Number: 08513B

Claim Number: **08513B**
 Claimant: **Hoolulu,**
 Other claimant: **Beckley,**
 Other name:
 Island: **Hawaii**
 District: **Kohala, South**

<https://www.waihona.com/purchase.asp>

6/30/2009

Ahupuaa:	Waimea		
Ili:	Napooakolu		
Apana:	1	Awarded:	1
Loi:		FR:	
Plus:		NR:	
Mala Taro:		FT:	64v5
Kula:		NT:	
House lot:		RP:	5062
Kihapai/Pakanu:		Number of Royal Patents:	1
Salt lands:		Koele/Poalima:	No
Wauke:		Loko:	No
Olona:		Lokoia:	No
Noni:		Fishing Rights:	No
Hala:		Sea/Shore/Dunes:	No
Sweet Potatoes:		Auwai/Ditch:	No
Irish Potatoes:		Other Edifice:	No
Bananas:		Spring/Well:	No
Breadfruit:		Pigpen:	No
Coconut:		Road/Path:	No
Coffee:		Burial/Graveyard:	No
Oranges:		Wall/Fence:	No
Bitter Melon/Gourd:		Stream/Muliwai/River:	No
Sugar Cane:		Pali:	No
Tobacco:		Disease:	No
Koa/Kou Trees:		Claimant Died:	No
Other Plants:		Other Trees:	
Other Mammals:	No	Miscellaneous:	

**No. 8513B, Kuamoo Hoolulu
F.T. 64-65v5**

William Beckley, sworn deposed, he wrote the claim for Kuamoo Hoolulu, his wife, and gave it in himself to Board Land Commission at Honolulu.

Jose Bowers, sworn deposed, he knows the claim of Kuamoo Hoolulu to consist of a field on the Ili Napooakolu, Waimea, the gift of William Beckley, the konohiki, A.D. 1846, partly cultivated. They are surrounded by the waste land of konohiki. I know of no counter claim.

Kaikeike, sworn deposed, that the evidence given by Jose Bowers is true. I know of no counter claim.

F.T. 104v5

August 7th, Received of Kuamoo Hoolulu, No. 8313B, \$12.00

[Award 8513B; R.P. 5062; Napooakolu Waimea Kohala; 1 ap.; 29.44 Acs]

Appendix B SHPD Correspondence

LINDA LINGLE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
601 KAMOKILA BOULEVARD, ROOM 555
KAPOLEI, HAWAII 96707

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Commission on Water Resource Management
Conservation and Coastal Lands
Conservation and Resources Enforcement
Engineering
Forestry and Wildlife
Historic Preservation
Kahoolawe Island Reserve Commission
Land
State Parks

August 5, 2009

Hallett H. Hammatt, Ph.D.
Cultural Surveys Hawaii, Inc.
PO Box 1114
Kailua, Hawaii 96734

LOG NO: 2009.3224
DOC NO: 0908MD07
Archaeology

Dear Dr. Hammatt

**SUBJECT: Chapter 6E-8 Historic Preservation Review –
Archaeological Inventory Survey of 8.96 Acres with Three (3) New Sites
Lalamilo Ahupua`a, South Kohala District, Island of Hawaii
TMKs: (3) 6-5-003:004, 005, 007 & 044 (all, por.) and 6-6-003:006 & 013 (both, por.)**

This letter reviews the aforementioned report (*Yucha, Shideler and Hammatt 2009; Draft Archaeological Inventory Survey for the Waimea Trails and Greenway Project, Lalamilo Ahupua`a, South Kohala District, Hawaii Island, TMK: [3] 6-5-003:004 por., :005 por., :007 por., :044 por., 6-6-003:006 por., :013 por; SCH Job Code: LALAMILO 1*) which we received on July 22, 2009. This report summarizes an archaeological inventory survey in which three new sites were recorded. The three sites are: SIHP 50-10-06-26871, a WWII-era infrastructure associated with Camp Tarawa, recommended as significant under criteria "a" and "d"; SIHP -26872, an early post-contact era irrigation ditch (Akona's *Auwai*), recommended as significant under criteria "a", "c" and "d"; and SIHP -26873, an historic-era concrete ford and associated roadway, recommended as significant under criterion "d."

This AIS covers Phase 1 of the Waimea Trails and Greenway Project, and follows a site reconnaissance conducted by your firm around 2000. Phase 1 is the portion of the trail that will be ADA-accessible. A site visit was conducted by SHPD Hawaii Island Section Assistant Archaeologist Morgan Davis with project engineers David and John Imata of Imata & Associates; Galen Kuba from the County of Hawaii Department of Public Works, and Bobby Command, County of Hawaii Assistant to the Mayor.

We have some general questions/comments that we are requesting be clarified:

1. Was the survey done for this Phase 1 8.96 acres, or does the acreage represent the entire area that will be ultimately surveyed as part of the entire trail? In the Management Summary on p. i the entire acreage is listed as the project area, but in the Environmental Setting section on p. 8 this survey is said to cover 1.1 of a total 12 miles of the project.
2. In the Background Research section, please include information on the arrival of cattle to Hawaii.
3. Please include a chart in your Summary and Interpretation section indicating your recommendations for significance etc. for the sites. This information is currently only available in the Management Summary.

Dr. Hallet H. Hammatt
Page 2 of 2

We have concerns about some of the recommended significance evaluations and treatments, as detailed below.

Site 26871: We concur with the suggested significance assessments for this site, however, we cannot at this time concur with the proposed treatment. We do not find that either the current context or condition of either feature is sufficient to warrant the avoidance (preservation) you propose as a mitigation measure. Feature A is broken and no longer functional; we suggest that the portion of the ford containing the written name and date be recovered for use in a permanent interpretive marker at this location.

The Feature B asphalt-paved roadway has been extensively modified by current landscaping as part of the Greenways project as it runs from the parking area through an interpretive garden. Signs, water lines, sewer plumbing, a park bench and wooden steps all impinge into the current roadway and associated embankment. It is therefore no longer in a setting or context that represents the World War II era. We believe that sufficient information has been obtained by this AIS, and that no further work is required to document this section of the road.

Site 26872: You recommend that the portion of the ditch within the project area is significant under criteria "a", "c" and "d". We would appreciate an expanded explanation for why you are recommending criteria "a" and "c". The ditch has apparently been repeatedly damaged (during WWII and roadway constructions in the past); we would appreciate your thoughts on its qualities as an excellent example of its type (criterion "c"). We will consider the recommended treatment for this site after the question regarding criterion "c" has been addressed.

Site 26873: We concur with the recommended significance under criterion "d" for this a post-Contact ford, and concur with your recommendation of no further work for this site.

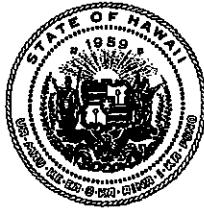
We look forward to reviewing a revised version of this AIS. If you have questions about this letter please contact Morgan Davis of our Hawaii Island Section at (808) 933-7650.

Aloha,



Nancy McMahon, Deputy SHPO/State Archaeologist
and Historic Preservation Manager
State Historic Preservation Division

LINDA LINGLE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
601 KAMOKILA BOULEVARD, ROOM 555
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KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

September 8, 2009

Hallet H. Hammatt, Ph.D.
Cultural Surveys Hawaii, Inc.
PO Box 1114
Kailua, Hawaii 96734

LOG NO: 2009.3316
DOC NO: 0909MD12
Archaeology

Dear Dr. Hammatt:

**SUBJECT: Chapter 6E-8 Historic Preservation Review –
Archaeological Inventory Survey of 8.96 Acres with 3 New Sites
Lalamilo Ahupua‘a, South Kohala District, Island of Hawai‘i
TMKs: (all, por.) (3) 6-5-003:004, 005, 007 & 044 and 6-6-003:006 & 013**

Thank you for resubmitting the above-referenced report (*Archaeological Inventory Survey For the Waimea Trails and Greenway Project, Lalamilo Ahupua‘a, South Kohala District, Hawaii Island, TMK: [3] 6-5-003:004 por., :005 por., :007 por., :044 por., 6-6-006:006 por., :013 por.; CSH Job Code: LALAMILO I*), which we received on August 28, 2009. This report summarizes an archaeological inventory survey in which three new sites were recorded. The three sites are: SIHP 50-10-06-26871, WWII-era infrastructure associated with Camp Tarawa, recommended as significant under criteria “a” and “d”; -26872, an early post-contact irrigation ditch (Akona’s *Auwai*), recommended as significant under criteria “a” and “d”; and -26873, a historic-era concrete ford and associated roadway, recommended as significant under criterion “d.” We concur with these significance recommendations. No further work is recommended for -26873 and we concur with that recommendation.

SIHP 26872, the ditch, has been recommended for preservation via avoidance as no part of the planned trail (which is to be constructed to be ADA accessible for persons with disabilities) is anticipated to affect it, and we concur with that recommendation. Should required ADA plans change this assumption SHPD is to be contacted so mitigation efforts can be discussed.

SIHP 26871 includes two features. Feature A, the ford, is recommended for preservation. Feature B, the remnants of a WWII-era road, is recommended for no further work. We concur with the recommendation for Feature B, and concur with the recommendation for mitigation regarding preservation of the portion of Feature A - the Ford - that contains the inscription and date. Because this Feature A does lie in the path of the trail’s stream crossing, we request that a preservation/interpretation plan be developed for our review and approval which will involve using the signature portion of the Ford to create an interpretive monument with interpretive signage.

We had previously requested minor revisions to an earlier draft of this report (*Log No. 2009.3224, Doc No. 0908MD07*) and all changes have been made. The report is generally of good quality and meets the requirements of HAR §13-276, thus fulfilling the historic preservation review requirements for this project. Upon receipt of this letter please submit one paper copy of your report marked “Final” to our Kapolei office along with a CD containing a searchable pdf version of the final report and a copy of this approval letter, marked to the attention of the “Kapolei Library.”

Hallet H. Hammatt, Ph.D.

Page 2 of 2

We look forward to reviewing the preservation plan for Feature A of SIHP 26871. If you have questions about this letter please contact Morgan Davis at (808) 933-7650.

Aloha,



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**AN ARCHAEOLOGICAL ASSESSMENT
OF PROPOSED WAIMEA TRAILS AND GREENWAY PROJECT
WITHIN THE LĀLĀMILO AND WAIKŌLOA AHUPUA'A,
SOUTH KOHALA DISTRICT, ISLAND OF HAWAI'I
(TMK 6-2, 6-5, 6-6)**

by

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Prepared for

GERALD PARK URBAN PLANNER

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I. INTRODUCTION

Cultural Surveys Hawaii, Inc. conducted an archaeological assessment for the proposed Waimea Trails and Greenway Project. The proposed trail route borders Waikōloa Stream from “Church Row” in Waimea town to South Kohala View Estates (Figure).

The Waimea Trails and Greenway Project is designed to provide a green belt through Waimea town for non-motorized, people-friendly community access along a stretch of Waikōloa Stream. The primary function of the proposed trail is to provide an alternative transportation route for non-motorized vehicles in the Waimea area. The linear project area passes through several well-known areas of Waimea, Puopelu, and Wai`aka and 3 separate *ahupua`a* including Lālāmilo, Waikōloa, and `Ōuli, on the island of Hawai`i (TMK 6-2, 6-5, & 6-6) (Figure 1).

A. Project Background

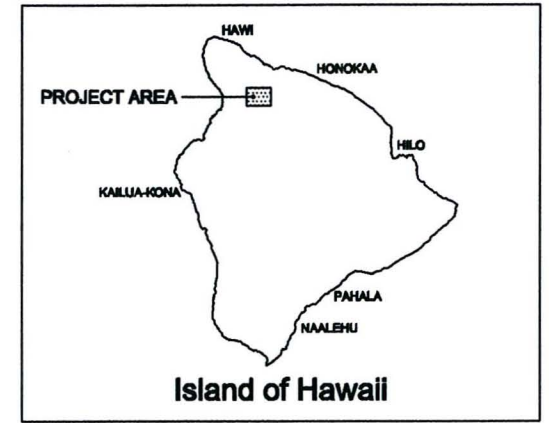
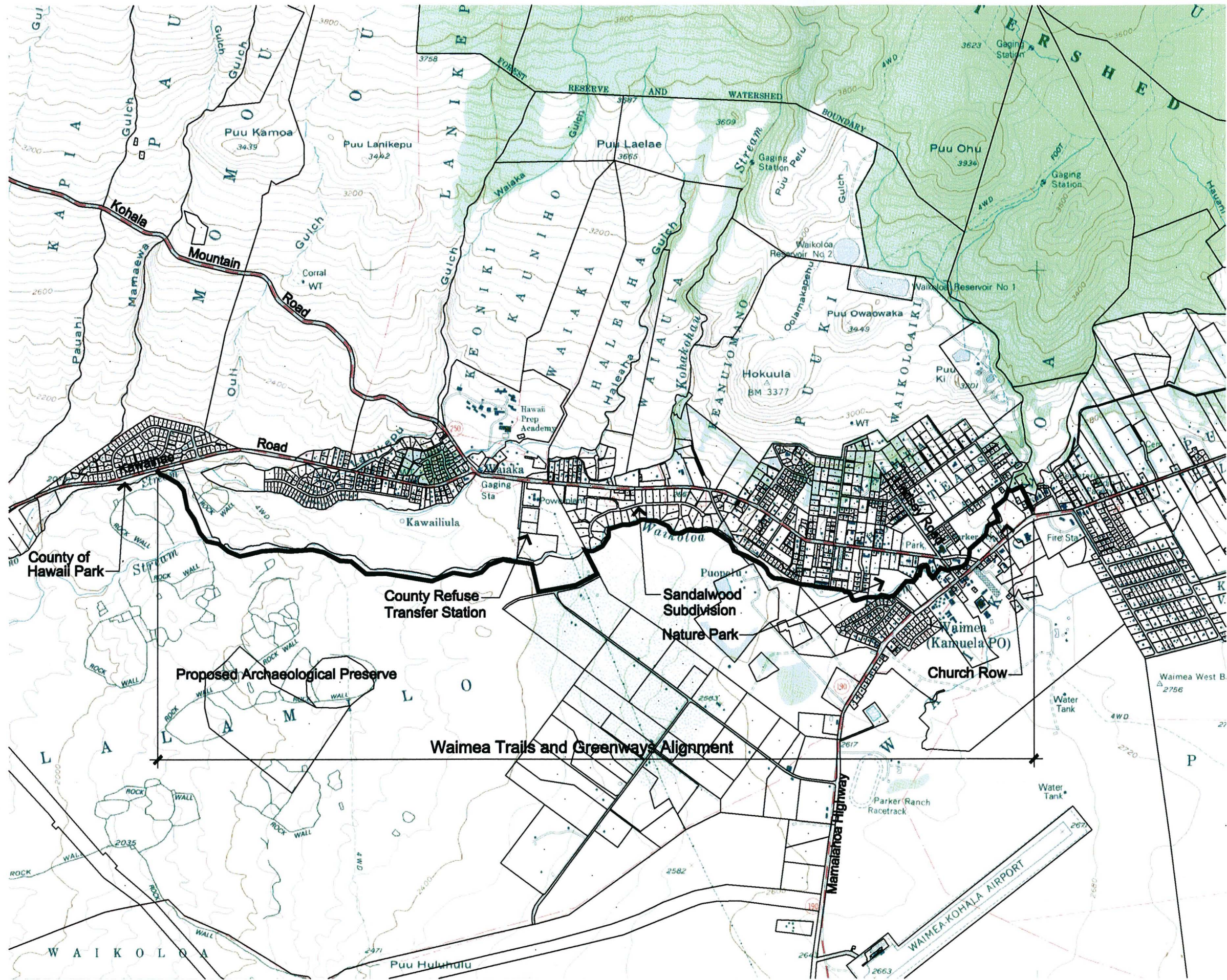
Cultural Surveys Hawai`i (CSH) was contacted by Gerald Park Urban Planner to provide an archaeological assessment for a roughly 6 mile section of a proposed 12 mile route characterized as a “multi-use pedestrian bikeway and equestrian path”.

The assessment includes historical background and previous archaeological research. The research work consisted of the examination of historical documents, Land Commission Awards, historic maps, with the specific purpose of identifying traditional Hawaiian and subsequently historic land use patterns. The review of existing archaeological and historical information allowed us to reconstruct traditional land use activities in the project area and help in our assessment to minimize impact on these resources. Fieldwork for the Waimea Trails and Greenway Project was conducted May 22nd and 23rd, 2000 by Matt McDermott B.A., and Doug Borthwick, B.A.. The research and fieldwork were conducted under the overall guidance of the project director Hallett Hammatt, Ph. D.

B. Project Area Description

The project area is located in the Waimea area of Hawai`i Island and includes a corridor running generally east-west from South Kohala View Estates in the west to “Church Row” in Waimea Town in the east. The corridor is along Waikōloa and Keanu`imanō Streams with several north-south running access routes projecting off from the main trail. In its entirety the trail and green way may extend about 12 miles. The corridor researched for the present archaeological assessment is approximately 6 miles long and varies from 30-45 feet wide.

In a larger context, the project area is situated in the Waimea Saddle region between the Kohala Mountains and Mauna Kea Volcano at an elevations about 2,000-3,000 feet above sea level. The climate is generally cool, moist and windy. Temperatures usually range



Source: USGS, Kamuela Quadrangle

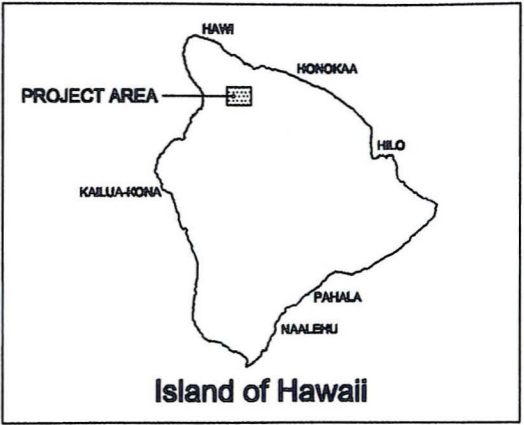
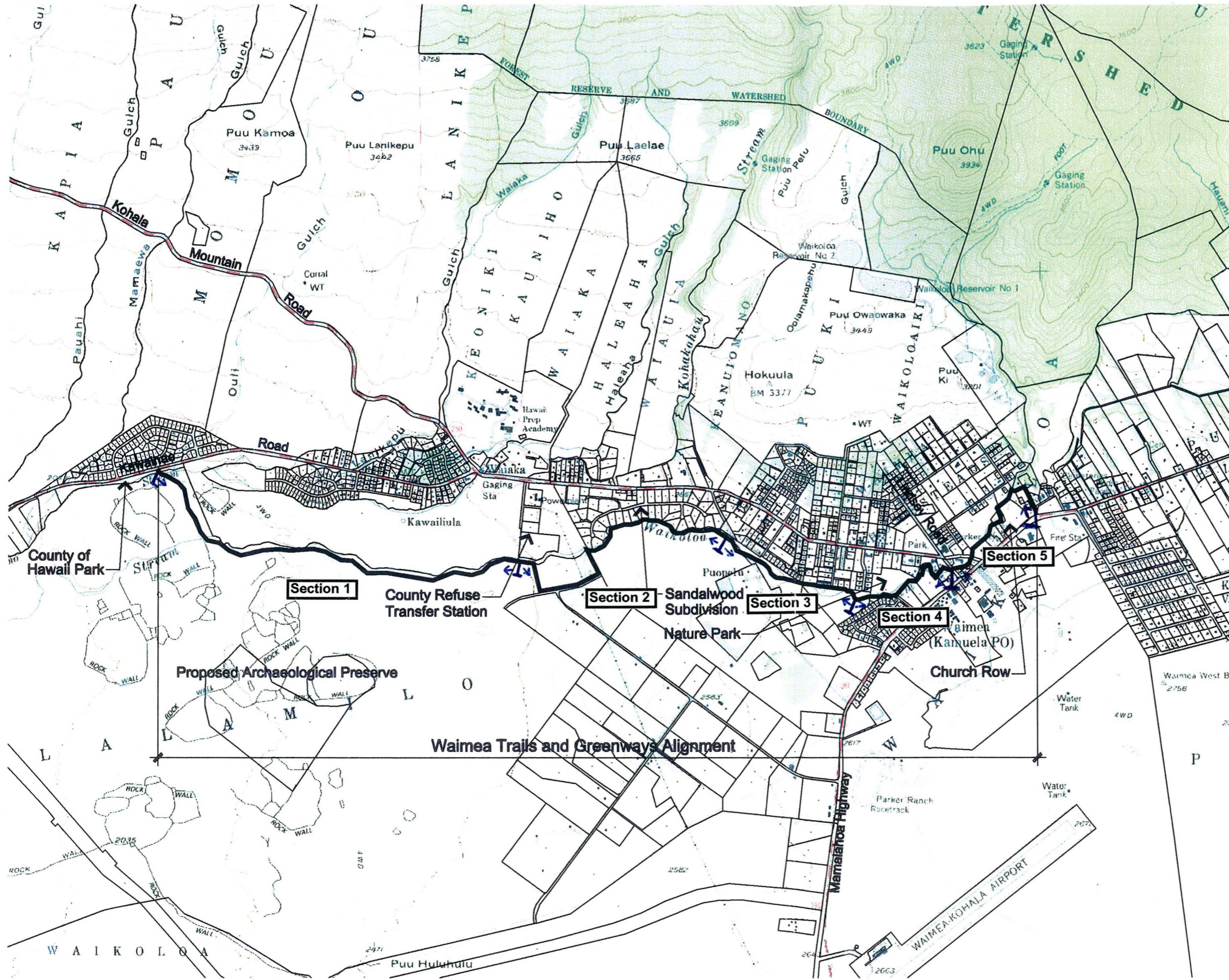
Figure 1
Location Map
Waimea Trails & Greenways

Department of Parks & Recreation
 Waimea, Island of Hawaii

NORTH

LINEAL SCALE (FEET)
 1000 500 0 500 1000 2000

Gerald Park
 Urban Planner
 November 2001



Source: USGS, Kamuela Quadrangle

Figure 2
Location Map Showing Sections 1 - 5

Waimea Trails & Greenways
 Department of Parks & Recreation
 Waimea, Island of Hawaii

NORTH

LINEAL SCALE (FEET)
 1000 500 0 500 1000 2000

Gerard Park
 Urban Planner
 November 2001

between 60-70° F, with mean maximums between 70-80° F, and mean minimums in the upper 40° F. The annual rainfall ranges from 75- 100 in. per year, with heavy rain fall within the months of January to April. Winds are dominated by consistent northeasterly trades. The soils within the project area are of a Waimea series that consists of well drained very fine sandy loam that formed in volcanic ash. These incepticol soils are usually in areas that are gently sloping to moderately steep. There are three major streams flowing off the Kohala slopes and onto the plains of Waimea, including Lanikepu, Waikōloa, and Kohākōhau (also known as Keanu`i`omanō) Streams.

From west to east the project area includes different climates, terrains, and degrees of urbanization. For the purpose of this assessment the corridor was divided into five sections, based mainly on degree of urbanization:

- Sect. 1: So. Kohala View Estates to Hawai`i County Refuse Transfer Station (Fig. 2)
- Sect. 2: West end of Refuse Transfer Station to Sandalwood Subdivision (Fig. 2)
- Sect. 3: East end of Sandalwood Subdivision to Waiki`i Rd. (Fig. 2)
- Sect. 4: Waiki`i Rd. to Lindsey Road Bridge (Eucalyptus forest)(Fig. 2)
- Sect. 5: Lindsey Road Bridge to Iwiola Catholic Church (Fig. 2)

C. Scope of Work/Methodology

The entire project area was covered by pedestrian investigation along the proposed 6 mile route. The archaeological assessment consisted of the following steps:

1. Background research on the Waimea area, but focusing on the proposed trails and green way corridor. The research consisted of an examination of historic maps, archival documents, and especially previous archaeological research in the area. The files of the State Historic Preservation Division were consulted for previous archaeological reports and other information on archaeological sites.
2. The entire corridor was covered on foot using the best available maps. The majority of the corridor could be accurately located on the ground based on the provided maps using known land marks such as existing roads, buildings and natural features. However, in portions of section 5 (see above) accurate survey was not possible based on available project maps.
3. The preparation of a report to contain results of the background search and field inspection. This report assesses the impact of the proposed route on archaeological resources. Maps of the entire trail and greenway route are provided showing location of all archaeological sites on or near the corridor. The report provides County recommendations regarding impacts on archaeological resources

II. TRADITIONAL BACKGROUND

The history of the Waimea region of Hawai`i island has been documented in a number of studies and publications including, but not limited to the *Fornander Collection of Hawaiian Folk-lore* (Fornander 1916-1919), *Ruling Chiefs of Hawai`i* (Kamakau 1961), *Place Names of Hawai`i* (Puku`i et. al 1974), *ʻŌlelo No`eau* (Puku`i 1983), *Hōkū o Hawai`i* Newspaper (Franklin et. al 1994) and missionary accounts (Baldwin and Lyons 1837; Doyle 1904, 1945, 1953; Bishop 1828; Ellis 1969).

These studies include references to oral traditions, the legendary rulers and personalities, early historic accounts, land ownership, and the changes in land use from traditional to modern times. The following section is a synopsis of these and other sources so as to provide a general overview of the historical and cultural setting related to the project area.

A. Place Names and *Mo`olelo*

The importance of place and stories connected to that place are an important part of traditional Hawaiian culture and the transmission of cultural knowledge from one generation to the next. The proposed Waimea Trails and Green Way Project falls within the traditional *ahupua`a* boundaries of Lālāmilo (lit., milo tree branch), Waikōloa (lit., duck water; or could refer to a name of a wind), and `Ōuli (referring to the name of a famous soldier of Kahekili's who was skilled with the *ma`a*, or sling) (Puku`i et al. 1974). Puopelu (shortened for Pu`u`ōpelu) literally means `ōpelu hill and Wai`aka, means "laughing-water." The name Wai`aka is used to identify both a stream that flows off of the Kohala mountains, and the land section.

Ke kipu`upu`u ho`anu `ili o Waimea
(The Kipu`upu`u rain of Waimea that chills the skin of people)
[Puku`i 1983:188; #1748]

The project area region generally referred to as "Waimea" which literally means reddish water, as it was thought to be tinted as it was drained through the *hapu* tree fern forests or through the red soil (Elbert, Ms in Barrerra and Kelly 1974). Waimea has been poetically characterized as being "like a spear rubbed by the wind, as the cold spray is blown by the *kipu`upu`u* rain..." (Proverb from a Kamehameha *mele* quoted by Henry Judd in Doyle 1953:42) and has a rich history that is evident in its place names and proverbs.

"Waimea" is a name that also identifies several localities in this section of Kohala (Franklin et. al 1994). They are (a) the town of Waimea (also called Kamuela [Samuell]), named either for post master Samuel Spencer or for the rancher, Samuel Parker (Pukui et al. 1974); (b) a region, or *kalana*, that extends from the coast to the uplands and encompasses several *ahupua`a* between Kawaihae and Waikōloa; (c) the upland area only of that region including the entire plain between Kohala and Mauna Kea Mountains ; and (d) the upland region of intensive residential and agricultural occupation- the Waimea Field System (Clark and Kirch 1983:46). In *ʻŌlelo no`eau* (Pukui 1983), Waimea is noted

as an area of cool climate and chilling rains:

(A) *Hele po`ala i ka anu of Waimea*
Going in a circle in the cold of Waimea

Said of a person who goes in circles and gets nowhere. Waimea, Hawai'i is a cold place and when foggy, it is easy for one unfamiliar with the place to lose his way [Puku`i 1983: 83; #757].

(B) *Ka ua Kīpu`upu`u o Waimea/ Waimea i ka ua Kīpu`upu`u*
The Kīpu`upu`u rain of Waimea/ Waimea, land of the Kīpu`upu`u rain

An expression often used in songs of Waimea Hawai'i. This area is famed for its cold rain. When Kamehameha organized an army of spear fighters and runners from Waimea, they called themselves Kipu`upu`u after the cold rain of their homeland [Puku`i 1983:169, 319; #1571 & #2913].

(C) *Ka ua paliloa o Waimea*
The Tall-cliff rain of Waimea

The rain of Waimea, Hawai'i, that sweeps down cliffs. [Puku`i 1983:172; #1593]

Ke kānoa kapu o Lono-Makahiki: `oia ho`i `o Hōkū`ula!
(The sacred bowl of Lono-Makahiki: it is Hōkū`ula!)
[*Ka Hōkū of Hawai`i* 4/23/1914 in Franklin et. al 1994]

Translated and interpreted by Kepā Maly (Franklin et. al 1994), the legend of Ka-Miki was published in the Hawaiian newspaper "Ka Hōkū o Hawai'i" between the years of 1914-1917. It is a story about two brothers and their journey around the island of Hawai'i. The legend includes references to over 800 place names, and provides interesting information about Pu`u Hōkū`ula, the most prominent hill located just north of Waimea town.

Hōkū`ula (Red Star): When Ka-Miki and Maka`iole drew near to completing their formal `ōlohe training (fighting and competing skills) under their goddess/ great grandmother Ka`uluhe, she told them to go and visit their kūpuna (ancestress) Lani-nui-ku`i-a-mamao-loa who dwelt at Lanimaomao (Waimea). Lani-nui-ku`i-amamao-loa was the guardian and keeper of the sacred *kānoa* (`awa mixing bowl) Hōkū`ula which belonged to Lono-Makahiki, and the *ma`au* (strainer) called Kalau-o-Kāhuli which was upon the plain of Waikōloa. These two items were to be used in `awa ceremonies for the brothers `ailolo (brain eating- completion of training ceremonies) [*Ka Hoku o Hawai`i* 2/5/1914 in Franklin et. al 1994].

The association of the bowl, or *kānoa* of the god Lono (a provider of abundant crops and rain-laden clouds) with Hōkū`ula may refer to the agricultural lands of the region; i.e., (1) the bowl or container could symbolize a land of agricultural abundance; (b) the sprinkling

of waters from the bowl could refer to the waters of the streams that flow from the uplands and spread across the plains; and (c) the importance of the rituals of Lono in agricultural endeavors, particularly in the areas of Kohala where large field systems have been archaeologically documented. Thus the legendary account may symbolically represent actual resources of the Waimea region.

B. Accounts Related to *Heiau*

Thomas Thrum in his survey of *heiau* sites on the island of Hawai'i documented a single *heiau* in Waimea. Uli, the name of the *heiau*, was of unknown size and class and dedicated to Hākau and said to have been rebuilt by Kamehameha, and its images and steps repaired. Coconuts for its consecration were brought from Puako, 12 miles away. A low mound only remains to indicate its site, opposite of the church premises (T.Thrum 1908:).

A missionary account by Lorenzo Lyons in the 1850's tells of legends within the setting of Waimea, and mentions a *heiau* in the area:

On a nearby ridge stood another *heiau* built "...by the great Akua Makuakua who has come from far off Kahiki." from the hillside he watched the rainbows "...and there he found the beautiful goddess Wao." They lived at Hōkū`ula. Each time Wao was ready to bear a child she returned to the Waimea hills, which were sacred to her. The *kapu* was proclaimed in her honor- the forbidden ground extended ..."down across the plains to whatever place a stone happened to stop rolling when started above by her servants" [Doyle 1953 in Barrera and Kelly 1974]

According to legend, Wao changed her servants into stones to guard the land during the night hours; when daylight came she transformed them back into their human forms (Barrera and Kelly 1974:1).

Lorenzo Lyons also tells of the legendary story of a Ho'opili-a-Hae, and mentions her as being the founder of a *heiau* for women in Waimea:

"The earliest chiefs of Waimea of whom we have record stemmed from the same Ulu-Hema line that led to Liloa, the founder of the island dynasty. Liloa's grandson Keawe-nui-a-'Umi took as one of his wives Ho'opili-a-Hae, daughter of Liloa's *kahuna* Pae-a-Molenole." [Clark and Kirch, 1983:26]

"(The *heiau*) was attended exclusively by young virgins. In the sanctity of the cool highland forest, they "...performed the sacred ceremonies, learning also the science of healing so that they might eventually minister to others. Hoapiliaha`e's children were named for the five rains of the *heiau*" [Doyle 1953: 42-43] (in Barrera and Kelly 1974:1)

C. Historical Battles at Waimea

ʻO ke aluka koa a Kama i Waimea

(a multitude of warriors had Kama at Waimea)

[Kamakau 1961 :55-61 in Barrerra and Kelly 1974]

Hōkū`ula, located approximately 1 mile east of Wai`aka, is famed for being the location of a prominent battle ground in which Kamalālāwalu, the ruler of Maui Island waged war against the island of Hawai`i. Deceived by misleading advice from his trusted advisors and poor strategic planning, Kamalālāwalu arrived on Hawai`i island, landing at Kawaihae only to realize that there were no people there. They continued up to Hōkū`ula, a prominent bluff about half a mile in height to its summit. Situated in this manner, he believed his army would be able to have the advantage in defending themselves against the Hawai`i island forces.

Upon hearing of Kamalālāwalu's arrival, Lonoikamakahiki, the Hawai`i island ruler sent an army from Kona, Ka`u, Puna, and Hilo to Hōkū`ula, where the Maui warriors were stationed. The following morning Kamalālāwalu observed that the lowlands were literally covered with countless men. He soon realized that his Maui forces were inferior in numbers and asked Kumaikeau "*E Kumaikeau ma, pehea kēia? He aha kēia lehulehu o lalo?*" "Kumaikeau and the rest of you, how is the situation? What is the extent of their numbers below?" Kumaikeau replied "*Akahi nō au a `ike i ka nui o nā kānaka o Hawai`i nei...*" "I have never seen so many people in Hawai`i before..." After three days of negotiations, the two combating forces waged battle, with Lonoikamakahiki gaining the victory over Kamalālāwalu's army (Fornander 1916:342-350).

Another battle fought in the Waimea area was between the leeward and windward chiefs of Hawai`i Island toward the middle of the 18th century. This clash took place at Mahiki, east of Waimea and just across the district boundary in Hamakua. Here the father of the great chief Alapa`inuiakauaua was leading his forces against the Hilo chiefs when he was killed. Alapa`inui was on Maui at the time but returned to Hawai`i and ultimately regained control of the Kona and Kohala districts (Kamakau 1961: 65). Eventually he went on to take over the whole island of Hawai`i and place it under his rule. In his later years, Alapa`inui lived first in Waipi`o, then lived for sometime in Waimea, and later moved to Kawaihae (Kamakau 1961: 77).

During Kamehameha's campaign to extend his rule to all the major islands, he stayed at Waimea and at Kawaihae for some time. There are mentions of Kamehameha's visits to Waimea in 1791 and 1792 when he rebuilt Pu`u Koholā *heiau* (Clark and Kirch 1983). At that time a large work force was required and the people of Waimea were solicited. It has also been suggested by Clark and Kirch (1983:27) that food and tapas were brought from Waimea to feed and clothe the many warriors in preparation of the *Peleleu* fleet to battle Maui and O`ahu in 1794 and 1795.

III. POST-CONTACT PERIOD

The Waimea area, with its favorable soils, and water from Kohala Mountain streams that could be harnessed and distributed on the fairly level plains, was an obvious area for the expansion of introduced food crop production. Waimea was very productive agriculturally in the early years following contact with the Western world. Based on early accounts, *kalo*, or taro (*Colocasia esculata sp.*) was the dominant crop with *`uala*, or sweet potatoes (*Ipomoea batatas sp.*) and *kō*, or sugar cane (*Saccharum officinarum sp.*) also grown in substantial quantities.

The decline in traditional Hawaiian agriculture in the Waimea region has been attributed to factors such as 1) depopulation and the concomitant abandonment of the fields; 2) the pursuit of other commercial interests such as sandalwood and *pulu* trade, sugarcane, and finally the introduction of cattle.

It is important to mention that after the abandonment of traditional Hawaiian agriculture in Waimea, there were two resurgences of agricultural endeavors to boost the economy of Waimea (Clark and Kirch 1983) . In the late 1820's, two Chinese, Lau Ki and `Aiko started a sugar mill at Lihue in upper Lālāmilo. While the mill was not successful commercially, sugar production continued in the Waimea area (Barrerra and Kelly 1974: 47). In the late 1830's, cotton was grown in Waimea when Governor Kuakini ordered the planting of an "immense field of cotton in the Waimea area," (Kuykendall 1967: 183). In the late 1840's and early 1850's, both sweet and Irish potatoes were cultivated extensively, however by 1865, these crops were reported to have been greatly diminished.

A. Sandalwood and *Pulu*

The mountains surrounding Waimea were well known for rich sandalwood reserves. During the early part of the 19th century as contact with the West was growing, the extent of the sandalwood trade was evident as it became one of the earliest commodities of a newly formed market oriented economy.

Similar to the sandalwood trade was the exploitation of *pulu*, the soft fiber gathered from the buds of the tree fern (*Cibotium sp.*) And used for stuffing pillows, mattresses, and furniture (Thrum 1929 in Erkelen 1998: 15). The *pulu* trade began in 1851 with shipments to the West Coast of north America and Australia. Like sandalwood, the over-exploitation of this resource also led to its demise and by 1860, the trade had virtually ended (Doyle 1945: 182).

B. Population Estimates

The general impression of the pre-contact settlement pattern, constructed from a variety of archaeological and early historical sources, is one of scattered settlements along Waikōloa Stream (Clark 1987: 103; Erkelen 1998: 11). During subsequent decades, with the arrival

of western foreigners and missionaries, impressions of the life and landscape would be recorded for 19th-century Waimea. In 1823, Asa Thurston counted 220 houses in his walk through Waimea in the section between `Ōuli and Pu`u Kapu (a distance of approximately 4.8 km or 3 miles); this was interpreted as representing a population of 1,100 to 1,200 individuals (Ellis 1979:399 in Erkelens 1998: 11). Although the population was concentrated at Kea`ali`i (located along Wai`aka Stream) at the time of Thurston's visit, a settlement of 300 to 400 individuals near the present Waimea town is a reasonable estimate (Clark 1987: 103).

It was not, however, until the 1830s that a missionary would be stationed in northern Hawai`i. On July 13, 1832 Lorenzo Lyons and his wife Betsy arrived at Kawaihae by brig from Honolulu to take up residence at Waimea. Lorenzo Lyons had a church and school (for adults) at Waimea in 1835, serving a congregation of from 100 to 500 Hawaiians. In his writings, Lyons stated:

“During the past year I have taken a census of the population of this district and find it to be as follows: Waimea, 1,396; Kohala 6,175; Hamakua 4,015; total 11,586, from which it appears there has been a diminution of the people 3,500, within three and a half years. Marriages are numerous. But the progeny are wanting. Children are not in general, objects of desire. Taxes are in proportion to the number of children. My census may not be correct. Many think I am numbering them for the purpose of taxation, and conceal a part of their number.” [Doyle 1945:82-83]

C. Cattle Industry

An examination of the cattle industry in the Waimea area clearly shows its dominant role. The cattle industry, which eventually changed the economy and lifestyle of Waimea, had its origins in bullock hunting, which was controlled by Hawaiian chiefs. The initial increase in cattle population was aided by a ten year *kapu* placed on hunting or taking of cattle. Feral cattle multiplied rapidly and ran wild on the plains of Waimea. For some two to three decades after the lifting of the protective ban, bullock hunters were employed to hunt down the wild cattle and take them to a market.

In the 1830's, meat, hides, and tallow began to be marketed, and thus formed the true beginning of the cattle industry. By 1847, about two-thirds of Waimea area had been converted to pasture for government herds of cattle, as well as for sheep and horses (Doyle 1945). By the middle of the 1800's the Waimea region was the center of the industry.

The cattle industry had two major impacts on Waimea. The first was the effect of marauding cattle on the unprepared Hawaiian farmer (Erkelens 1998:19). As early as 1802, there were complaints concerning the destruction of gardens by feral cattle (Turnbull 1813:243, in Barrerra and Kelly 1974:44). In 1836, Waimea was surrounded by a stone wall to protect it from cattle (Baldwin and Lyons 1837).

The second major impact on Waimea was the increase in population as a result of economic

opportunities provided by the cattle industry (Erkelens 1998:19). Bishop (Bishop 1828, in Erkelens 1998:19) reports that Kuakini's arrival in Waimea marked the beginning of the cattle industry, as attendance at church services increased to approximately 1,000 individuals from a previous attendance of 200 (Bishop 1828; WMR 1832; Doyle 1945)

Following Kuakini's construction of the road between Kawaihae and Waimea in 1830, ox carts were able to haul commercial items much more efficiently than was previously possible. Although missionary census records for the period from 1832 to 1845 suggest little overall change in population of Waimea (approximately 1,000 individuals), there was undoubtedly a change in composition of the constituency from predominantly Hawaiian to a mix of foreigners and Hawaiians..

D. Parker Ranch and the 20th Century

John Palmer Parker, an American born in Newton, Massachusetts in 1790, intended a sailing career when he left home in 1809. After several years at sea, Parker arrived on Hawai'i Island in 1815 and decided to remain there. By 1819, Parker had a Hawaiian *ali'i* wife, Kipikane, and a baby daughter, Mary. Parker and his family went to live at Waiapuka in Kohala where he farmed on twenty-one acres that had been granted to him by Kamehameha. In this era, most of the ranch work consisted of capturing wild cattle and domesticating them. As the ranching industry expanded so did responsibilities such as managing the many personnel of the Parker Ranch, building houses and growing food to feed all. Subsequently, Parker hired South American and Mexican horsemen to train his ranch hands to track, rope, brand, and bring in the wild cattle. These "vaquero", "paniolo," or "espangnol" not only introduced the management of cattle and horses, but also brought colorful clothes, hats and saddles that became the mark of Hawaiian *paniolo*. The first Hawaiian *paniolo* or cowboys actually predate many of the mainland western cowboys. The ranch personnel also made most of their own gear and machinery, including saw mills.

In the last years of the 19th Century, Waimea remained a small town concentrating on the shipment of cattle to export markets. The Waimea of 1881 was graced with two stores, a boarding house, lodging house, and a coffee saloon (Bowser 1881:540). Even at this seemingly late date, wild cattle were occasionally a problem. In 1888, Paul Jarrett was the first to commence fencing Parker Ranch lands to segregate the domesticated from the wild cattle (Doyle 1904). The next Parker Ranch manager, A.W. Carter, (manager 1899-1936), consolidated all the Parker family land holdings under the control of his ward, Thelma Parker. A.W. Carter then began in earnest to increase ranch lands, systematically breed for better, stronger, healthier cattle and horse stock, bought a barge to ship cattle with other Big Island ranchers, increased ditches for watering livestock and imported different grasses and feed for cattle. He provided the U.S. military branches with cavalry horses. He also ventured for a short time into training horses and horsemen for polo teams, and then became one of the major providers of horses in Hawaii and abroad for work, pleasure, and shows. His son, A.H. Carter succeeded him in 1937. The Parker Ranch had become one of the biggest private businesses in Hawaii and remains the dominant economic force in Waimea.

IV. PREVIOUS ARCHAEOLOGICAL RESEARCH

A. Previous Studies

A number of archaeological investigations have been conducted in the general vicinity of the project area (Table 1), including studies by Pete *et. al* (1970), Barrera and Kelly (1974), Neller and Beggerly (1980), Clark (1981;1987), Clark and Kirch (1983), Kam (1983), Bonk (1985; 1989), Hammatt, Borthwick, and Shideler (1988), Hammatt and Shideler (1989), Spencer (1989), Cordy (1989), McEldowney (1990), Clark *et al.* (1990), Thompson and Rosendahl (1991;1992), Erkelens (1993;1998), Allan and Schilz (1994), and Franklin *et. al* (1994). For the purpose of this report, however, only the studies conducted closest to the Waimea Trails and Greenways project area were reviewed in detail.

One of the most widely cited studies in this area was completed by Barrera and Kelly (1974). In 1973 Bishop Museum conducted an archaeological survey and historical review for the proposed Waimea to Kawaihae Road corridor during which over 4,500 archaeological features were identified, the majority of which were located either near the coast at Kawaihae or near Waimea.

Of particular interest are the sites located in upper Lalamilo and upper Waikōloa, that are closest to the current project area. Based on the survey results, Lalamilo contains nearly 3,500 features (Barrera and Kelly 1974). The study resulted in the designation of the “Kuleana and Ranch District” in the Lalamilo portion of the project area (*Ibid.*) This information is important because it indicates the high density of surface archaeology that one can expect to find in upper Lalamilo near the project area. Sites have been described as a habitation and agriculture system. The findings were expanded upon in later studies (Clark 1981; Clark and Kirch 1983) which referred to these feature complexes as the Waimea agricultural system:

The Waimea agriculture system comprises the remains of an extensive series of agricultural features, throughout which are scattered multiple residential structures... (*op. cit.*: 293).

In 1981 Bishop Museum conducted a survey and excavation project along the Mudlane to Kawaihae Road right-of-way (Clark and Kirch 1983) and that same year a reconnaissance of 1.9 acres in Waimea Town was done by the Historic Preservation Office (Kam 1983). In 1985 a reconnaissance of three reservoir sites and a large watershed area extending from Waimea to Pa`auilo was conducted (Bonk 1985b), a reconnaissance of four parcels proposed for residential developments was done (Bonk 1985a) and a reconnaissance of a reservoir site in a parcel adjoining the present project area was conducted (Rosendahl 1985)

In 1986, Cultural Surveys Hawai'i (Hammatt and Borthwick 1986) conducted archaeological investigations on approximately 50 acres located on Waikōloa Stream and followed in 1988 by further detailed survey and testing (Hammatt *et. al* 1988). The next work in the area was a reconnaissance of approximately 100 acres at Hawai'i Preparatory Academy (Bonk 1989) and data recovery of sites in the project area originally investigated

by Hammatt and Borthwick in 1986 and 1988 (Hammatt and Shideler 1989). The year 1989 also saw follow up investigation of Pa`auilo/Waimea Watershed Project that had been covered by Bonk in 1985 (Spencer 1989).

Two brief checks in the Waimea area were conducted by staff member of the State Historic Preservation Division in 1991 (Smith 1991; McEldowney 1991), and an inventory survey of potential hospital sites in several locations around Waimea were conducted in that same year (Thompson and Rosendahl 1991).

Recent archaeological investigations in the Waimea Town have further documented 19th and early 20th century habitation and associated sites (Erkelens 1998). The investigations included surface and sub-surface surveys. Five sites were identified, including house, burials, and agricultural sites. All sites and materials observed were historic either from the mid 19th or early 20th century. The sub-surface investigations also indicated that extensive bulldozing had disturbed large areas of the 10+ acre parcel (Erkelens 1998).

Most recently, Erkelens (1998) surveyed State Site # 50-10-06-8812 in the *kuleana* house lots within Waimea Town Center and five previously unrecorded sites. State Site # 50-10-06-19416 is a historic cemetery. State Site #s 50-10-06-19417, 19418, and 19419 are four historic structures grouped into three sites. The final unrecorded site is a burial location, with no State Site number given.

B. Anticipated Finds

These projects have demonstrated the presence of an extensive complex of agricultural and residential features in the Waimea area. The core of this complex extends westward from about the Waimea Fire Station down to approximately 1800 ft. a.m.s.l. (Above mean sea level), and covered the lower slopes of the Kohala Mountains down as far as Pu`u Pa in Waikōloa. This agricultural system has been characterized variously as dryland, irrigated dryland, and supplementally irrigated. This system consisted of a series of agricultural fields, either in the form of manufactured terraces or arrangements of low earthen berms, many of which were fed by irrigated ditches collecting water from streams draining the Kohala Mountains. Residential areas, consisting of both permanent and temporary field shelters, have been found throughout the area.

The result of reviewing previous archaeological work provided the basis for assessing the probability of locating features and/or sites within the project area, as well as indicating what types of features and/or sites to expect. It was expected that features/sites would be part of the Waimea-Lālāmilo agricultural system, with both prehistoric and early historic components. Because of the presence of the field system within the project area, it was thought that unless portions of the trail had been heavily disturbed in the recent past, there would be a relatively high probability that surface or subsurface historic sites would be found in various densities, especially in the undeveloped portion of the project area (*makai* of the refuse transfer station).

Table 1: Previous Archaeological Projects in the Vicinity of Waimea Town

Reference	Report Title	Description and Results
Barrera and Kelly 1974	<i>Archaeological and Historical Surveys of the Waimea to Kawaihae Road Corridor, Island of Hawai'i. Report 74-1. Dept. of Anthro., B.P. Bishop Museum.</i>	An Archaeological survey of a corridor of roughly 10,272 acres and 4,561 archaeological features were recorded. The majority of which were near Kawaihae, on the coast or in the Lalamilo area near Waimea. Of particular interest is the area referred to as the "kuleana and ranch district."
Neller and Beggerly 1980	<i>An Archaeological Reconnaissance of the Proposed Improvements to the Lalamilo-Pu'ukapua Irrigation System Waimea, Hawai'i</i>	Archaeological Reconnaissance for a proposed pipeline installation project area of 14,000 sq. feet. No sites were present in or near the vicinity, although A few buildings were of historic interest.
Clark 1981	Archaeological Survey of Section 4 Mudlane-Waimea Kawaihae Road Corridor. In <i>The Mudlane-Waimea-Kawaihae Archaeological Project: Interim Report I.</i>	An archaeological survey of 295 acres located in the uplands of Lalamilo. During the survey, 321 sites, including both agricultural and residential features were identified. The district contains many residential structures scattered through out what was once an extensive agricultural system. The agricultural system was divided into four complexes, each with its own characteristics.
Clark and Kirch 1983	Report 7, Archaeological Investigations in Section 4, In <i>Archaeological Investigations of the Mudlane-Waimea-Kawaihae Road Corridor, Island of Hawai'i</i>	Inventory survey of portions of the road not covered in the previous survey. Numerous sites were identified, both agricultural and habitation, and the project provided a broad data base for comparing site distribution data from the coast to upland.
Bonk 1985	An Archaeological Survey in Portions of Waikoloa, Pu'ukapu and 'Ōuli, District of South Kohala, Hawai'i.	Inventory survey in four areas encompassing 300 acres of land. Nine sites were located in Areas I and II. Four of them were recommended for additional work. No sites were identified in Area III, and numerous sites were located in Area IV (a parcel between Kawaihae-Waimea Road and the Kohala-Waimea Road).
Clark 1987	Waimea-Kawaihae, a Leeward Hawai'i Settlement System	The chronological development of a intensively used agricultural field systems and permanent settlement in Waimea.
Hammatt, Borthwick, and Shideler 1988	Intensive Archaeological Survey of 12.4 Acres for Proposed Lalamilo House Lots, Unit 2, Lalamilo, South Kohala, Hawai'i. Cultural Surveys Hawai'i.	Archaeological investigations on a 12 acre parcel in Upper Lalamilo. Seven Archaeological sites recorded and limited subsurface excavation conducted. Both habitation and agricultural sites were documented.

Hammatt and Shideler 1989	Archaeological Investigations at Ka La Loa Subdivision, Lalamilo, South Kohala, Hawai'i. Ms on file with Cultural Surveys Hawai'i.	Further investigations on two identified sites from 1988 study. Data analysis suggested that the informal agricultural activity (represented in ag. mounds) were occurring by the mid 13 th century, and field boundary walls were constructed by the mid-15th century, with permanent habitation occurring from early 16 th century to the late 18 th century.
Spencer 1989	Archaeological Investigations of the Lālāmilo Agricultural Addition Irrigation Pipeline Corridor and Livestock Water Distribution System and Management Area, Waimea-Pa`auilo Watershed, Hawai'i Country, Hawai'i.	An investigation of a water pipeline corridor and the reconnaissance of the Nienie area. No cultural resources observed, and assessed that the probability of encountering significant cultural properties was too low to warrant a more intensive inventory.
Bonk 1989	An Archaeological Reconnaissance Survey in a Portion of Wai`aka, South Kohala, Hawai'i.	Survey of an 8 acre piece of land that falls into a major agricultural field complex identified by Clark (1981) as field complex #1. The project area contained no residential structures or stone-walled structures or features. only "low mildly terraced field ridges" and "larger terraces with broader and flatter surfaces behind soil embankments."
McEldowney 1990	Memorandum concerning a field check of pastoral lot #100, awarded to Mr. James Akiona, Hawaiian Home Lands, Pu`ukapu, South Kohala, Hawai'i.	Inspection of a mapped stone complex of 2 enclosures. The larger oval enclosure measured 58 x 43 meters and was subdivided by an internal wall that cuts through the downslope of the western end. The smaller rectangular enclosure measures 20 x 13 m. Both have unknown functions but it is speculated that they are historic cattle ranching structures. Site is significant because it is the only example of its kind in the vicinity.
Clark, Davidson, and Cleghorn 1990	Archaeological Testing and Data Recovery for the Waimea School Improvements, Lot A (TMK:6-7-2:17), Waikōloa, South Kohala, Hawai'i Island.	Surface and subsurface investigations of previously recorded site (50-10-06-8808); one of two field sites in Field Complex 4 that is part of the Waimea agricultural system (Clark 1981). Three `auwai, or irrigation ditches were studied. Profiles suggest a historic period origin, although some indirect evidence is present for possible prehistoric construction. A sample from the lower charcoal lens in a subsurface activity lens yielded an age range with multiple calendrical conversion. The preferred range is A. D. 1449 to 1674).
Thompson and Rosendahl 1991 & 1992	Archaeological Inventory Survey Potential Sites for North Hawai'i Community Hospital /Archaeological Inventory Survey Waimea Elderly Housing Project	An archaeological inventory survey of Waimea Elderly Housing project area. The field survey consisted of 100% pedestrian reconnaissance, with no significant cultural remains of any kind were observed.

Erkelens 1993	Review of Historical Documents and Background Literature, Waimea Town Center Project	A report to serve as a summary of the preliminary investigations relating to the Waimea Town Center project which encompasses 385 acres. The review of the survey indicated that information previously gathered is incomplete for the project area. Not all archaeological sites and features are presently known. Previously recorded maps are not detailed or complete.
Schilz 1994	Final report: Archaeological Survey and Evaluation Land of `Ouli District of South Kohala, Island of Hawai`i, Hawai`i.	A survey in lands within the `Ouli <i>ahupua`a</i> . A total of 75 sites were recorded including 45 military sites, 14 ranching sites, 9 historic sites, and 7 traditional Hawaiian sites. (State Site Numbers 50-10-05-14679 through 50-10-05-14752, and State Site # 50-10-5-9012)
Franklin, Maly and Rosendahl 1994	Archaeological Inventory Survey Hawai`i Preparatory Academy Waimea Campus Expansion	Inventory survey of 14.9 acre proposed HPA Waimea Campus. During fieldwork, seven archaeological sites associated with agriculture and habitation were identified. The sites comprised the formal types: water channel, cemetery, terrace, concrete foundation, and alignment. Only two sites were significant a historic habitation/ cemetery and an earl historic habitation terrace.
Erkelens 1998	The Kuleana Lots at Pukalani Waimea Town Center Project Area	A archaeological investigation of project area 385 acres. Sites include three 19 th century house lots, a historic cemetery, four historic structures, a burial. Skeletal remains of two individuals were encountered during subsurface testing. Preservation of cemetery and rehabilitation/ preservation of the historic buildings are recommended.

V. RESULTS OF FIELD SURVEY

On May 22-23, 2000, archaeologists Matt McDermott and Doug Borthwick conducted a field inspection of the proposed Waimea Trails and Greenway Project that extends about 6 miles long and varies from 30-45 ft wide. The project area that was inspected was divided into five different sections based on terrain type, degree of urbanization, and the potential for cultural resources.

Section 1 (Figure 3) encompasses the trail corridor from the Kawaihae Road intersection at South Kohola View Estates to the County Refuse Transfer Station. The corridor begins at the confluence of Keahuimano and Lanikepu Streams near Kawaihae Road. The corridor shifts from the north to south side of Waikōloa Stream in this section then angles southeast along Keahuimano Stream to the western end of the refuse transfer station.

Section 1 is, within what has been referred to as the Lālāmilo Field Complex, a subset of the Waimea agricultural system (Clark 1987). Additionally, Section 1 is, at least in part, within the “Lalamilo Kuleana and Ranch District,” State site 50-10-05-2292 (Barrera and Kelly 1974)(Figure 2).

The Field Complex and Kuleana and Ranch District designations were based on surveys related to the proposed Waimea/Kawaihae Highway. The types of sites and features reported on include *`auwai* (irrigation ditches), agricultural fields and house sites (both pre-and post contact). The *`auwai* — some stone-lined, others with soil embankments — extend off the three streams, Waikaloa, Keahuimano and Lanikepu, in Section 1 of the project area.

The *`auwai* irrigate fields which are delineated by low mounded walls, sometimes utilizing the natural landscape. Natural swales or depressions are often enhanced to create the fields.

The house sites range from low platforms to high-walled enclosures and, as mentioned earlier, are from both before and after A.D. 1776. The historic time period house sites have been documented as related to 1800s Land Commission Awards (*i.e.* LCA or *kuleana*).

Section 1 was not staked during the field inspection so no specific site or features designations were accomplished in relation to intersects with the proposed trail route. The field inspection did indicate that certain *`auwai* sections, a wall segment, and a number of fields are in the vicinity of the trail corridor. No house sites appear to be within the trail corridor.

Section 2 (Figure 4) refers to the portion of the trail corridor between the existing county refuse transfer station and the eastern end of the Sandalwood Subdivision. The corridor is on the southern side of Waikōloa Stream for the Sandalwood Subdivision portion then shifts to the northern side near the old land fill and existing transfer station. At the conjunction of Sections 2 and 3 is an old concrete ford in Waikōloa Stream. The ford is associated with an old, asphalt covered roadway that extends from the Kawaihae Road to

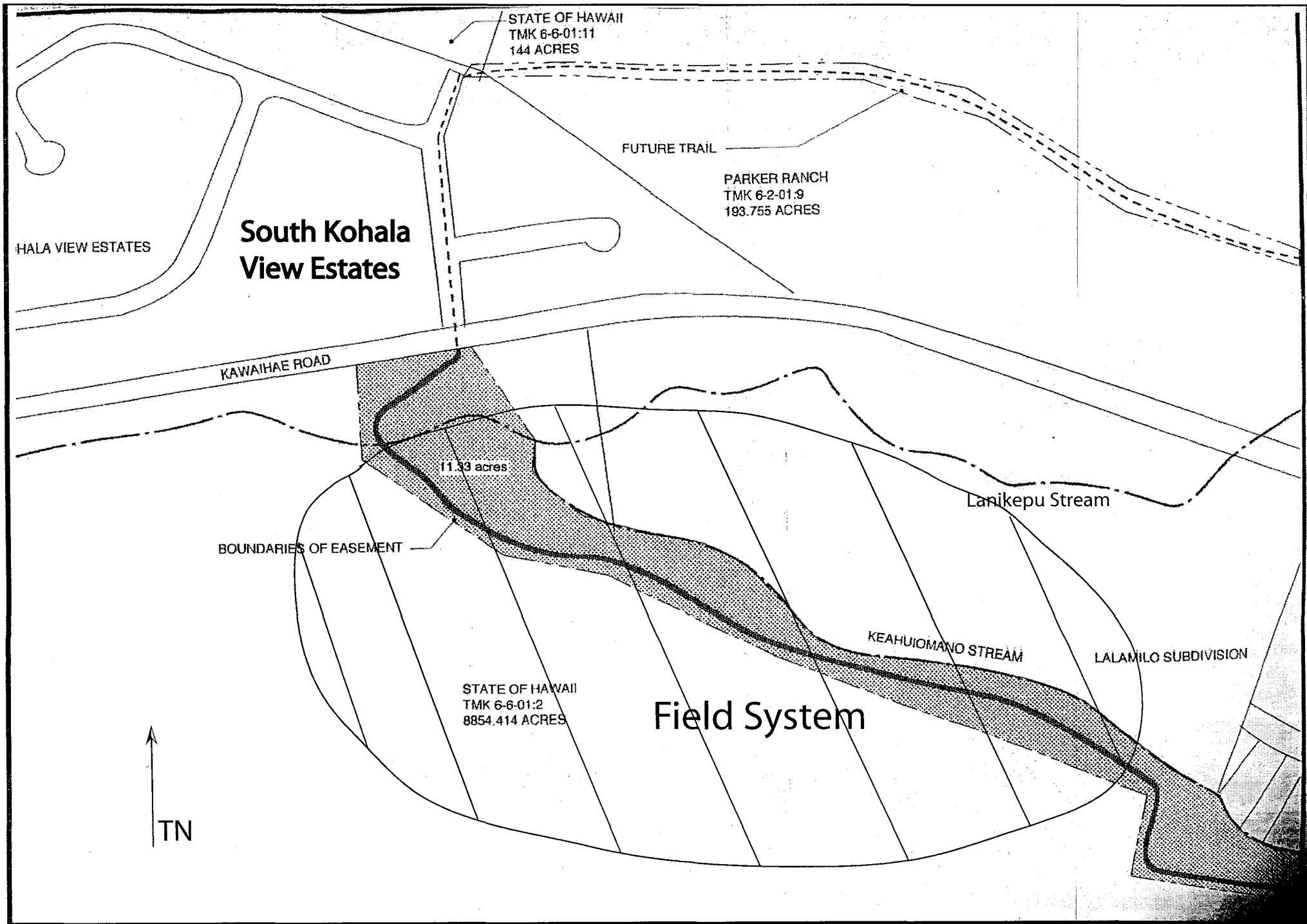


Figure 3 Map Showing Section 1

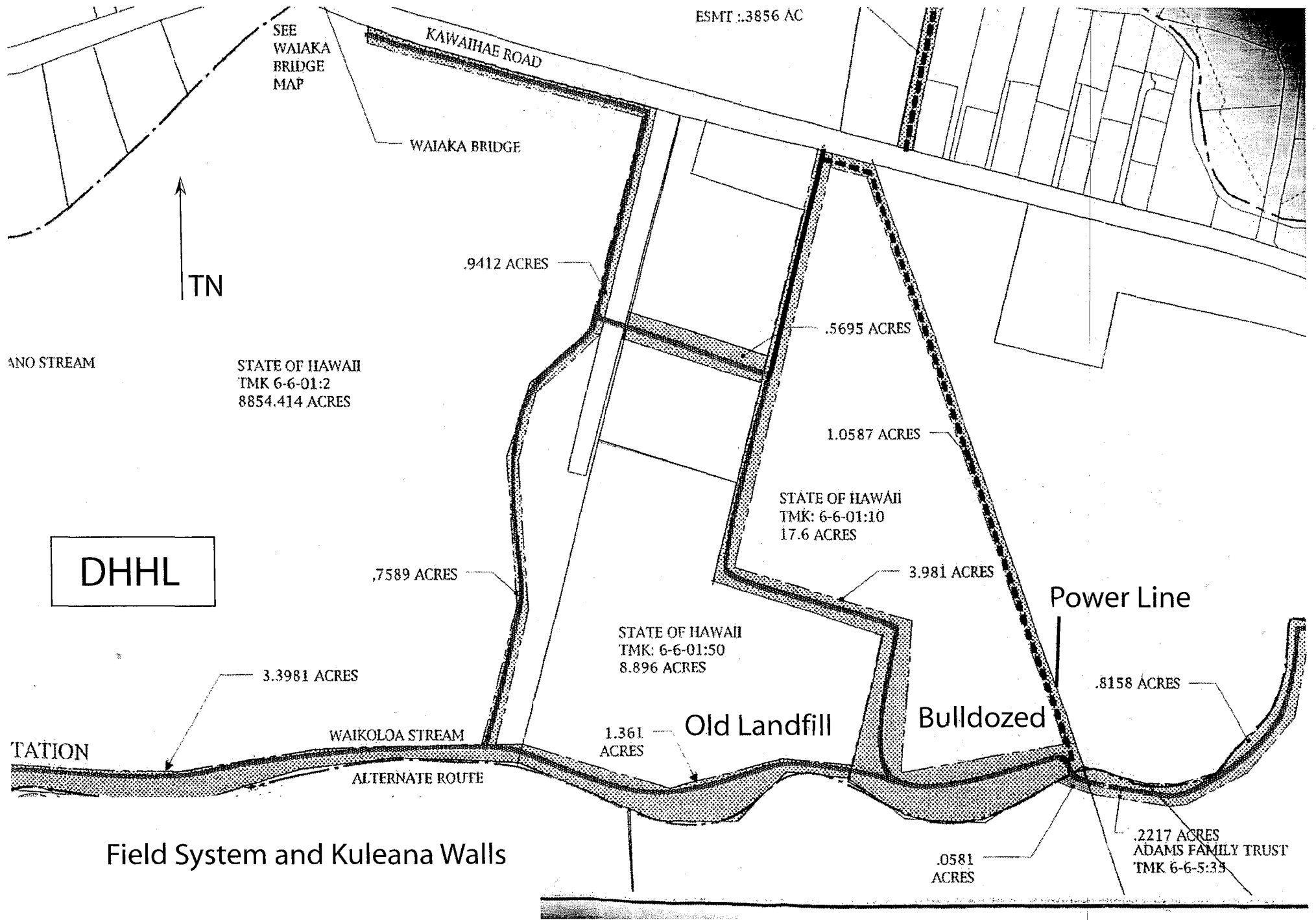


Figure 4 Map Showing Section 2

Pu`u `Opelu, the former Parker Ranch Headquarters and residence of Richard Smart, now a museum open to the public. The roadway and associated stream crossing are presumably older than 50 years and thus can be considered historic properties, although the proposed trail would have no significant impact on the features.

The portion of the proposed trail corridor adjoining the Sandalwood Subdivision is pasture type land that is presently separated from active pasture by a new fence line. The area had not been grazed for a while and the Kikuyu grass is fairly thick. No historic features were observed on either side of the fence line. The heavily grazed side had excellent ground visibility. The ungrazed side had poor ground visibility.

The portion of Section 2 that is State land, just east of the existing transfer station, has been altered extensively by bulldozing and old landfill activities. The trail corridor follows a bulldozed path between Waikōloa Stream and the 'mountain of trash' of the old land fill. No historic properties were observed in Section 2.

Section 3 (Figure 5) refers to the portion of the proposed trail route between the east end of the Sandalwood subdivision and Waiki`i Village Road. The proposed route shifts to the northern side of Waikōloa Stream for most of Section 3 where it is adjacent to existing houselots. The area has been altered in association with the residential properties and no archaeological resources were observed in Section 3.

Section 4 (Figure 6) refers to the area between Waiki`i Village Road and Lindsay Road Bridge. This section is dominated by a stand of large Eucalyptus trees within which Waikōloa Stream makes a few sharp bends or meanders. The proposed trail route is on the southern side of the stream between existing buildings and the stream. However unlike Section 5, the buildings and associated infrastructure (e.g. parking lots) within Section 4 do not encroach up to the edge of the stream. The stand of Eucalyptus trees buffers the proposed trail route from the office buildings.

Remnant structures related to a pipeline crossing and possibly a concrete ford were observed in Section 4. The large concrete slab remnant had an imprinted date of "194_" suggesting a World War II association. The pipe crossing remnant structures are short, faced, ramp like structures with the faced vertical side facing the stream. Construction type is similar to the Section 5 crossing, consisting of basalt boulders and concrete.

Section 5 (Figure 7) is the eastern trail terminus at Church Row westward to the Waikōloa stream bridge at Lindsey Road. Section 5 has been altered extensively by modern urbanization. The proposed route would be on the southern side of Waikōloa stream which has been more altered by recent construction than the northern side. Recent construction activity in this section includes: the Baptist Church yard, KECK office complex, new parking lots for the Koa Grill Restaurant, and the Waimea Shopping Center.

The southern bank of Waikōloa Stream in Section 5 is dominated by thick kikuyu grass, christmas berry, ginger, and other introduced plants. The area between the modern buildings and the stream is fairly narrow especially behind the Waimea Shopping Center.

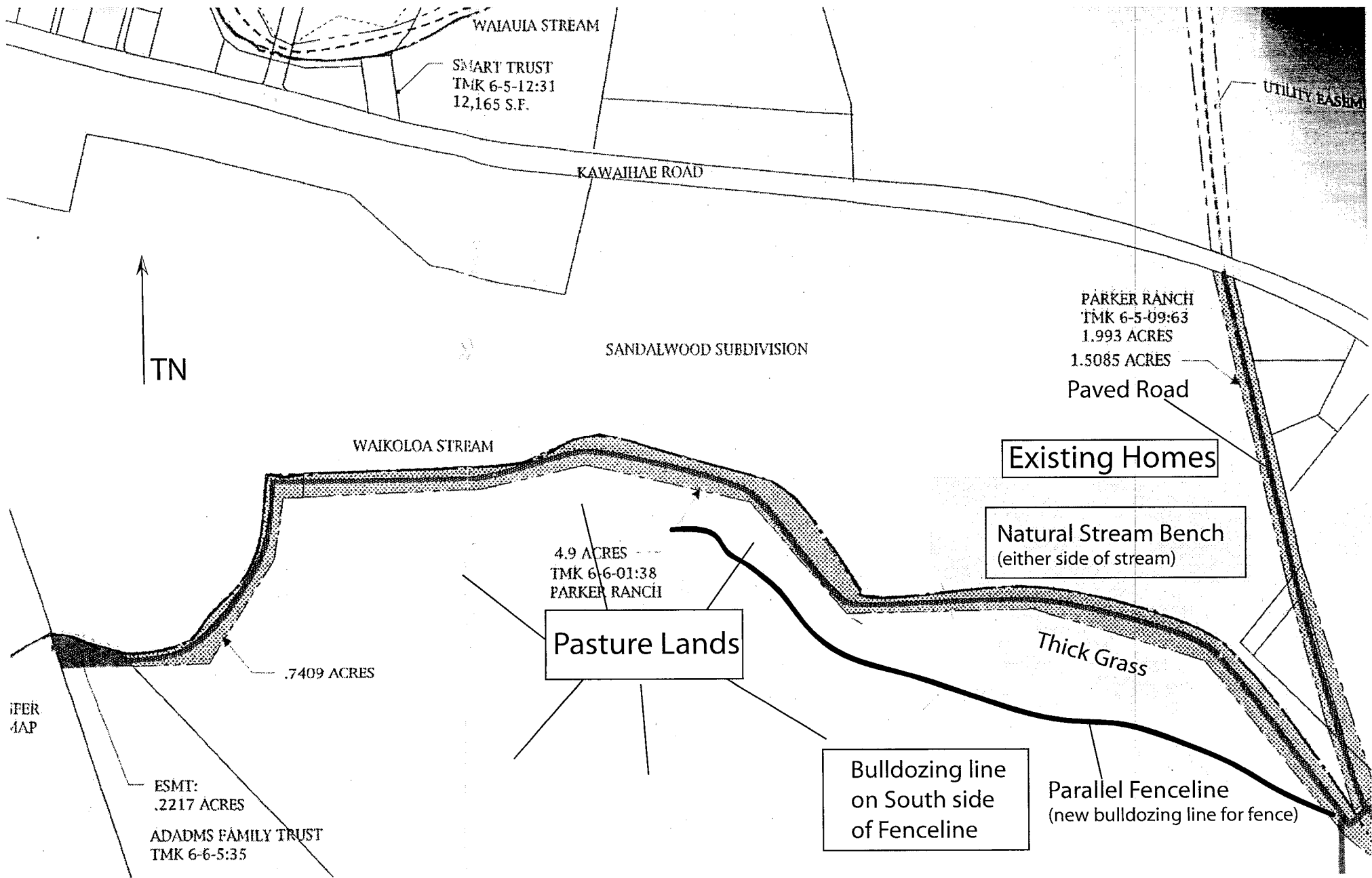


Figure 5 Map Showing Section 3

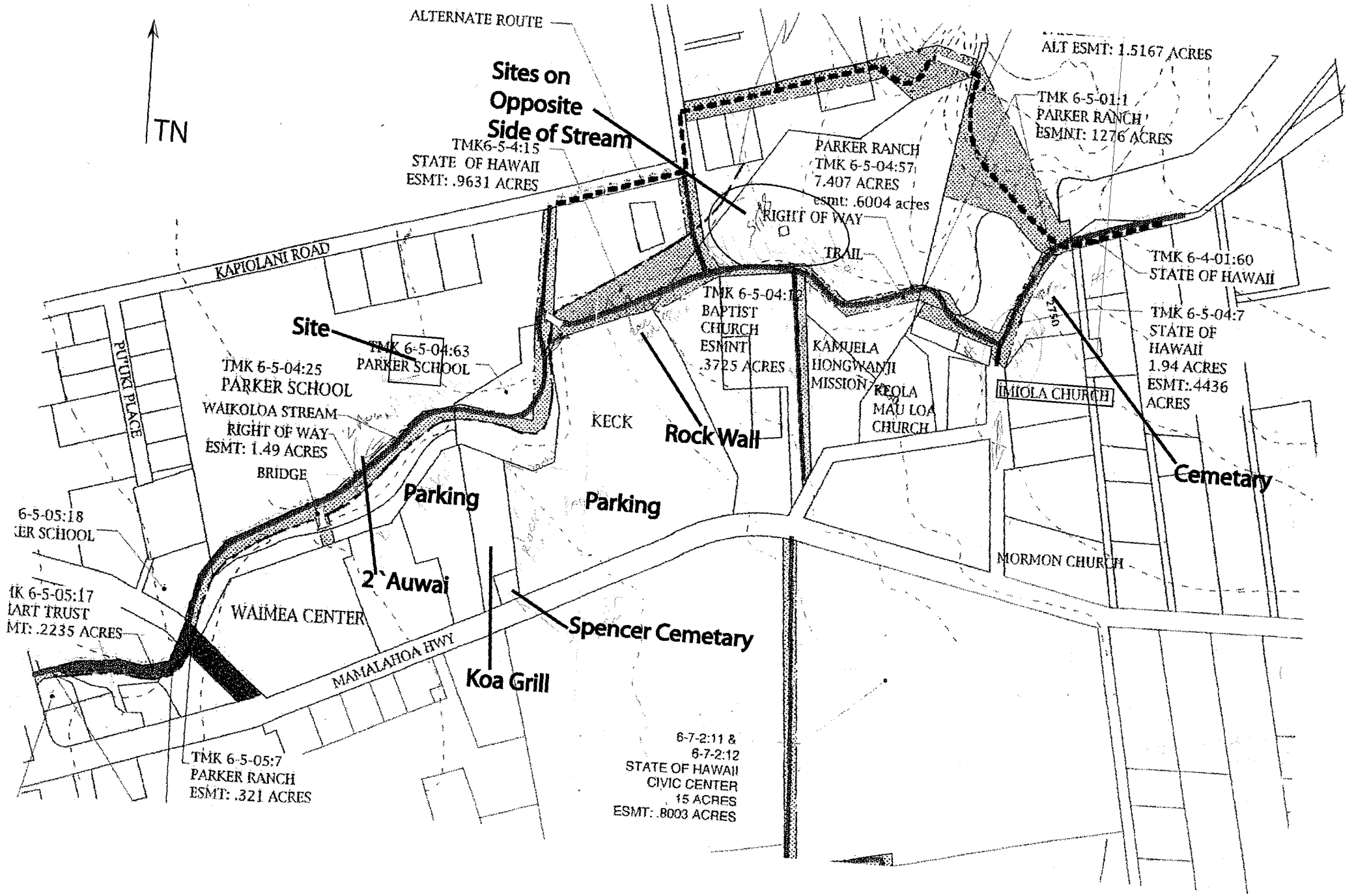


Figure 7 Map Showing Section 5

Two historic structures were observed within Section 5; a stacked stone wall behind the KECK offices and a remnant of a basalt boulder and concrete stream crossing. The boulder wall is typical of the many dry masonry stone walls in the Waimea area and presently serves as the stream side property boundary for the KECK office complex. The remnant boulder and concrete stream crossing appears to be for an old narrow roadway and/or for an old pipeline. The old stream crossing is situated behind a row of stores some 200 ft. east of the Lindsey Road bridge.

Additionally, the eastern terminus of the trail is in close proximity to Imi`ola Church and associated cemetery. The church is on the State and National Register of Historic Places and has been allotted State Site # 50-10-06-7151.

VI. SUMMARY AND RECOMMENDATIONS

The trail corridor was separated into five sections to aid in the discussion of field observations. Based on the field observation, Sections 2-5 have been urbanized to such an extent that no surface historic properties exist, except for concrete and boulder stream crossing structures(s). Section 1, west of the County Refuse Transfer Station, has been altered little during the modern urbanization of Kamuela town. Section 1 contains site complexes associated with agriculture and habitation from the pre-and post- contact eras (Barrera and Kelly 1974, Clark and Kirch 1983, Clark 1987). The Trail Corridor intersects a number of features, such as, *`auwai* and field walls. The corridor was not staked in Section 1; thus a precise inventory of possibly affected sites and features was not undertaken for this assessment.

Based on the background studies and field inspection Cultural Surveys Hawai`i recommends an inventory-level survey for the entire route. The field inspection indicated that the focus of the inventory survey should be in the area west of the County Refuse Transfer Station (*i.e.* Section 1). Complete background studies would complement the field survey providing a basis from which to assess all identified sites.

The inventory survey should await a staked alignment so that sites can be accurately located in relation to the alignment. Alternatively, the inventory survey results could be utilized to create an alignment with less impact to archaeological resources.

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**CULTURAL IMPACT ASSESSMENT FOR THE
PROPOSED WAIMEA TRAILS AND GREENWAY PROJECT,
WAIMEA, SOUTH KOHALA DISTRICT
ISLAND OF HAWAI‘I**

Portions of TMK 6-2, 6-5, 6-6

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I. INTRODUCTION

A. Project Background

At the request of Gerald Park, Urban Planner, Cultural Surveys Hawai‘i, Inc. (CSH) conducted a Cultural Impact Assessment for a roughly 6 mi. (10 km) section of a proposed 12 mi. (19 km) Waimea Trails and Greenway project. The proposed route is characterized as a “multi-use pedestrian bikeway”. The Waimea Trails and Greenway Project is designed to provide a green belt through Waimea Town for non-motorized, pedestrian-friendly community access along a stretch of Waikōloa Stream. The primary function of the proposed trail is to provide an alternative transportation route for non-motorized vehicles in the Waimea area. The project corridor passes through several well-known areas of Waimea, Pu‘uopelu, and Wai‘aka and three *ahupua‘a* including Lālāmilo, Waikōloa, and ‘Ōuli, on the island of Hawai‘i (portions of TMK 6-2, 6-5, and 6-6) (Figures 1-2).

B. Project Area Description

The project area is located in the Waimea area of South Kohala Hawai‘i Island and includes a corridor running generally west-east from the South Kohala View Estates in the west to “Church Row” in Waimea Town in the east (Figures 1-2). The corridor runs along Waikōloa and Keanu‘imanō Streams, with several north-south access routes projecting off from the main trail. In its entirety, the trails and greenway may extend approximately 12 miles. The corridor researched for the present study is between the South Kohala View Estates on the west and Church Row on the east.

The project area is situated in the Waimea Saddle region, between the Kohala Mountains and Mauna Kea Volcano, at an approximate elevation of 2,000-3,000 ft. (600-1,200 m) A.M.S.L.. The climate is generally cool, moist, and windy. Temperatures normally range between 60-70° F, with mean maximums between 70-80° F, and mean minimums in the upper 40° F. The average annual rainfall ranges from 75-100 in. (190-250 cm), with heavy rainfall between the months of January and April (Giambelluca et al. 1986). Winds are dominated by consistent northeasterly trades. The soils within the project area are of a Waimea Series that consists of well drained, very fine sandy loam that formed in volcanic ash. These incepticol soils are usually in areas that are gently sloping to moderately steep (Foote et al. 1972). There are three major streams flowing off the Kohala slopes and onto the plains of Waimea, including Lanikepu, Waiōkloa, and Kohākōhau (also known as Keanu‘i‘omanō) Streams.

From west to east, the project area includes varying climates, terrains, and degrees of urbanization. For the purpose of this cultural impact evaluation, the corridor was divided into five sections, based mainly on degree of urbanization (Figures 1-2):

- Section 1: South Kohala View Estates to Hawai‘i County Refuse Transfer Station
- Section 2: West end of Refuse Transfer Station to east end of Sandalwood Subdivision
- Section 3: East end of Sandalwood Subdivision to Waiki‘i Rd.
- Section 4: Waiki‘i Rd. to Lindsey Road Bridge (Eucalyptus forest)
- Section 5: Lindsey Road Bridge to Imi‘ola Catholic Church

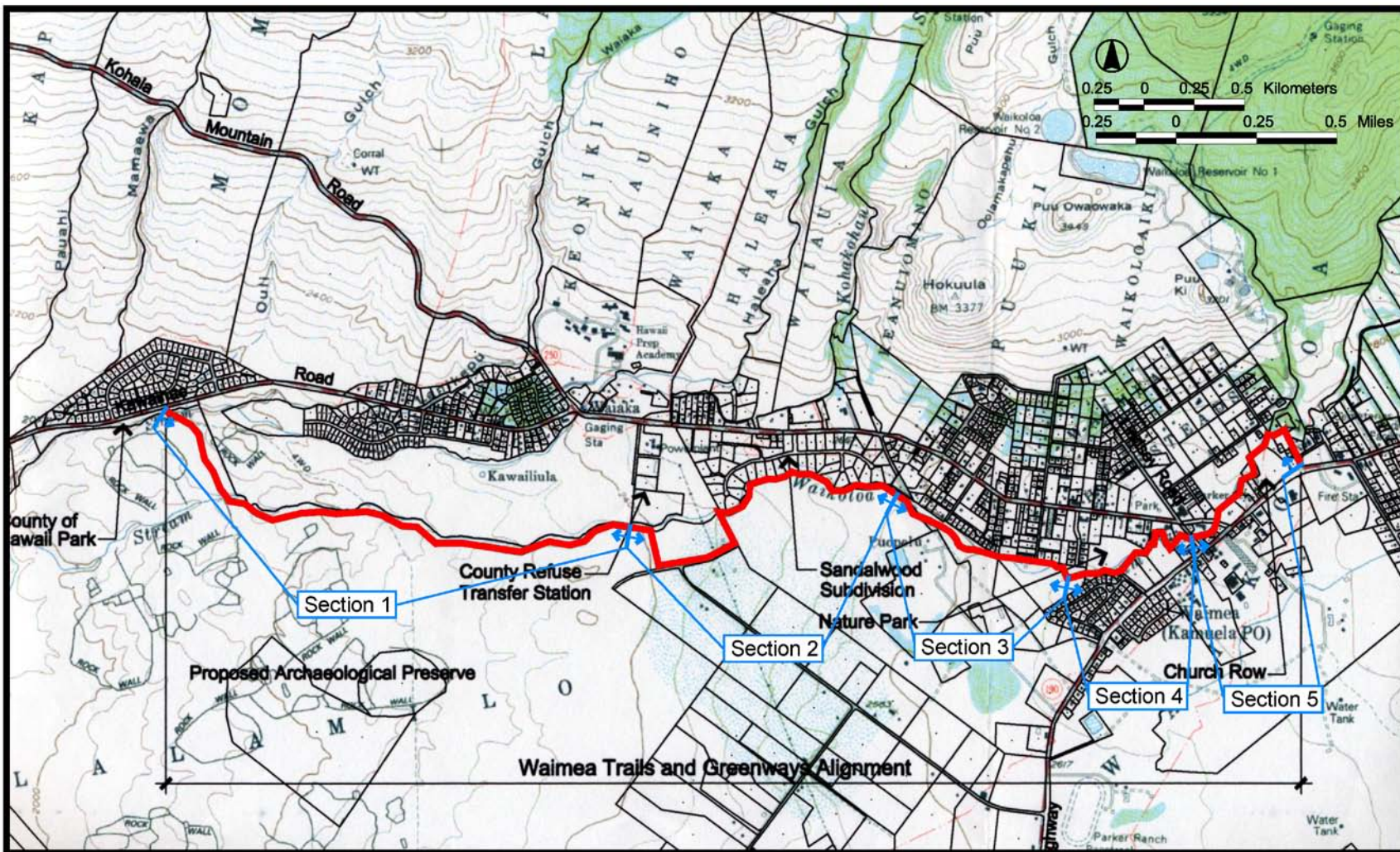


Figure 1 USGS Topographic Map, Kamuela Quadrangle, showing the location of the project area.

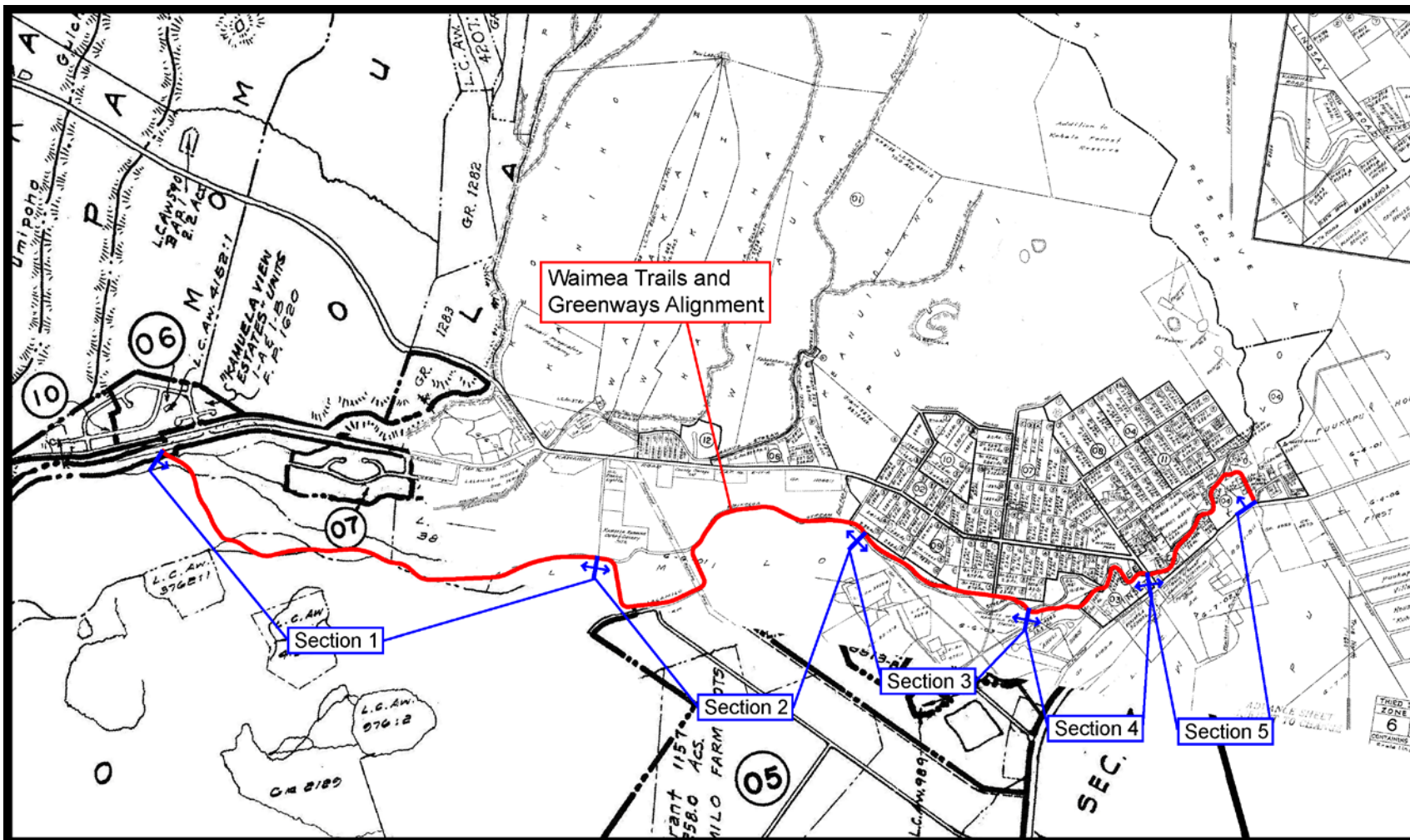


Figure 2 Portions of TMK 6-2, 6-5, and 6-6, showing the location of the project area.

C. Scope of Work

The agreed upon scope of work of this Cultural Impact Assessment is summarized as follows:

1. Examination of historical documents, Land Commission Awards, and historic maps, 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. A review of the existing archaeological information pertaining to the sites on the property as they may allow us to reconstruct traditional land use activities and identify and describe the cultural resources, practices, and beliefs associated with the parcel, and identify present uses, if appropriate.
3. Conduct community consultations with persons knowledgeable about the historic and traditional practices in the project area and region.
4. Preparation of a report on items 1-3 summarizing the information gathered related to traditional practices and land use. The report assessed the impact of the proposed action on the cultural practices and features identified.

D. Methods

Historical documents, maps, and photographs were researched at: the Kaua'i Historical Society, the Hawai'i State Archives; the Survey Office of the Department of Accounting and General Services; the Hawai'i State Library; the Bernice Pauahi Bishop Museum archives and library; Hamilton Library at the University of Hawai'i at Mānoa; the Mission Houses Museum Library; the State Historic Preservation Division (SHPD) library; and the library of Cultural Surveys Hawai'i.

Hawaiian organizations, government agencies, community members and cultural and lineal descendants with ties to Waimea were contacted to: (1) identify potentially knowledgeable individuals with cultural expertise and knowledge of the project area and the surrounding vicinity, and (2) identify cultural concerns and potential impacts within the project area.

E. The Interview Process

Once potential participants were identified, they were contacted by telephone or in person. If the individual expressed a willingness to participate, an appointment was scheduled at a location of the individual's choosing. Following the interview's completion, it was transcribed. The interviewees were given the opportunity to review a draft typed transcript for corrections, editing and additions. Excerpts from the interviews were then incorporated into the text where appropriate.

II. CULTURAL BACKGROUND

The history of the Waimea region of Hawai'i island has been documented in a number of studies and publications including, but not limited to the Fornander Collection of Hawaiian Folklore (Fornander 1916-1919), Ruling Chiefs of Hawai'i (Kamakau 1961), Place Names of Hawai'i (Puku'i et al. 1974), 'Ōlelo No'eau (Puku'i 1983), Hōkū o Hawai'i" Newspaper (Franklin et al. 1994) and missionary accounts (Baldwin and Lyons 1837; Doyle 1904, 1945, 1953; Bishop 1828; Ellis 1969).

These studies include references to oral traditions, the legendary rulers and personalities, early historic accounts, land ownership, and the changes in land use from traditional to modern times. The following section is a synopsis of these and other sources so as to provide a general overview of the historical and cultural setting related to the project area.

A. Place Names and *Mo'olelo*

The importance of place names and stories connected to an area are an important part of traditional Hawaiian culture and the transmission of cultural knowledge from one generation to the next. The proposed Waimea Trails and Greenway Project falls within the traditional *ahupua'a* boundaries of Lālāmilo (lit., milo tree branch), Waikōloa (lit., duck water; or could refer to a name of a wind), and 'Ōuli (referring to the name of a famous soldier of Kahekili's army who was skilled with the ma'a, or sling) (Puku'i et al. 1974). Puopelu (shortened for Pu'u'ōpelu) literally means 'ōpelu hill, and Wai'aka means "laughing-water." The name Wai'aka is used to identify both a stream that flows off of the Kohala mountains and a land section.

Ke kipu'upu'u ho'anu 'ili o Waimea
(The Kipu'upu'u rain of Waimea that chills the skin of people)
[Puku'i 1983:188; #1748]

The region generally referred to as "Waimea," which literally means reddish water, as it was thought to be tinted as it drained through the *hapu'u* tree fern forests or through the red soil (Elbert, Ms in Barrera and Kelly 1974). Waimea has been poetically characterized as being "like a spear rubbed by the wind, as the cold spray is blown by the *kipu'upu'u* rain..." (Proverb from a Kamehameha *mele* quoted by Henry Judd in Doyle 1953:42) and has a rich history that is evident in its place names and proverbs.

"Waimea" is a name that also identifies several localities in this section of Kohala (Franklin et al. 1994). They are (a) the town of Waimea (also called Kamuela [Samuel]), named either for postmaster Samuel Spencer, or for the rancher Samuel Parker (Puku'i et al. 1974); (b) a region, or *kalana*, that extends from the coast to the uplands and encompasses several *ahupua'a* between Kawaihae and Waikōloa; (c) the upland area only of that region including the entire plain between the Kohala and Mauna Kea Mountains; and (d) the upland region of intensive residential and agricultural occupation- the Waimea Field System (Clark and Kirch 1983:46). In 'Ōlelo no'eau (Puku'i 1983), Waimea is noted as an area of cool climate and chilling rains:

A. *Hele po‘ala i ka anu of Waimea*

Going in a circle in the cold of Waimea

Said of a person who goes in circles and gets nowhere. Waimea, Hawai‘i is a cold place and when foggy, it is easy for one unfamiliar with the place to lose his way [Puku‘i 1983: 83; #757].

B. *Ka ua Kīpu‘upu‘u o Waimea / Waimea i ka ua Kīpu‘upu‘u*

The Kīpu‘upu‘u rain of Waimea / Waimea, land of the Kīpu‘upu‘u rain

An expression often used in songs of Waimea Hawai‘i. This area is famed for its cold rain. When Kamehameha organized an army of spear fighters and runners from Waimea, they called themselves Kīpu‘upu‘u after the cold rain of their homeland [Puku‘i 1983:169, 319; #1571 & #2913].

C. *Ka ua paliloa o Waimea*

The Tall-cliff rain of Waimea

The rain of Waimea, Hawai‘i, that sweeps down cliffs. [Puku‘i 1983:172; #1593]

Waimea was known for a place of learning the art of fighting. “The land of Waimea was one of the lands where there were many warriors from ancient times. That place, Waimea, furnished Kamehameha with armies of men trained in battle” (Desha 2000: 188). The warriors that came out of this area were called Kīpu‘upu‘u warriors. The traditional *mele* Hole Waimea maybe the reason behind the naming of the Waimea warriors:

*Hole Waimea I ka ihe a ka makani
Hao mai nā ‘ale a ke Kīpu‘upu‘u
He lā‘au kala‘ihi ia na ke anu
‘Ō‘ō I ka nahele o Mahiki*

Waimea is stripped by the spear of the wind
Blown by the gust of the Kīpu‘upu‘u
A staff made stiff in the cold
Pierced is the forest of Mahiki

Desha translates the hidden meaning:

There is a hidden meaning in this old *mele*, as that forest of Mahiki was a place for making spears for the warrior in ancient times. In times of peace, the *ali‘i* and the men would go there to prepare for the times of war to come.

When Kamehameha was staying at Kawaihae, he went with his many warriors to that forest for the making of spears. Some of his court accompanied them, in other words, the chiefly women. At this place of the story, the writer conceals the hidden meaning of the “stripping of Waimea by the spears of the wind” and it is for the reader to guess the meaning. (Desha 2000:192)

Ke kānoa kapu o Lono-Makahiki: ‘oia ho‘i ‘o Hōkū‘ula!

(The sacred bowl of Lono-Makahiki: it is Hōkū‘ula!)

[Ka Hōkū of Hawai‘i 4/23/1914 in Franklin et al. 1994]

Translated and interpreted by Kepā Maly (in Franklin et al. 1994), the legend of Ka-Miki was published in the Hawaiian newspaper “Ka Hōkū o Hawai‘i” between the years of 1914-1917. It is a story about two brothers and their journey around the island of Hawai‘i. The legend includes

references to over 800 place names, and provides interesting information about Pu‘u Hōkū‘ula, the most prominent hill located just north of Waimea town.

Hōkū‘ula (Red Star): When Ka-Miki and Maka‘iole drew near to completing their formal ‘ōlohe training (fighting and competing skills) under their goddess/great grandmother Ka‘uluhe, she told them to go and visit their kūpuna (ancestress) Lani-nui-ku‘i-a-mamao-loa who dwelt at Lanimaomao (Waimea). Lani-nui-ku‘i-amamao-loa was the guardian and keeper of the sacred kānoa (‘awa mixing bowl) Hōkū‘ula which belonged to Lono-Makahiki, and the ma‘au (strainer) called Kalau-o-Kāhuli which was upon the plain of Waikōloa. These two items were to be used in ‘awa ceremonies for the brothers ‘ailolo (brain eating- completion of training ceremonies) [Ka Hoku o Hawai‘i 2/5/1914 in Franklin et al. 1994].

The association of the bowl, or *kānoa* of the god Lono (a provider of abundant crops and rain-laden clouds) with Hōkū‘ula may refer to the agricultural lands of the region; i.e., (1) the bowl or container could symbolize a land of agricultural abundance; (b) the sprinkling of waters from the bowl could refer to the waters of the streams that flow from the uplands and spread across the plains; and (c) the importance of the rituals of Lono in agricultural endeavors, particularly in the areas of Kohala where large field systems have been archaeologically documented. Thus, the legendary account may symbolically represent actual resources of the Waimea Region.

B. Accounts Related to *Heiau*

Thomas Thrum in his survey of *heiau* sites on the island of Hawai‘i documented a single *heiau* in Waimea. The *heiau*, Uli, was of unknown size and class, and was dedicated to Hākau. Uli was said to have been rebuilt by Kamehameha, and its images and steps repaired. Coconuts were brought from Puako, 12 miles away, for its consecration. Only a low mound remains to indicate the location of the *heiau*, opposite of the church premises (T.Thrum 1908).

A missionary account by Lorenzo Lyons in the 1850's tells of legends within the setting of Waimea, and mentions a *heiau* in the area:

On a nearby ridge stood another *heiau* built “...by the great Akua Makuakua who has come from far off Kahiki.” From the hillside he watched the rainbows “...and there he found the beautiful goddess Wao.” They lived at Hōkū‘ula. Each time Wao was ready to bear a child she returned to the Waimea hills, which were sacred to her. The kapu was proclaimed in her honor- the forbidden ground extended “...down across the plains to whatever place a stone happened to stop rolling when started above by her servants.” [Doyle 1953 in Barrera and Kelly 1974]

According to legend, Wao changed her servants into stones to guard the land during the night hours. When daylight came she transformed them back into their human forms (Barrera and Kelly 1974:1).

Lorenzo Lyons also tells of the legendary story of a Ho‘opili-a-Hae, and mentions her as being the founder of a *heiau* for women in Waimea:

“The earliest chiefs of Waimea of whom we have record stemmed from the same Ulu-Hema line that led to Liloa, the founder of the island dynasty. Liloa’s grandson Keawe-nui-a-‘Umi took as one of his wives Ho‘opili-a-Hae, daughter of Liloa’s kahuna Pae-a-Molenole.” [Clark and Kirch, 1983:26]

“(The *heiau*) was attended exclusively by young virgins. In the sanctity of the cool highland forest, they “...performed the sacred ceremonies, learning also the science of healing so that they might eventually minister to others. Hoapiliaha‘e’s children were named for the five rains of the *heiau*.” [Doyle 1953: 42-43] (in Barrera and Kelly 1974:1)

C. Historical Battles at Waimea

‘O ke aluka koa a Kama i Waimea

(a multitude of warriors had Kama at Waimea)

[Kamakau 1961 :55-61 in Barrera and Kelly 1974]

Hökū‘ula, located approximately 1 mile east of Wai‘aka, is famed for being the location of a prominent battle ground in which Kamalālāwalu, the ruler of Maui Island waged war against the Hawai‘i Island forces. Deceived by misleading advice from his trusted advisors and poor strategic planning, Kamalālāwalu arrived on Hawai‘i landing at Kawaihae, only to realize that there were no people there. They continued up to Hökū‘ula, a prominent *pu‘u*. Situated in this manner, he believed his army would be able to have the advantage in defending themselves against the Hawai‘i Island forces.

Upon hearing of Kamalālāwalu’s arrival, Lonoikamakahiki, the Hawai‘i Island ruler sent an army from Kona, Ka‘u, Puna, and Hilo to Hökū‘ula, where the Maui warriors were stationed. The following morning Kamalālāwalu observed that the lowlands were literally covered with countless men. He soon realized that his Maui forces were inferior in numbers and asked Kumaikeau “*E Kumaikeau ma, pehea kēia? He aha kēia lehulehu o lalo?*” “Kumaikeau and the rest of you, how is the situation? What is the extent of their numbers below?” Kumaikeau relied “*Akahi nō au a ‘ike i ka nui o nā kānaka o Hawai‘i nei...*” “I have never seen so many people in Hawai‘i before...” After three days of negotiations, the two combating forces waged battle, with Lonoikamakahiki gaining the victory over Kamalālāwalu’s army (Fornander 1916:342-350).

Another battle fought in the Waimea area was between the leeward and windward chiefs of Hawai‘i Island toward the middle of the 18th century. This clash took place at Mahiki, east of Waimea, and just across the district boundary in Hamakua. Here, the father of the great chief Alapa‘inuiakauaua was leading his forces against the Hilo chiefs when he was killed. Alapa‘inui was on Maui at the time but returned to Hawai‘i and ultimately regained control of the Kona and Kohala districts (Kamakau 1961: 65). Eventually he went on to take over the whole island of Hawai‘i and place it under his rule. In his later years, Alapa‘inui lived first in Waipi‘o, then lived for sometime in Waimea, and later moved to Kawaihae (Kamakau 1961: 77).

During Kamehameha’s campaign to extend his rule to all the major islands, he stayed at Waimea and at Kawaihae for some time. There are mentions of Kamehameha’s visits to Waimea in 1791 and 1792 when he rebuilt Pu‘u Koholā heiau (Clark and Kirch 1983). At that time a large work force was required and the people of Waimea were solicited. It has also been

suggested by Clark and Kirch (1983:27) that food and *tapas* were brought from Waimea to feed and clothe the many warriors in preparation of the Peleleu fleet to battle Maui and O‘ahu in 1794 and 1795.

III. HISTORICAL BACKGROUND

A. Post-Contact Period

The Waimea area, with its favorable soils and water from Kohala Mountain streams that could be harnessed and distributed on the fairly level plains, was an obvious area for the expansion of introduced food crop production. Waimea was very productive agriculturally in the early years following contact with the Western world. Based on early accounts, *kalo*, or *taro* (*Colocasia esculata* sp.) was the dominant crop with *‘uala*, or sweet potatoes (*Ipomoea batatas* sp.) and *kō*, or sugar cane (*Saccharum officinarum* sp.) also grown in substantial quantities. The decline in traditional Hawaiian agriculture in the Waimea region has been attributed to factors such as: 1) depopulation and the concurrent abandonment of the fields; 2) the pursuit of other commercial interests, such as the sandalwood and *pulu* trade, sugarcane cultivation, and the introduction of cattle.

It is important to mention that after the abandonment of traditional Hawaiian agriculture in Waimea, there were two resurgences of agricultural endeavors to boost the economy of Waimea (Clark and Kirch 1983). In the late 1820's, two Chinese, Lau Ki and ‘Aiko started a sugar mill at Lihue, in upper Lālāmilo. While the mill was not successful commercially, sugar production continued in the Waimea area (Barrera and Kelly 1974: 47). In the late 1830's, cotton was grown in Waimea when Governor Kuakini ordered the planting of an “immense field of cotton in the Waimea area,” (Kuykendall 1967: 183). In the late 1840's and early 1850's, both sweet and Irish potatoes were cultivated extensively. However by 1865, these crops were reported to have been greatly diminished.

B. Māhele and Land Commission Awards

The Organic Acts of 1845 and 1846 initiated the process of the Mahele - the division of Hawaiian lands - which introduced private property into Hawaiian society. In 1848 the crown and the *ali‘i* (royalty) received their land titles.

Kuleana awards for individual parcels within the *ahupua‘a* were subsequently granted in 1850. These awards were presented to tenants - native Hawaiians, naturalized foreigners, non-Hawaiians born in the islands, or long-term resident foreigners who could prove occupancy on the parcels before 1845 (Apple 1978:45). .

The records associated with these awards illuminate the character of the settlement within the *ahupua‘a* at the mid-19th century. The majority of the individual *kuleana* claims are situated close to streams emptying from the southern slope of Kohala Mountain. The streams include Waikoloa, Kohakohau, Haleaha, Waiaka, and Kanikepu. These and other streams flowed onto the Waimea plain then turned to the west (*makai*) to flow down slope towards the Kawaihae/Puako area. The focus of habitation and agriculture was at the base of Kohala Mountain and extending out onto the Waimea plain. The awarded *kuleana* were in a relatively narrow band extending from approximate elevation 2,100 ft and 2,900 ft. This zonal band would include the presently proposed trail corridor.

LCA claims in proximity to the corridor include land use data such as house lots with associated cultivation and enclosed walls, agriculture such as *taro* and *mamaki*. This pattern of land use is exemplified in LCA 3828 to J. A. Palea. Kauhini testified on behalf of Palea 's claim of two house lots and a land claim:

I have seen/it/in three sections, two house-lots and one land section. The land section is in the *ili* land of Waikoloa [Waikoloa Nui or Lalamilo] in Waimea, Hawaii. It had a fence at one time; it has fallen apart at this time. Two houses for Palea are in there. He had built them and the boundaries are:

Mauka, Waho, also Makai by Hueu's land

Kohala, by Wiliama Pekele's [Beckley's] land

Palea received this land in 1847 from Hueu. This is an old place on which Palea has lived since 1829. He is living there at the present time (Native Testimony Vol. 4:31).

Research for the proposed Waimea to Kawihae Highway resulted in the designation of the Lālāmilo *Kuleana* and Ranch District (Barrera and Kelly 1974). The district boundaries encompass a portion of the trail corridor.

C. Sandalwood and Pulu

The mountains surrounding Waimea were well-known for rich sandalwood reserves. During the early part of the 19th century, as contact with the West was growing, the extent of the sandalwood trade was evident as it became one of the earliest commodities of a newly formed market oriented economy.

Similar to the sandalwood trade, was the exploitation of *pulu*, the soft fiber gathered from the buds of the tree fern (*Cibotium* sp.). Pulu was used for stuffing pillows, mattresses, and furniture (Thrum 1929 in Erkelens 1998: 15). The *pulu* trade began in 1851, with shipments to the West Coast of North America and Australia. Like sandalwood, the over-exploitation of this resource also led to its demise. By 1860, the trade had virtually ended (Doyle 1945: 182).

D. Population Estimates

The general impression of the pre-contact settlement pattern, constructed from a variety of archaeological and early historical sources, is one of scattered settlements along Waikōloa Stream (Clark 1987: 103; Erkelens 1998: 11). During subsequent decades, with the arrival of western foreigners and missionaries, impressions of the life and landscape would be recorded for 19th-century Waimea. In 1823, Asa Thurston counted 220 houses in his walk through Waimea. In the section between 'Ōuli and Pu'u Kapu (a distance of approximately 4.8 km or 3 miles), this was interpreted as representing a population of 1,100 to 1,200 individuals (Ellis 1979:399 in Erkelens 1998: 11). Although the population was concentrated at Kea'ali'i (located along Wai'aka Stream) at the time of Thurston's visit, a settlement of 300 to 400 individuals near the present Waimea town is a reasonable estimate (Clark 1987: 103).

It was not, however, until the 1830's that a missionary would be stationed in northern Hawai'i. On July 13, 1832, Lorenzo Lyons and his wife Betsy arrived at Kawaihae by brig from Honolulu to take up residence at Waimea. Lorenzo Lyons had a church and school (for adults) at Waimea in 1835, serving a congregation of from 100 to 500 Hawaiians. In his writings, Lyons stated:

“During the past year I have taken a census of the population of this district and find it to be as follows: Waimea, 1,396; Kohala 6,175; Hamakua 4,015; total 11,586, from which it appears there has been a diminution of the people 3,500, within three and a half years. Marriages are numerous. But the progeny are wanting. Children are not in general, objects of desire. Taxes are in proportion to the number of children. My census may not be correct. Many think I am numbering them for the purpose of taxation, and conceal a part of their number.” [Doyle 1945:82-83]

E. Cattle Industry

An examination of the cattle industry in the Waimea area clearly shows its dominant role. The cattle industry, which eventually changed the economy and lifestyle of Waimea, had its origins in bullock hunting, which was controlled by Hawaiian chiefs. The initial increase in cattle population was aided by a ten year *kapu* placed on hunting or taking of cattle. Feral cattle multiplied rapidly and ran wild on the plains of Waimea. For some two to three decades after the lifting of the protective ban, bullock hunters were employed to hunt down the wild cattle and take them to a market.

In the 1830's, meat, hides, and tallow began to be marketed, and thus formed the true beginning of the cattle industry. By 1847, about two-thirds of Waimea area had been converted to pasture for government herds of cattle, as well as sheep and horses (Doyle 1945). By the middle of the 1800's the Waimea region was the center of the industry.

The cattle industry had two major impacts on Waimea. The first was the effect of marauding cattle on the unprepared Hawaiian farmer (Erkelens 1998:19). As early as 1802, there were complaints concerning the destruction of gardens by feral cattle (Turnbull 1813:243, in Barrera and Kelly 1974:44). In 1836, Waimea was surrounded by a stone wall to protect it from cattle (Baldwin and Lyons 1837).

The second major impact on Waimea was the increase in population as a result of economic opportunities provided by the cattle industry (Erkelens 1998:19). Bishop (Bishop 1828, in Erkelens 1998:19) reports that Kuakini's arrival in Waimea marked the beginning of the cattle industry, as attendance at church services increased to approximately 1,000 individuals from a previous attendance of 200 (Bishop 1828; WMR 1832; Doyle 1945)

Following Kuakini's construction of the road between Kawaihae and Waimea in 1830, ox carts were able to haul commercial items much more efficiently than was previously possible. Although missionary census records for the period from 1832 to 1845 suggest little overall change in the population of Waimea (approximately 1,000 individuals), there was undoubtedly a change in composition of the constituency, from predominantly Hawaiian to a mix of foreigners and Hawaiians.

F. Parker Ranch and the 20th Century

John Palmer Parker, an American born in Newton, Massachusetts in 1790, had intended a sailing career when he left home in 1809. After several years at sea, Parker arrived on Hawai'i Island in 1815 and decided to remain there. By 1819, Parker had a Hawaiian *ali'i* wife, Kipikane, and a baby daughter, Mary. Parker and his family went to live at Waiapuka in Kohala where he farmed on twenty-one acres that had been granted to him by Kamehameha. In this era, most of the ranch work consisted of capturing wild cattle and domesticating them. As the ranching industry expanded, so did responsibilities such as managing the many personnel of the Parker Ranch, building houses and growing food to feed all. Subsequently, Parker hired South American and Mexican horsemen to train his ranch hands to track, rope, brand, and bring in the wild cattle. These "*vaquero*," "*paniolo*," or "*espangnol*" not only introduced the management of cattle and horses, but also brought colorful clothes, hats, and saddles that became the mark of Hawaiian *paniolo*. The first Hawaiian *paniolo*, or cowboys, actually predate many of the mainland western cowboys. The ranch personnel also made most of their own gear and machinery, including saw mills.

In the last years of the 19th Century, Waimea remained a small town concentrating on the shipment of cattle to export markets. The Waimea of 1881, was graced with two stores, a boarding house, lodging house, and a coffee saloon (Bowser 1881:540). Even at this seemingly late date, wild cattle were occasionally a problem. In 1888, Paul Jarrett was the first to commence fencing Parker Ranch lands to segregate the domesticated from the wild cattle (Doyle 1904). The next Parker Ranch manager, A.W. Carter, (manager 1899-1936), consolidated all the Parker family land holdings under the control of his ward, Thelma Parker. A.W. Carter then began in earnest to increase ranch lands, systematically breed for better, stronger, healthier cattle and horse stock, bought a barge to ship cattle with other Big Island ranchers, increased ditches for watering livestock, and imported different grasses and feed for cattle. He provided the U.S. military branches with cavalry horses and ventured for a short time into training horses and horsemen for polo teams. Parker Ranch then became one of the major providers of horses in Hawai'i and abroad for work, pleasure, and shows. A.W. Carter's son, A.H. Carter succeeded him in 1937. The Parker Ranch had become one of the biggest private businesses in Hawai'i and remains the dominant economic force in Waimea.

Since the early 1900s Waimea has been part of a fast paced urbanization of the Big Island. After the World War II (late 1940s-1950s) a small portion of land near South Kohala Distribution Road was used as a dump "and remnant pieces of disposed car parts and miscellaneous "junk" can be seen lying on the surface (personal communication, Woody Ramous in McGuire 2002). More recently new developments such as the Sandalwood Subdivision, the Waimea Center, Carter Professional Center, and the Canada France Hawaii Telescope have added to the growing town of Waimea.

In 1993 the W. M. Keck Observatory was placed on Mauna Kea. The headquarters resides in Waimea Town, south of the Waikōloa Stream and north of Mamalahoa Highway. Waimea continues to grow with further urbanization, though Parker Ranch remains a mainstay of the economy of the area.

IV. PREVIOUS ARCHAEOLOGICAL RESEARCH

A. Previous Studies

A number of archaeological investigations have been conducted in the general vicinity of the project area (Table 1, Figure 3). However, for the purpose of this report, only the studies conducted nearest to the proposed Waimea Trails and Greenways project area were reviewed in detail.

One of the most widely cited studies in this area was completed by Barrera and Kelly (1974). In 1973, the Bishop Museum conducted an archaeological survey and historical review for the proposed Waimea to Kawaihae Road corridor, during which over 4,500 archaeological features were identified, the majority of which were located either near the coast at Kawaihae or in the Lālāmilo area near Waimea.

Of particular interest are the sites located in upper Lālāmilo and upper Waikōloa, which are nearest to the current project area. Based on the survey results, Lālāmilo contains nearly 3,500 features (Barrera and Kelly 1974). The study resulted in the designation of the “*Kuleana* and Ranch District” in the Lālāmilo portion of the project area (Ibid.) (Figure 4). This information is important as it indicates the high density of surface archaeology that one can expect to find in upper Lālāmilo near the project area. Sites have been described as being included in an extensive habitation and agricultural system. The findings were later expanded upon in 1981, when the Bishop Museum conducted a survey and excavation project along the Mudlane to Kawaihae Road right-of-way (Clark 1981; Clark and Kirch 1983). These feature complexes were then referred to as the Waimea agricultural system (Figure 5):

The Waimea agricultural system comprises the remains of an extensive series of agricultural features, throughout which are scattered multiple residential structures. The system forms a large arc to the W and S of the present-day village of Waimea. Beginning on the S flank of Kohala Mountain, a short distance below Pu‘u La‘ela‘e, this system extends down the slope and onto the Waimea plain W of town. It then bends to the E, fading out just S of Waimea and W of Kuhio Village (Clark and Kirch 1983: 293).

Excavations associated with the Mudlane to Kawaihae project resulted in a total of 45 charcoal samples undergoing radiocarbon analyses. Approximately 71% of the dates were post 1600 A.D. and considered relatively late (Clark and Kirch 1983). Additionally, the Mudlane to Kawaihae project yielded “evidence that the prehistoric and early historic inhabitants of the Waimea region practiced an intensive form of cultivation, utilizing what Clark has termed ‘supplemental irrigation.’” This differs from the two classic forms of indigenous Hawaiian agriculture, irrigated pondfield cultivation and dryland field-system cultivation. (Ibid.: 528)

As a result of the information gained through the Mudlane to Kawaihae project, Clark went on to develop a settlement pattern model for the Kawaihae-Waimea region (Clark 1987) This settlement pattern included four zones: Coastal Zone, Intermediate Zone, Kula zone, and Wilderness zone. The current project area lies within the Kula Zone, described as follows:

Table 1 Previous Archaeological Studies in the Vicinity of the Project Area

Author (Date)	Location	Nature of Study	Findings
Barrera & Kelly (1974)	Waimea to Kawaihae Road Corridor;	Archaeological Reconnaissance Survey	Approx. 4,561 features were recorded incl. habitation and agricultural complexes. The majority were near coastal Kawaihae or in the Lālāmilo area near Waimea. Of particular interest is the area referred to as the “ <i>kuleana</i> and ranch district.”
Ching (1979)	Lālāmilo	Archaeological Reconnaissance Survey	Many archaeological features recorded incl. habitation and agricultural complexes.
Neller & Beggerly (1980)	Lālāmilo to Pu‘ukapua Irrigation System	Archaeological Reconnaissance Survey	No sites were present in or near the vicinity, although a few buildings were of historic interest.
Clark (1981)	Section 4 (Upland Lālāmilo) Mudlane-Waimea Kawaihae Road Corridor	Archaeological Inventory Survey and Data Recovery	321 sites, including both agricultural and residential features were identified. Extensive agricultural system divided into four complexes, each with its own characteristics.
Clark & Kirch (1983)	Mudlane-Waimea Kawaihae Road Corridor	Archaeological Inventory Survey and Data Recovery	Numerous sites identified, both agricultural and habitation. Project provided a broad data base for comparing site distribution data from the coast to upland.
Bonk (1985a)	Waikōloa, Pu‘ukapu, ‘Ōuli	Archaeological Reconnaissance Survey	11 Sites including habitation and agricultural features
Bonk (1985b)	Waimea to Pa‘auilo Watershed	Archaeological Reconnaissance Survey	Single archaeological site including 2 features
Rosendahl (1985)	Lālāmilo	Archaeological Reconnaissance Survey	No sites located
Hammatt & Borthwick (1986)	Lālāmilo Houselots Subdivision	Archaeological Reconnaissance Survey	8 sites including agricultural features and complexes typical of the Waimea Field System

Hammatt et al. (1988)	Lālāmilo Houselots Subdivision	Archaeological Inventory Survey w/ Subsurface Testing	Seven Archaeological sites recorded and limited subsurface excavation conducted. Both habitation and agricultural sites were documented.
Hammatt & Shideler (1989)	Lālāmilo, Ka La Loa Subdivision	Data Recovery	Data analysis suggested that the informal agricultural activity (represented in ag. mounds) were occurring by the mid 13 th century, and field boundary walls were constructed by the mid-15 th century, with permanent habitation occurring from early 16 th century to the late 18 th century.
Spencer (1989)	Lālāmilo, Waimea-Pa‘auilo Watershed	Archaeological Reconnaissance Survey	No cultural resources observed
Bonk (1989)	Wai‘aka	Archaeological Reconnaissance Survey	Contained “low mildly terraced field ridges” and “larger terraces with broader and flatter surfaces behind soil embankments.” Falls into field complex #1 (Clark 1981).
Clark et al. (1990)	Waikōloa, Waimea School Improvements	Archaeological Testing and Data Recovery	Profiles of 3 ‘auwai suggest a historic period origin, prehistoric construction possible. Charcoal sample yielded an age range with preferred date range is A.D. 1449 to 1674
McEldowney (1991)	Pu‘ukapu pastoral lot #100	Field Check	stone complex of 2 enclosures
Thompson & Rosendahl (1992)	Potential Sites for North Hawai‘i Community Hospital / Waimea Elderly Housing Project	Archaeological Inventory Survey	Backhoe testing of ‘auwai features encountered charcoal samples which yielded radiocarbon dates as early as 770-1020 A.D.
Erkelens (1993)	Waimea Town Center Project	Review of Historical Documents and Background Literature	Review of the Waimea Town Center survey indicated that information previously gathered is incomplete for the project area. Not all archaeological sites and features are presently known.

Schilz (1994)	‘Ōuli	Archaeological Inventory Survey	Total of 75 sites recorded including 45 military sites, 14 ranching sites, 9 historic sites, and 7 traditional Hawaiian sites.
Franklin et al. (1994)	Hawaiʻi Preparatory Academy Waimea Campus Expansion	Archaeological Inventory Survey	7 sites associated with agriculture and habitation identified. The sites comprised the formal types: water channel, cemetery, terrace, concrete foundation, and alignment
Erkelens (1998)	The Kuleana Lots at Pukalani Waimea Town Center Project Area	Archaeological Inventory Survey w/ Subsurface Testing	Sites include 3 19 th century house lots, historic cemetery, 4 historic structures, a burial. Skeletal remains of two individuals were encountered during subsurface testing.
Haun et al. (2002)	Lālāmilo, DHHL Residential Development	Archaeological Inventory Survey w/ Subsurface Testing	Identified 75 sites including 818 agricultural and habitation features. Radiocarbon dating indicated utilization as early as 1500s A.D.
McGuire and Haun (2002)	DHHL Residential Development at Lālāmilo South Kohala District	Cultural Impact Assessment	No on-going cultural practices identified
Kikiloʻi and Borthwick (2002)	Waimea Trails and Greenway Project	Archaeological Assessment	During the assessment they concluded that the trail corridor intersects a number of features, such as ‘auwai and field walls and recommended an inventory survey.

Table 2 Field Complexes of the Waimea Agricultural System (per. Clark and Kirch 1983)

Field Complex	Location	Description
1	On the Kohala Slope, between Lanikepu and Hale‘aha Gluches, N of Keanu‘i‘omanō and Kohākōhau Streams	Upper elevation portion dominated by low, mildly terraced field ridges. Lower portion has larger, broad and flat terraces behind soil embankments. Water channels run down slope for drainage. Main channel of ‘auwai diverted from Kohākōhau Stream.
2	Bounded on N by Keanu‘i‘omanō and Kohākōhau Streams, and on S by Waikōloa Stream	Low terraces with retaining faces or ridges of soil and/or stone. Long axes of fields oriented perpendicular to prevailing winds. Main channels of ‘auwai diverted from Kohākōhau Stream and drain into Waikōloa Stream. Residential features scattered

		throughout area.
3	Between Waikōloa Stream on the N and Pu‘u Pā hill on the S.	Largest field complex. Both residential and agricultural features scattered throughout. Dominant agricultural features include: bounded field units; small planting swales; pondfields; ‘ <i>auwai</i> ’; minor planting features (mounds, small terraces, modified outcrops). Evidence of ‘supplemental irrigation’ system.
4	Directly S of the Village of Waimea	Long, narrow fields demarcated by low soil ridges. ‘ <i>Auwai</i> ’ divert water from Waikōloa Stream. Also includes residential structures. Similar to Field Complex 3

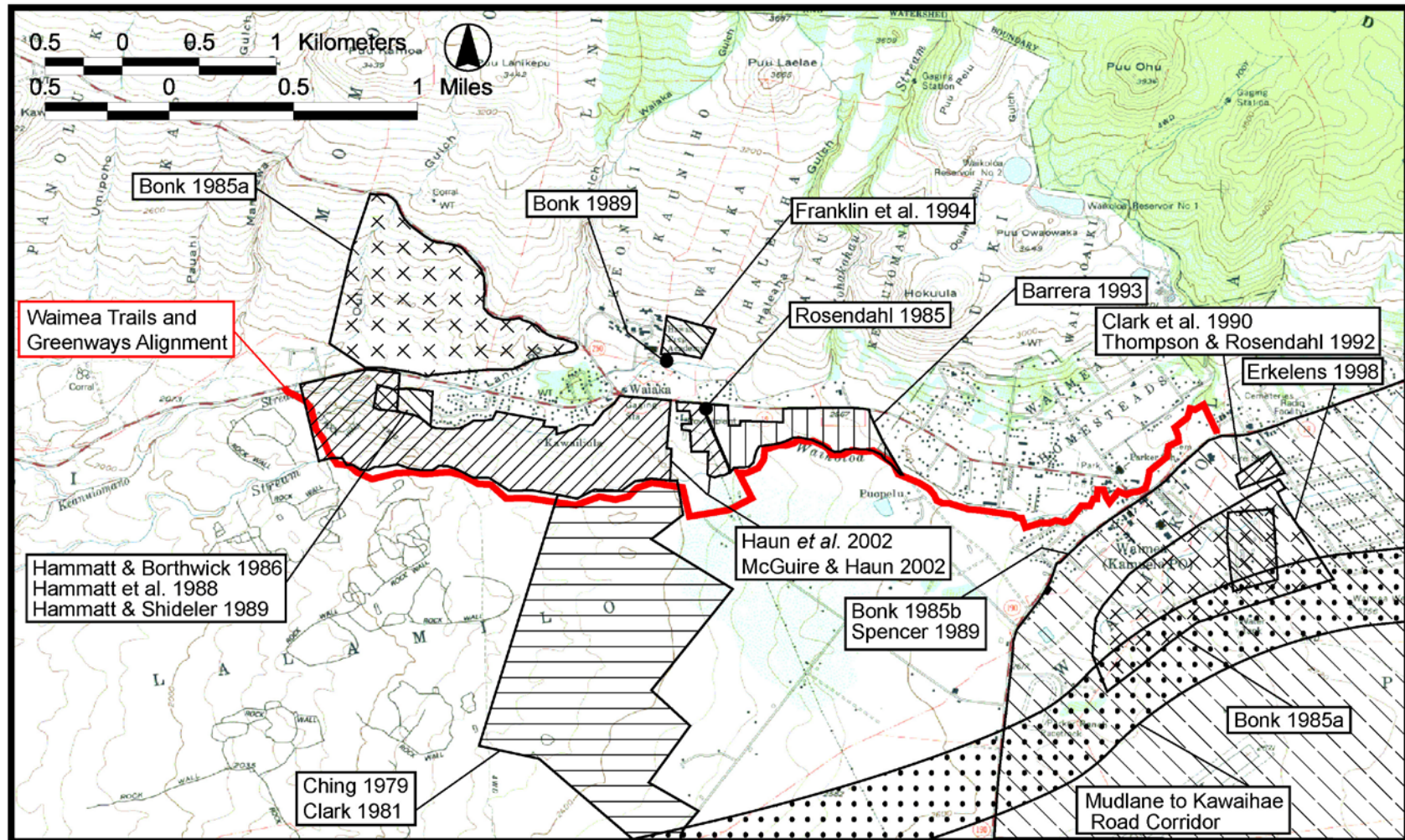


Figure 3 Previous Archaeological Studies in the Vicinity of the Project Area.

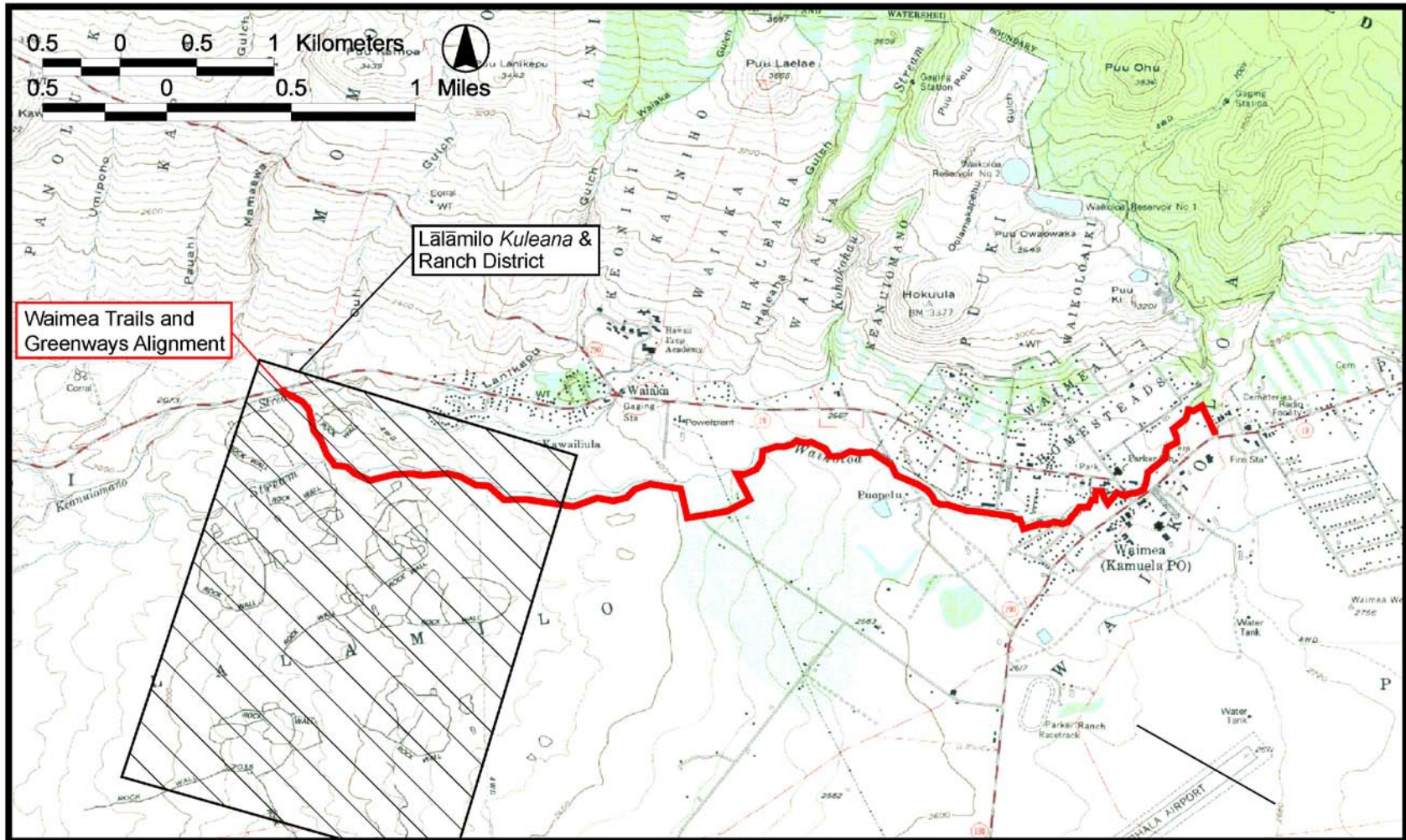


Figure 4 USGS Map Showing the Location of the *Kuleana* and Ranch District Designated by Barrera and Kelly (1974).

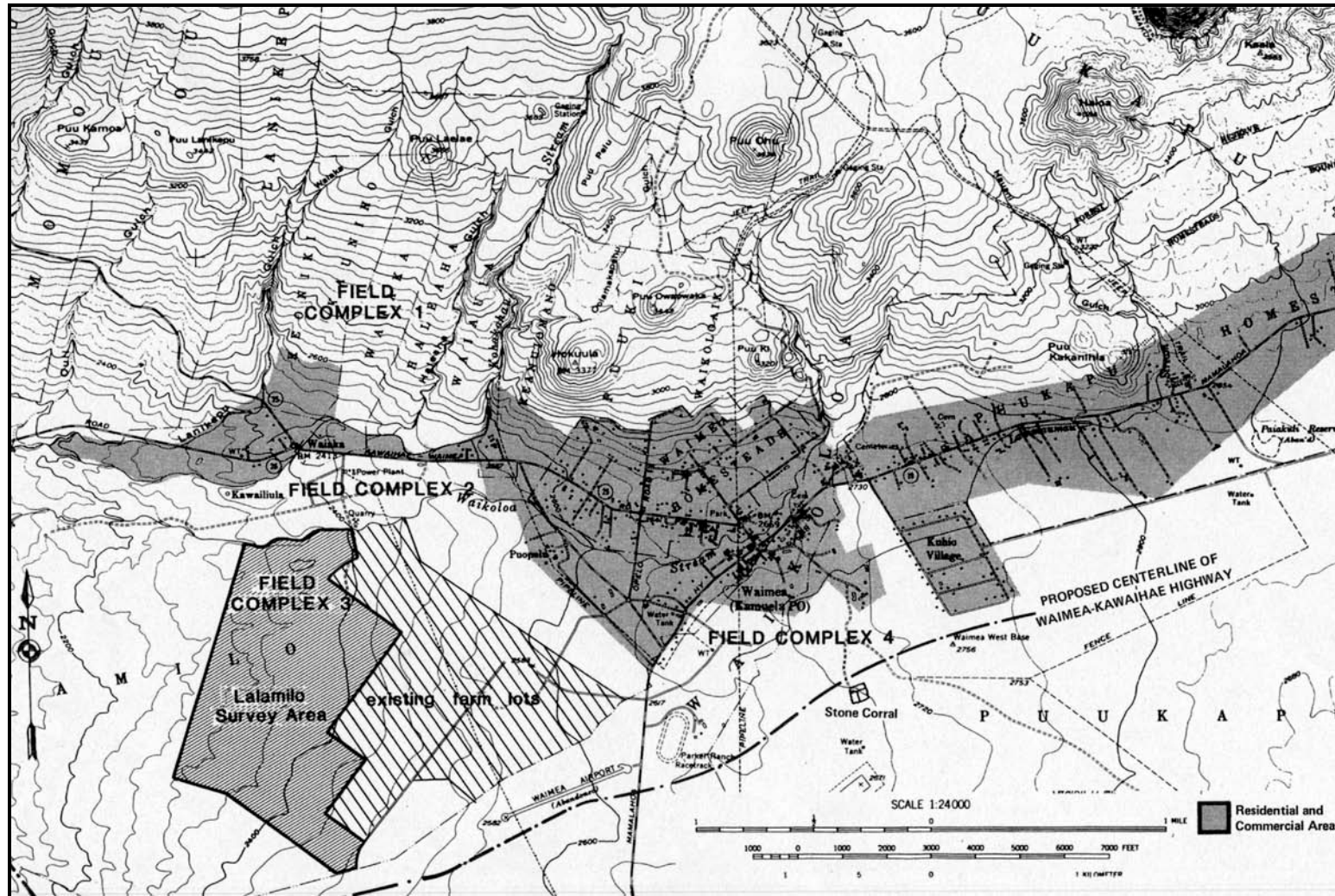


Figure 5 Map Showing the Location of Field Complexes 1-4 of the Waimea Agricultural System, Lālamilo Survey Area, and Existing Farm Lots (Clark and Kirch 1983) Note Field Complexes are General Areas and Do Not Have Definite Boundaries.

Extends from the Intermediate Zone to between 7.3 and 9.7 km inland. It ranges in elevation from 585 m to 830 m (1,919-2,722 ft) in elevation, with small sections extending to as much as 975 m (3,198 ft) elevation. Subsistence activity is dominated by agriculture...Crops included sweet potatoes, dry-land taro, gourds, and *wauke*. Habitation sites included single use sites, extended and recurrent occupations, and permanently occupied sites. Habitation features include small walled shelters, caves, overhangs, terraces, platforms, and enclosures. The more intensively occupied habitation sites are clustered in neighborhoods sometimes larger wards. Burial features are also present (Clark 1987).

In 1985, a reconnaissance survey of four parcels proposed for residential developments was completed (Bonk 1985a). Areas I and II of the survey, located south of Waimea Town, contained both agricultural and residential complexes (portions of Field Complex 4). Area IV, located west of Wai'aka, contained several residential sites (portions of Field Complex 2). Also in 1985, a reconnaissance survey of three reservoir sites and a large watershed area extending from Waimea to Pa'auilo was conducted, in which both residential and agricultural features were located (portions of Field Complex 4) (Bonk 1985b).

In 1986, Cultural Surveys Hawai'i (Hammatt and Borthwick 1986) conducted an archaeological reconnaissance survey on approximately 50 acres located immediately north of Waikōloa Stream. Eight sites, typical of the Waimea Agricultural System, were located (portions of Field Complexes 1 and 2). This work was followed by a detailed archaeological survey and subsurface testing of 12 acres of the original study area (Hammatt et al. 1988). Seven sites were documented including both agricultural and habitation complexes. Excavations revealed an abundance of indigenous artifacts and *midden*, indicating "this small agricultural-habitation complex was in use in the late prehistoric period and was abandoned before European manufactured goods were available (probably 1820 or before)" (Hammatt et al. 1988:69) Data recovery of sites yielded radiocarbon dates which "suggest an initial low investment agricultural effort probably in sweet potato production, followed by a gradual intensification of effort just to the west over a period of several centuries" (Hammatt and Shideler 1989:50).

A reconnaissance survey of approximately 100 acres was conducted at Hawai Preparatory Academy in Wai'aka (Bonk 1989). Agricultural features associated with Field Complex 1 were located.

In 1990, an inventory survey with subsurface testing and data recovery was conducted at the Waimea School improvements Lot A (Clark et al. 1990). Various agricultural features were located (portions of Field Complex 4). Radiocarbon dating of charcoal recovered during subsurface testing yielded a date range of A.D. 1449 to 1674.

Thompson and Rosendahl (1992) conducted an inventory survey of potential hospital sites in several locations around Waimea. Numerous agricultural features were located, comprising portions of Field Complexes 2-4.

Recent archaeological investigations in the Waimea Town Center project area have further documented 19th and early 20th century habitation and associated sites (Erkelens 1998). The

investigations included surface and sub-surface surveys. Five sites were identified, including house, burials, and agricultural sites (portions of Field Complex 4). All sites and materials observed were historic either from the mid 19th or early 20th century. The sub-surface investigations also indicted that extensive bulldozing had disturbed large areas of the 10+ acre parcel (Ibid.).

An archaeological inventory survey for a proposed DHHL residential development at Lālāmilo bordering the western portion of the proposed trail was completed in 2002 (Haun et al. 2002). During the inventory survey 75 sites with 818 features were identified and documented. Feature types included, agricultural, permanent and temporary habitation, burial, military defensive position, historic foundation, storage, and a quarry. Based on radiocarbon dating, artifact analyses, and historic documentary research, traditional Hawaiian utilization of the project area was posited to be as early as the 1500s and extending into the mid-1800s (Haun et al. 2002). The DHHL Development Survey area bordered portions of the proposed trail corridor. The proposed trail corridor west (*makai*) of the County Transfer Station would include similar site types.

A cultural impact assessment was also conducted for the same DHHL parcel (McGuire and Haun 2002). The assessment included a detailed background history and a single interview. No present-day cultural practices of any kind were identified though past cultural practices were discussed:

Past cultural practices identified were related to agricultural practices and the utilization of an ancient *'auwai* or ditch system which traversed much of the Lālāmilo area. The project area is part of the larger Lālāmilo field system evidenced by remnant *'auwai* and dryland terraces. Hawaiian burial practices (pre-contact and historic) were conducted in the project area as evidenced by the presence of burials and graves sites (McGuire and Haun 2002:47).

An archaeological assessment was conducted for the Waimea Trails and Greenway Project (Kikiloi and Borthwick 2002). During the assessment they concluded that the trail corridor intersects a number of features, such as *'auwai* and field walls. On the western end of the project there were site complexes associated with agriculture and habitation sites from pre-and-post contact eras (Barrera and Kelly 1974, Clark and Kirch 1983, Clark 1987). There are historic features previously documented such as the Imi'ola Church State Site #50-10-06-7151 and associated cemetery, the Spencer Cemetery, and a concrete ford with a date of 1943 suggesting a pre crossing clearly indicating World War II use. This assessment recommended that an archaeological inventory survey be carried out.

V. BACKGROUND OF *KAMA'ĀINA* INTERVIEWEES

Kama'āina and *kūpuna* with knowledge of the Waimea area were interviewed for this assessment. Four of the interviewees Melvin Hewett, Hisao Kimura, Alan Lindsey, and Lynn Taylor participated in formal interview sessions that were taped and transcribed.

Presented below are backgrounds of the four interviewees. Excerpts from the interviews are incorporated in Section VI TRADITIONAL PRACTICES OF WAIMEA RELATIVE TO THE WAIKŌLOA STREAM.

MELVIN HEWETT

Mr. Hewett grew up in Waimanalo homestead on the Island of O'ahu. He later moved to the Island of Hawai'i and is currently a trustee for Parker Ranch. Mr. Hewett started with Parker Ranch in 1991. Mr. Hewett has been involved in long range planning (eg. Waimea 20/20) for Parker Ranch and is well aware of the many issues that go into good planning in the Waimea, Kohala region.

HISAO KIMURA

Hisao Kimura was born in a leap year so he is either 90 or 91 years of age. He attended Waimea School then went to work for Parker Ranch in 1931. Mr. Kimura was the supervising horticulturist for the nursery and responsible for planting and importing of grasses in the ranch paddocks and pastures. He retired from Parker Ranch in 1978.

ALAN LINDSEY

Alan Lindsey was born in 1931 and was raised in Māhukona. The Lindsey 'ohana goes back 6 generations in the Waimea area. He attended Kamehameha Schools in 1941. In 1948 was employed by Parker Ranch as a cowboy, he later became supervisor. He retired in 1988 from the ranch.

LYNN TAYLOR

Lynn Taylor moved to Waimea, Hawai'i in 1954 along with her husband James M. Taylor, the head master of Hawai'i Preparatory Academy (HPA). Mrs. Taylor started the elementary school for HPA. Mr. Taylor accepted a job in 1975 as head master at La Jardin in Kailua O'ahu, where they both moved for twenty years. Lynn Taylor now resides in Waimea and is involved in many community activities and organizations such as Waimea Outdoor Circle, and the Waimea Trail Committee.

VI. TRADITIONAL PRACTICES OF WAIMEA RELATIVE TO THE WAIKŌLOA STREAM

This project seeks to assess traditional cultural practices as well as resources along the trail way. This section will express the different types of traditional practices, cultural resources associated with Waimea. Excerpts from interviews are incorporated throughout this section where applicable.

A. Gathering for Plant Resources

No specific documentation was found in regards to gathering of plants along Waikōloa Stream. However, Mr. Lindsey mentioned that there was a lot of plants near the stream “There was a lot of *‘ilima* before ...It used to be all the *‘olena* and use to have the *poha*” .Mr Lindsey also mentioned he used the root of the *kowali* (morning glory) plant to heal the broken bones of his dogs. He would pound the root with Hawaiian salt place it in the *ti* leaf and apply it on the dogs wound. Other long time residents Mr. Kimura and Mrs. Taylor indicated that they remember the banks of the stream as just low pasture grasses and that the vegetation adjacent to the stream now is relatively recent (ie post 1960). The majority of vegetation present now are invasive imports. During this assessment, there were no current practices related to traditional gathering rights identified.

B. Gathering Resources from the Waikōloa Stream

No specific documentation was found in regards to gathering for subsistence from the stream. From the *kama‘āina* interviewees Alan Lindsey expressed his knowledge of the different types of riparian resources in the stream such as tilapia and *‘ōpae*:

They have the shrimps. The *‘ōpae*, but you have to get them with the net that they cannot see, if they see that net they swim some place else. So you know how we used to catch them, you know the oranges used to come in the orange bag or the potatoes bags, they get the orange or green bags. What we do we put them underneath where the *‘ōpae* going come down and hook them up with ropes catch these 2 sides. And then when they drop inside they cannot go through because it is just like a net, like a strainer, like when you mix your poi, same thing. It is orange or green that they cannot see when they drop down it is too late they are in the bag already. Then all they do is take them home and boil them and you get fresh *‘ōpae*. If you put a white bag there they move somewhere else. I think up there still get yet, but I don’t know if anybody go up.

Other interviewees mentioned the absence of people fishing and gathering from the stream. Long time resident and Parker Ranch employee H. Kimura who was the ranches’ horticulturalist did not recall anyone ‘fishing’, other than kids just having fun. Based on informant information there was limited varieties of plants and fish in the stream and that the precious resources was the water.

C. Historic Properties

Imi‘ola Church and an associated cemetery are located at the eastern terminus of the trail. The church is on the State and National Register of Historic Places and has been allotted State Site # 50-10-06-7151. Relatively close by on Mamalahoa Highway is the Spencer Family Cemetery.

The proposed trail intersects a number of agricultural features, such as, ‘*auwai* and field walls *makai* (west) of the County Transfer Station adjacent to the DHHL property. Other site types in that area include, house sites and burials. The area *makai* of the transfer station has been altered far less than the urban core of Waimea. The area is referred to as a portion of the ‘Waimea Agricultural System’ and the ‘Lālāmilo *Kuleana* Ranch District’ (Barrera and Kelly 1974). Site types include late prehistoric to historic agricultural features, consisting of modified outcrops, mounds, terraces, field boundaries and irrigation ditches (‘*auwai*). During the archaeological assessment a number of concrete fords and remnant structures related to a pipeline crossing were observed within and along the banks of Waikōloa Stream.

D. Burials

No specific documentation was found regarding ‘*iwi* in the project area. However, there are church (ie Imi‘ola) and family cemeteries (ie Spencer Family) within the Waimea Town area. When asked about burials along the stream Mr. Lindsey mentioned “No not in that area because all what is up on the ranch Mānā all the burials are in their own cemetery, Parker Ranch got their own cemetery, they have their own family in there”. Previously undocumented burials and possible burial sites were documented *makai* (west) of the County Transfer Station (Haun et al. 2002) in areas through which the trail is planned. Additionally, south of the Waikōloa Stream in the ‘*ili* of Pukalani two unmarked burials were encountered (Erkelens 1998).

E. Trails

None of the interviewees mentioned any historic trails that could be affected by the proposed trail.

Based on late 19th and 20th century maps the primary transportation routes *mauka/makai* correlate closely to the existing major roadways. The primary transportation route the Waimea-Kawaihae Road is north of the proposed trail. The Hawi Mountain Road intersects the Waimea/Kawaihae road at Wai‘aka near HPA also north of the proposed trail corridor. Mamalahoa Highway (and its predecessor) enters Waimea Town south of the proposed trail corridor. The proposed trail corridor will have certain access points to existing transportation corridors. The informants indicated that they had no knowledge of any historic trails that might be affected by the proposed greenway trail.

F. Nā Mea ‘*Uhane*

There are some things in life that people just can’t explain, things not seen or heard but felt deep in your *na‘au* (gut). Alan Lindsey mentioned the “calling tree” a tree that has strong spiritual powers:

... You know by Kohala Estates, you go right across that banyan tree. You know what they call that banyan tree? The “calling tree”, when they used to take cattle down in the morning, I used to get up at twelve at night, one o’clock we used to meet at the Ranch Restaurant, eat our breakfast. That banyan tree calls people and some guys...sometimes they go straight for the banyan tree, we say, “where you going?” They hear voices, that are the dead, that is the old Hawaiian dead people, and sometimes you can hear them, they call. But you know I am not afraid of that kind of stuff see because my dad never did make me scared. That is why I could ride any bucking horse and everything. I used to ride bucking bull. ...They say it’s a “calling tree”. But I don’t believe in that, the only guy that can call me is the heavenly father, then I go to that tree. It is all superstition.

A few of the interviewees mentioned a “Rain Rock” which is located north of the project area. Alan Lindsey stated that this “rain stone” was down by Anna’s Ranch and people used to believe in it. Mr. Kimura (HK) mentioned that people would pray on this rock for rain:

HK: ...we have the famous well known “Rain Rock” that the Hawaiians have told us to respect and worship.

CSH: Oh, the rain rock!

HK: On the *ma uka* side.

CSH: Kind of by Anna Perry Fiskes old place.

HK: That’s right. You could lie on it.

CSH: Did it rain?

HK: Sometime you got to believe, yeah.

CSH: What is the story that they used to tell you about that rock?

HK: Well...whenever you need...every so often we get slight drought season and sometimes more severe than others then we go there *pule*.

.....

HK: My family (father worked for Parker Ranch) lived in the ranch house with a water tank. Water was collected from the roof of the house. Neighbors came and helped them whenever there was a severe drought. We shared this water, when condition-weather was dry.

CSH: They were catching water on the water tank? Or was it still piped in from the stream?

HK: Yeah, water tank. Catchments, from your roof and it accumulates because we use it only on severe drought.

CSH: So all the individual houses had their own individual pipeline in the stream?

HK: From the stream, The County Water Department would see that homes be supplied by piped in water system and each home-the source of the water is form the running water. Yeah. So what we used for a strainer was the Bull Durham bag, everybody had Bull Durham, everyone smokes Bull Durham.

CSH: Put the bag at the end of the pipe.

HK: You collect all of that. You would be surprised.

G. Climate Changes in Waimea

As we sat and talked with different people from the community regarding Waikōloa Stream, many were concerned that occasionally the stream ran dry. In fact, the *kama'āinas* mentioned that it doesn't rain as much as it once did. Cattle ranching has played a large part in deforestation which has resulted in less rainfall. Complicating the situation is the tapping and redirecting of streams which has reduced the water flow in a number of streams.

In 1856 the Waimea community was concerned about water issues and how it would affect their community in the future. With the introduction of cattle and the clearing of the forest there was less of an orographic precipitation process. (Orographic Precipitation- precipitation caused by the lifting of moist air over a mountain barrier).

It is in the memory of many foreigners now living there, when the whole of these plains were covered with a thick wood, to the very edge of the slope. Where hardly a tree is to be seen for miles, we were informed by an old resident, that twenty-five years ago he lost himself with his team in the weeds. He also stated that at that time there was far more rain at Waimea than there is now, which indeed might be readily inferred, as clearing the land has been almost entirely effected by the cattle. The few head brought by Vancouver in 1793 increased so rapidly, that early in the present century thousands of them were killed for their hides. At this moment they swarm in the thick jungle that covers the windward or eastern slopes towards Hamakua. They are now gradually destroying this, and thousands of old dead trees both standing upright and lying prostrate, from the present boundary of these woods, and exhibit the mode in which the destruction is effected; for whilst the old trees die of age, no young ones are seen taking their places, as during the last thirty or forty years, the cattle have eaten or trodden them down.

At the present time the vapors and rain which are brought across the plain by the trade winds, area generally dissipated between Waimea village and Lihue, which latter place is something under a mile nearer the brow of the hill, and it is quite usual to notice that at Lihue the weather is fine and the sun shining, whilst at Waimea it is wet, raw and misty. This spot where the vapors now commonly terminate, is three or four miles from the debatable ground between the two winds before alluded to. (Sandwich Islands monthly Magazine, February 1856:44-47 in Barrera and Kelly 1974)

Further in the early 1900's Alfred Carter, of Parker Ranch, filed a petition against the Territory of Hawaii for wrongfully diverting water from the Waikōloa Stream. The residents of Waimea used the stream for basic normal household usage and for pasture lands. It was not used for large scale irrigation system. In the days of traditional farming Waimea was known for it's famous *Kipu'upu'u* rains, only at times did the fields need irrigation. This was acknowledged the by the Supreme Court:

The evidence is to the effect that there were a very few *lois* of *taro* in the locality in questions. It was shown that the Hawaiians habitually raised in their house-lots dry land taro, bananas and vegetables as well as sugar cane which they cultivated for human consumption as well as for food for their animals. And it is a fair inference from the evidence that the ditch system at Waimea was constructed from the purpose of supplying water to the inhabitants for household purposes and for the irrigation, when the natural rainfall was insufficient, of their cops (Hawaiian Reports Vol. 24: in McGuire and Haun 2002).

In 1917 the case was appealed and the Hawai'i State Supreme Court maintained their decision that the Territory owned all the waters of Waikōloa stream, and that the waters were "subject to reasonable use" by both the Territory and the petitioner (Hawaiian Reports Vol. 24: in McGuire and Haun 2002).

Lynn Taylor observed more of a water flow between 1954-1974 and has a theory of why it rains less:

Most local inhabitants will tell you that it rains less now then formerly, and I think this is true. I do have a theory that the clouds, which have been built up by the trade winds blowing across the Pacific, are no longer almost constantly seeded by the moisture rising from the plunging waterfalls and streams which aren't there, so they often blow away without dropping their precious rain.

In support of Mrs. Taylor's theory there is an article in the Journal of Geophysical Research, they state that "Numerous studies with general circulation models suggest that tropical deforestation can result in regional-scale climate change, namely increased air temperature and wind speed and reduced precipitation and relative humidity".(Hoffmann, WA, W Schroeder, RB Jackson. 2003).

All the informants mentioned water resources, or lack there of, as one of Waimea's primary concerns. None of those interviewed, however, felt that the proposed trail would adversely affect stream resources.

VII. SUMMARY AND RECOMMENDATIONS

Summary

Based on background studies much of the project area has been urbanized to such an extent that no surface historic properties exist, except for concrete and boulder stream crossing structures. However the area *makai* of the county transfer station has been slightly altered and contains complexes associated with agriculture and habitation sites from the pre-and post-contact eras. The trail corridor intersects a number of features, such as *'auwai*, and field walls. The area includes a wide array of site types including documented burial sites.

A cultural impact assessment of an approximately 266.4 acres of the DHHL property west of the County Transfer Station documented numerous historic properties. The consultation process included a single knowledgeable individual who indicated that there were no on going cultural practices. It was noted that past cultural practices were evident by remnants of *'auwai* and dryland terraces, as well as presence of burials and graves sites (McGuire and Haun 2002:47).

This cultural impact assessment did not identify any cultural practitioners or any on going practices within the project area.

There were some concerns the community had regarding the project corridor. The stream should be kept clear of any brush to reduce any overflow during a high volume periods. Second, safety of residents who live along the proposed trail. Melvin Hewett expressed his concern stating that “I think from our (Parker Ranch) standpoint, security, and people not wandering right into the homes is the biggest concern”. The area that Mr. Hewett is referring to is Parker Ranch’s “Heritage Area” which includes Pu‘u Opelu the home of Richard Smarts estate. However all of the interviewees expressed the opinion that the trail was a good community based project.

Recommendations

Based on the above findings, it is recommended that no further formal cultural impact mitigations measures are warranted. However, informants wanted the consultation process to continue through the build-out phase of the project.

It should be noted, however, that historic properties associated with former traditional Hawaiian activities in the project area, such as artifacts, cultural layers, and burials may be present despite the decades of cattle ranching and associated activities in the area west (*makai*) of the county transfer station.

It is our understanding that Waimea is a very close and family oriented community. Thus we feel that it would be educational to have some interpretive themes for the proposed trail corridor. Themes referenced by the informants included history, legends, and how the environment has changed water resources of the Waimea area.

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**CULTURAL IMPACT ASSESSMENT FOR THE
PROPOSED WAIMEA TRAILS AND GREENWAY PROJECT,
WAIMEA, SOUTH KOHALA DISTRICT
ISLAND OF HAWAI‘I**

Portions of TMK 6-2, 6-5, 6-6

by

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Prepared for

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I. INTRODUCTION

A. Project Background

At the request of Gerald Park, Urban Planner, Cultural Surveys Hawai‘i, Inc. (CSH) conducted a Cultural Impact Assessment for a roughly 6 mi. (10 km) section of a proposed 12 mi. (19 km) Waimea Trails and Greenway project. The proposed route is characterized as a “multi-use pedestrian bikeway”. The Waimea Trails and Greenway Project is designed to provide a green belt through Waimea Town for non-motorized, pedestrian-friendly community access along a stretch of Waikōloa Stream. The primary function of the proposed trail is to provide an alternative transportation route for non-motorized vehicles in the Waimea area. The project corridor passes through several well-known areas of Waimea, Pu‘uopelu, and Wai‘aka and three *ahupua‘a* including Lālāmilo, Waikōloa, and ‘Ōuli, on the island of Hawai‘i (portions of TMK 6-2, 6-5, and 6-6) (Figures 1-2).

B. Project Area Description

The project area is located in the Waimea area of South Kohala Hawai‘i Island and includes a corridor running generally west-east from the South Kohala View Estates in the west to “Church Row” in Waimea Town in the east (Figures 1-2). The corridor runs along Waikōloa and Keanu‘imanō Streams, with several north-south access routes projecting off from the main trail. In its entirety, the trails and greenway may extend approximately 12 miles. The corridor researched for the present study is between the South Kohala View Estates on the west and Church Row on the east.

The project area is situated in the Waimea Saddle region, between the Kohala Mountains and Mauna Kea Volcano, at an approximate elevation of 2,000-3,000 ft. (600-1,200 m) A.M.S.L.. The climate is generally cool, moist, and windy. Temperatures normally range between 60-70° F, with mean maximums between 70-80° F, and mean minimums in the upper 40° F. The average annual rainfall ranges from 75-100 in. (190-250 cm), with heavy rainfall between the months of January and April (Giambelluca et al. 1986). Winds are dominated by consistent northeasterly trades. The soils within the project area are of a Waimea Series that consists of well drained, very fine sandy loam that formed in volcanic ash. These incepticol soils are usually in areas that are gently sloping to moderately steep (Foote et al. 1972). There are three major streams flowing off the Kohala slopes and onto the plains of Waimea, including Lanikepu, Waiōkloa, and Kohākōhau (also known as Keanu‘i‘omanō) Streams.

From west to east, the project area includes varying climates, terrains, and degrees of urbanization. For the purpose of this cultural impact evaluation, the corridor was divided into five sections, based mainly on degree of urbanization (Figures 1-2):

- Section 1: South Kohala View Estates to Hawai‘i County Refuse Transfer Station
- Section 2: West end of Refuse Transfer Station to east end of Sandalwood Subdivision
- Section 3: East end of Sandalwood Subdivision to Waiki‘i Rd.
- Section 4: Waiki‘i Rd. to Lindsey Road Bridge (Eucalyptus forest)
- Section 5: Lindsey Road Bridge to Imi‘ola Catholic Church

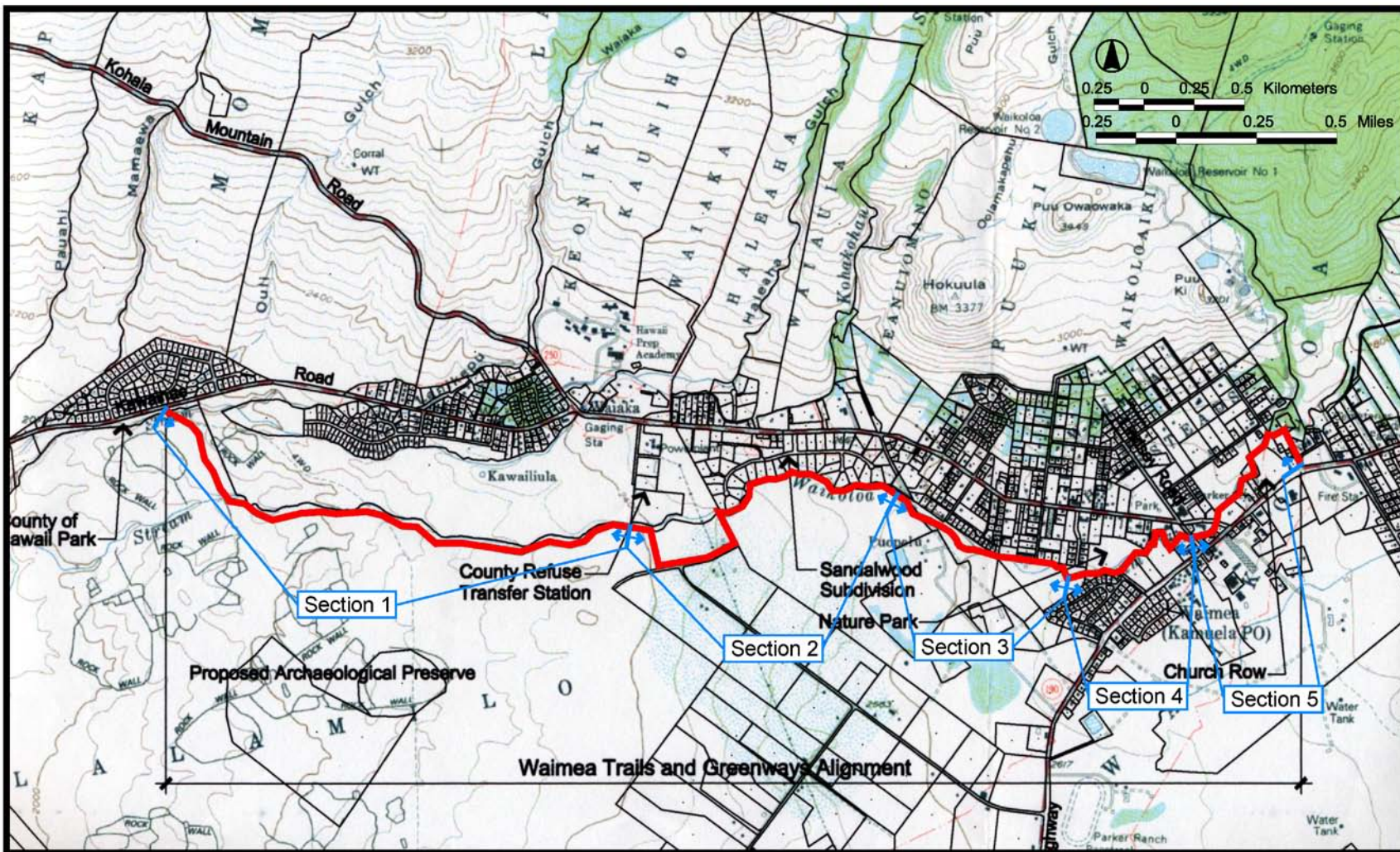


Figure 1 USGS Topographic Map, Kamuela Quadrangle, showing the location of the project area.

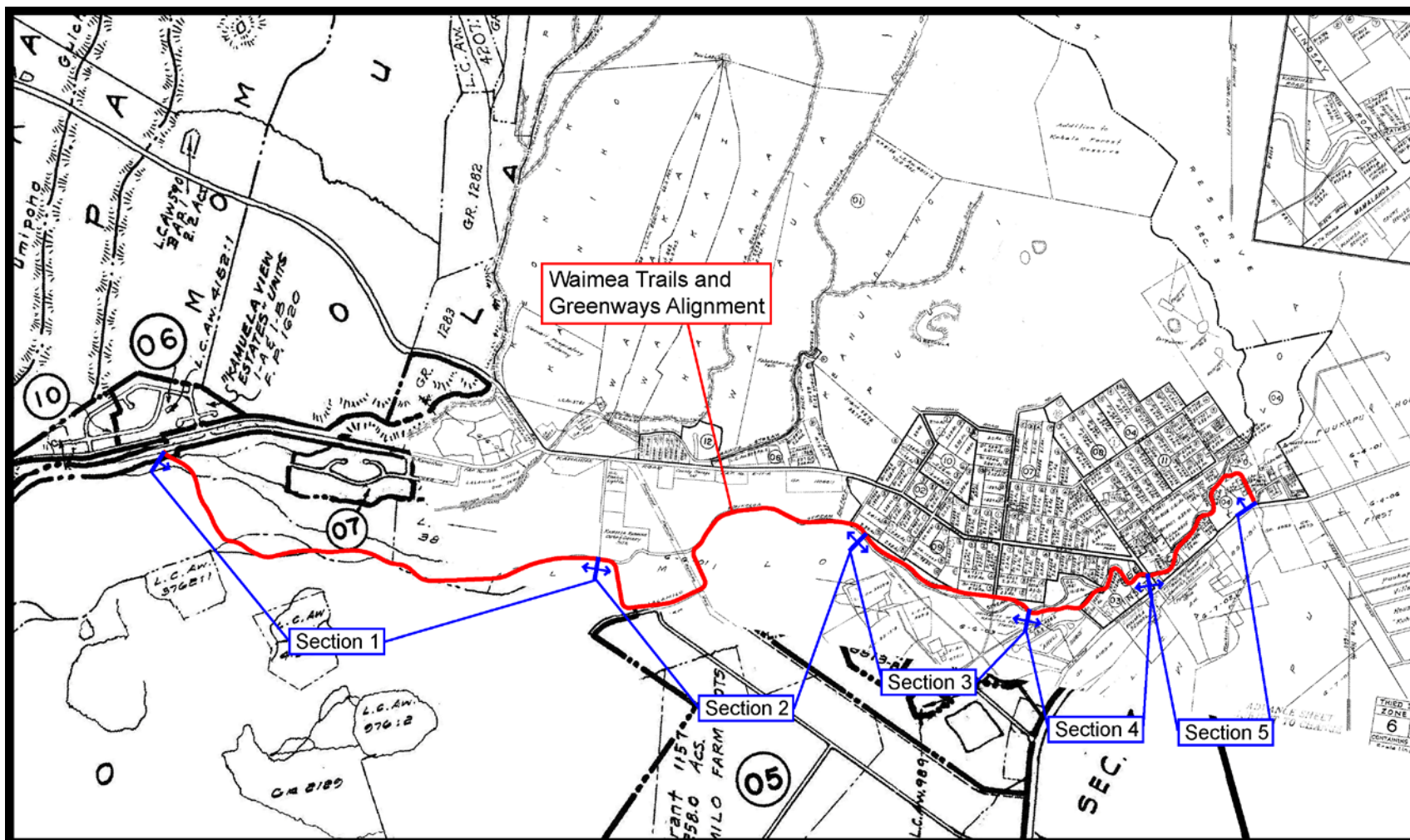


Figure 2 Portions of TMK 6-2, 6-5, and 6-6, showing the location of the project area.

C. Scope of Work

The agreed upon scope of work of this Cultural Impact Assessment is summarized as follows:

1. Examination of historical documents, Land Commission Awards, and historic maps, 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. A review of the existing archaeological information pertaining to the sites on the property as they may allow us to reconstruct traditional land use activities and identify and describe the cultural resources, practices, and beliefs associated with the parcel, and identify present uses, if appropriate.
3. Conduct community consultations with persons knowledgeable about the historic and traditional practices in the project area and region.
4. Preparation of a report on items 1-3 summarizing the information gathered related to traditional practices and land use. The report assessed the impact of the proposed action on the cultural practices and features identified.

D. Methods

Historical documents, maps, and photographs were researched at: the Kaua'i Historical Society, the Hawai'i State Archives; the Survey Office of the Department of Accounting and General Services; the Hawai'i State Library; the Bernice Pauahi Bishop Museum archives and library; Hamilton Library at the University of Hawai'i at Mānoa; the Mission Houses Museum Library; the State Historic Preservation Division (SHPD) library; and the library of Cultural Surveys Hawai'i.

Hawaiian organizations, government agencies, community members and cultural and lineal descendants with ties to Waimea were contacted to: (1) identify potentially knowledgeable individuals with cultural expertise and knowledge of the project area and the surrounding vicinity, and (2) identify cultural concerns and potential impacts within the project area.

E. The Interview Process

Once potential participants were identified, they were contacted by telephone or in person. If the individual expressed a willingness to participate, an appointment was scheduled at a location of the individual's choosing. Following the interview's completion, it was transcribed. The interviewees were given the opportunity to review a draft typed transcript for corrections, editing and additions. Excerpts from the interviews were then incorporated into the text where appropriate.

II. CULTURAL BACKGROUND

The history of the Waimea region of Hawai'i island has been documented in a number of studies and publications including, but not limited to the Fornander Collection of Hawaiian Folklore (Fornander 1916-1919), Ruling Chiefs of Hawai'i (Kamakau 1961), Place Names of Hawai'i (Puku'i et al. 1974), 'Ōlelo No'eau (Puku'i 1983), Hōkū o Hawai'i" Newspaper (Franklin et al. 1994) and missionary accounts (Baldwin and Lyons 1837; Doyle 1904, 1945, 1953; Bishop 1828; Ellis 1969).

These studies include references to oral traditions, the legendary rulers and personalities, early historic accounts, land ownership, and the changes in land use from traditional to modern times. The following section is a synopsis of these and other sources so as to provide a general overview of the historical and cultural setting related to the project area.

A. Place Names and *Mo'olelo*

The importance of place names and stories connected to an area are an important part of traditional Hawaiian culture and the transmission of cultural knowledge from one generation to the next. The proposed Waimea Trails and Greenway Project falls within the traditional *ahupua'a* boundaries of Lālāmilo (lit., milo tree branch), Waikōloa (lit., duck water; or could refer to a name of a wind), and 'Ōuli (referring to the name of a famous soldier of Kahekili's army who was skilled with the ma'a, or sling) (Puku'i et al. 1974). Puopelu (shortened for Pu'u'ōpelu) literally means 'ōpelu hill, and Wai'aka means "laughing-water." The name Wai'aka is used to identify both a stream that flows off of the Kohala mountains and a land section.

Ke kipu'upu'u ho'anu 'ili o Waimea
(The Kipu'upu'u rain of Waimea that chills the skin of people)
[Puku'i 1983:188; #1748]

The region generally referred to as "Waimea," which literally means reddish water, as it was thought to be tinted as it drained through the *hupu'u* tree fern forests or through the red soil (Elbert, Ms in Barrera and Kelly 1974). Waimea has been poetically characterized as being "like a spear rubbed by the wind, as the cold spray is blown by the *kipu'upu'u* rain..." (Proverb from a Kamehameha *mele* quoted by Henry Judd in Doyle 1953:42) and has a rich history that is evident in its place names and proverbs.

"Waimea" is a name that also identifies several localities in this section of Kohala (Franklin et al. 1994). They are (a) the town of Waimea (also called Kamuela [Samuel]), named either for postmaster Samuel Spencer, or for the rancher Samuel Parker (Puku'i et al. 1974); (b) a region, or *kalana*, that extends from the coast to the uplands and encompasses several *ahupua'a* between Kawaihae and Waikōloa; (c) the upland area only of that region including the entire plain between the Kohala and Mauna Kea Mountains; and (d) the upland region of intensive residential and agricultural occupation- the Waimea Field System (Clark and Kirch 1983:46). In 'Ōlelo no'eau (Puku'i 1983), Waimea is noted as an area of cool climate and chilling rains:

A. *Hele po‘ala i ka anu of Waimea*

Going in a circle in the cold of Waimea

Said of a person who goes in circles and gets nowhere. Waimea, Hawai‘i is a cold place and when foggy, it is easy for one unfamiliar with the place to lose his way [Puku‘i 1983: 83; #757].

B. *Ka ua Kīpu‘upu‘u o Waimea / Waimea i ka ua Kīpu‘upu‘u*

The Kīpu‘upu‘u rain of Waimea / Waimea, land of the Kīpu‘upu‘u rain

An expression often used in songs of Waimea Hawai‘i. This area is famed for its cold rain. When Kamehameha organized an army of spear fighters and runners from Waimea, they called themselves Kīpu‘upu‘u after the cold rain of their homeland [Puku‘i 1983:169, 319; #1571 & #2913].

C. *Ka ua paliloa o Waimea*

The Tall-cliff rain of Waimea

The rain of Waimea, Hawai‘i, that sweeps down cliffs. [Puku‘i 1983:172; #1593]

Waimea was known for a place of learning the art of fighting. “The land of Waimea was one of the lands where there were many warriors from ancient times. That place, Waimea, furnished Kamehameha with armies of men trained in battle” (Desha 2000: 188). The warriors that came out of this area were called Kīpu‘upu‘u warriors. The traditional *mele* Hole Waimea maybe the reason behind the naming of the Waimea warriors:

*Hole Waimea I ka ihe a ka makani
Hao mai nā ‘ale a ke Kīpu‘upu‘u
He lā‘au kala‘ihi ia na ke anu
‘Ō‘ō I ka nahele o Mahiki*

Waimea is stripped by the spear of the wind
Blown by the gust of the Kīpu‘upu‘u
A staff made stiff in the cold
Pierced is the forest of Mahiki

Desha translates the hidden meaning:

There is a hidden meaning in this old *mele*, as that forest of Mahiki was a place for making spears for the warrior in ancient times. In times of peace, the *ali‘i* and the men would go there to prepare for the times of war to come.

When Kamehameha was staying at Kawaihae, he went with his many warriors to that forest for the making of spears. Some of his court accompanied them, in other words, the chiefly women. At this place of the story, the writer conceals the hidden meaning of the “stripping of Waimea by the spears of the wind” and it is for the reader to guess the meaning. (Desha 2000:192)

Ke kānoa kapu o Lono-Makahiki: ‘oia ho‘i ‘o Hōkū‘ula!

(The sacred bowl of Lono-Makahiki: it is Hōkū‘ula!)

[Ka Hōkū of Hawai‘i 4/23/1914 in Franklin et al. 1994]

Translated and interpreted by Kepā Maly (in Franklin et al. 1994), the legend of Ka-Miki was published in the Hawaiian newspaper “Ka Hōkū o Hawai‘i” between the years of 1914-1917. It is a story about two brothers and their journey around the island of Hawai‘i. The legend includes

references to over 800 place names, and provides interesting information about Pu‘u Hōkū‘ula, the most prominent hill located just north of Waimea town.

Hōkū‘ula (Red Star): When Ka-Miki and Maka‘iole drew near to completing their formal ‘ōlohe training (fighting and competing skills) under their goddess/great grandmother Ka‘uluhe, she told them to go and visit their kūpuna (ancestress) Lani-nui-ku‘i-a-mamao-loa who dwelt at Lanimaomao (Waimea). Lani-nui-ku‘i-amamao-loa was the guardian and keeper of the sacred *kānoa* (‘awa mixing bowl) Hōkū‘ula which belonged to Lono-Makahiki, and the ma‘au (strainer) called Kalau-o-Kāhuli which was upon the plain of Waikōloa. These two items were to be used in ‘awa ceremonies for the brothers ‘ailolo (brain eating- completion of training ceremonies) [Ka Hoku o Hawai‘i 2/5/1914 in Franklin et al. 1994].

The association of the bowl, or *kānoa* of the god Lono (a provider of abundant crops and rain-laden clouds) with Hōkū‘ula may refer to the agricultural lands of the region; i.e., (1) the bowl or container could symbolize a land of agricultural abundance; (b) the sprinkling of waters from the bowl could refer to the waters of the streams that flow from the uplands and spread across the plains; and (c) the importance of the rituals of Lono in agricultural endeavors, particularly in the areas of Kohala where large field systems have been archaeologically documented. Thus, the legendary account may symbolically represent actual resources of the Waimea Region.

B. Accounts Related to *Heiau*

Thomas Thrum in his survey of *heiau* sites on the island of Hawai‘i documented a single *heiau* in Waimea. The *heiau*, Uli, was of unknown size and class, and was dedicated to Hākau. Uli was said to have been rebuilt by Kamehameha, and its images and steps repaired. Coconuts were brought from Puako, 12 miles away, for its consecration. Only a low mound remains to indicate the location of the *heiau*, opposite of the church premises (T.Thrum 1908).

A missionary account by Lorenzo Lyons in the 1850's tells of legends within the setting of Waimea, and mentions a *heiau* in the area:

On a nearby ridge stood another *heiau* built “...by the great Akua Makuakua who has come from far off Kahiki.” From the hillside he watched the rainbows “...and there he found the beautiful goddess Wao.” They lived at Hōkū‘ula. Each time Wao was ready to bear a child she returned to the Waimea hills, which were sacred to her. The kapu was proclaimed in her honor- the forbidden ground extended “...down across the plains to whatever place a stone happened to stop rolling when started above by her servants.” [Doyle 1953 in Barrera and Kelly 1974]

According to legend, Wao changed her servants into stones to guard the land during the night hours. When daylight came she transformed them back into their human forms (Barrera and Kelly 1974:1).

Lorenzo Lyons also tells of the legendary story of a Ho‘opili-a-Hae, and mentions her as being the founder of a *heiau* for women in Waimea:

“The earliest chiefs of Waimea of whom we have record stemmed from the same Ulu-Hema line that led to Liloa, the founder of the island dynasty. Liloa’s grandson Keawe-nui-a-‘Umi took as one of his wives Ho‘opili-a-Hae, daughter of Liloa’s kahuna Pae-a-Molenole.” [Clark and Kirch, 1983:26]

“(The *heiau*) was attended exclusively by young virgins. In the sanctity of the cool highland forest, they “...performed the sacred ceremonies, learning also the science of healing so that they might eventually minister to others. Hoapiliaha‘e’s children were named for the five rains of the *heiau*.” [Doyle 1953: 42-43] (in Barrera and Kelly 1974:1)

C. Historical Battles at Waimea

‘O ke aluka koa a Kama i Waimea

(a multitude of warriors had Kama at Waimea)

[Kamakau 1961 :55-61 in Barrera and Kelly 1974]

Hökū‘ula, located approximately 1 mile east of Wai‘aka, is famed for being the location of a prominent battle ground in which Kamalālāwalu, the ruler of Maui Island waged war against the Hawai‘i Island forces. Deceived by misleading advice from his trusted advisors and poor strategic planning, Kamalālāwalu arrived on Hawai‘i landing at Kawaihae, only to realize that there were no people there. They continued up to Hökū‘ula, a prominent *pu‘u*. Situated in this manner, he believed his army would be able to have the advantage in defending themselves against the Hawai‘i Island forces.

Upon hearing of Kamalālāwalu’s arrival, Lonoikamakahiki, the Hawai‘i Island ruler sent an army from Kona, Ka‘u, Puna, and Hilo to Hökū‘ula, where the Maui warriors were stationed. The following morning Kamalālāwalu observed that the lowlands were literally covered with countless men. He soon realized that his Maui forces were inferior in numbers and asked Kumaikeau “*E Kumaikeau ma, pehea kēia? He aha kēia lehulehu o lalo?*” “Kumaikeau and the rest of you, how is the situation? What is the extent of their numbers below?” Kumaikeau relied “*Akahi nō au a ‘ike i ka nui o nā kānaka o Hawai‘i nei...*” “I have never seen so many people in Hawai‘i before...” After three days of negotiations, the two combating forces waged battle, with Lonoikamakahiki gaining the victory over Kamalālāwalu’s army (Fornander 1916:342-350).

Another battle fought in the Waimea area was between the leeward and windward chiefs of Hawai‘i Island toward the middle of the 18th century. This clash took place at Mahiki, east of Waimea, and just across the district boundary in Hamakua. Here, the father of the great chief Alapa‘inuiakauaua was leading his forces against the Hilo chiefs when he was killed. Alapa‘inui was on Maui at the time but returned to Hawai‘i and ultimately regained control of the Kona and Kohala districts (Kamakau 1961: 65). Eventually he went on to take over the whole island of Hawai‘i and place it under his rule. In his later years, Alapa‘inui lived first in Waipi‘o, then lived for sometime in Waimea, and later moved to Kawaihae (Kamakau 1961: 77).

During Kamehameha’s campaign to extend his rule to all the major islands, he stayed at Waimea and at Kawaihae for some time. There are mentions of Kamehameha’s visits to Waimea in 1791 and 1792 when he rebuilt Pu‘u Koholā heiau (Clark and Kirch 1983). At that time a large work force was required and the people of Waimea were solicited. It has also been

suggested by Clark and Kirch (1983:27) that food and *tapas* were brought from Waimea to feed and clothe the many warriors in preparation of the Peleleu fleet to battle Maui and O‘ahu in 1794 and 1795.

III. HISTORICAL BACKGROUND

A. Post-Contact Period

The Waimea area, with its favorable soils and water from Kohala Mountain streams that could be harnessed and distributed on the fairly level plains, was an obvious area for the expansion of introduced food crop production. Waimea was very productive agriculturally in the early years following contact with the Western world. Based on early accounts, *kalo*, or *taro* (*Colocasia esculata* sp.) was the dominant crop with *‘uala*, or sweet potatoes (*Ipomoea batatas* sp.) and *kō*, or sugar cane (*Saccharum officinarum* sp.) also grown in substantial quantities. The decline in traditional Hawaiian agriculture in the Waimea region has been attributed to factors such as: 1) depopulation and the concurrent abandonment of the fields; 2) the pursuit of other commercial interests, such as the sandalwood and *pulu* trade, sugarcane cultivation, and the introduction of cattle.

It is important to mention that after the abandonment of traditional Hawaiian agriculture in Waimea, there were two resurgences of agricultural endeavors to boost the economy of Waimea (Clark and Kirch 1983). In the late 1820's, two Chinese, Lau Ki and ‘Aiko started a sugar mill at Lihue, in upper Lālāmilo. While the mill was not successful commercially, sugar production continued in the Waimea area (Barrerra and Kelly 1974: 47). In the late 1830's, cotton was grown in Waimea when Governor Kuakini ordered the planting of an “immense field of cotton in the Waimea area,” (Kuykendall 1967: 183). In the late 1840's and early 1850's, both sweet and Irish potatoes were cultivated extensively. However by 1865, these crops were reported to have been greatly diminished.

B. Māhele and Land Commission Awards

The Organic Acts of 1845 and 1846 initiated the process of the Mahele - the division of Hawaiian lands - which introduced private property into Hawaiian society. In 1848 the crown and the *ali‘i* (royalty) received their land titles.

Kuleana awards for individual parcels within the *ahupua‘a* were subsequently granted in 1850. These awards were presented to tenants - native Hawaiians, naturalized foreigners, non-Hawaiians born in the islands, or long-term resident foreigners who could prove occupancy on the parcels before 1845 (Apple 1978:45). .

The records associated with these awards illuminate the character of the settlement within the *ahupua‘a* at the mid-19th century. The majority of the individual *kuleana* claims are situated close to streams emptying from the southern slope of Kohala Mountain. The streams include Waikoloa, Kohakohau, Haleaha, Waiaka, and Kanikepu. These and other streams flowed onto the Waimea plain then turned to the west (*makai*) to flow down slope towards the Kawaihae/Puako area. The focus of habitation and agriculture was at the base of Kohala Mountain and extending out onto the Waimea plain. The awarded *kuleana* were in a relatively narrow band extending from approximate elevation 2,100 ft and 2,900 ft. This zonal band would include the presently proposed trail corridor.

LCA claims in proximity to the corridor include land use data such as house lots with associated cultivation and enclosed walls, agriculture such as *taro* and *mamaki*. This pattern of land use is exemplified in LCA 3828 to J. A. Palea. Kauhini testified on behalf of Palea 's claim of two house lots and a land claim:

I have seen/it/in three sections, two house-lots and one land section. The land section is in the *ili* land of Waikoloa [Waikoloa Nui or Lalamilo] in Waimea, Hawaii. It had a fence at one time; it has fallen apart at this time. Two houses for Palea are in there. He had built them and the boundaries are:

Mauka, Waho, also Makai by Hueu's land

Kohala, by Wiliama Pekele's [Beckley's] land

Palea received this land in 1847 from Hueu. This is an old place on which Palea has lived since 1829. He is living there at the present time (Native Testimony Vol. 4:31).

Research for the proposed Waimea to Kawihae Highway resulted in the designation of the Lālāmilo *Kuleana* and Ranch District (Barrera and Kelly 1974). The district boundaries encompass a portion of the trail corridor.

C. Sandalwood and Pulu

The mountains surrounding Waimea were well-known for rich sandalwood reserves. During the early part of the 19th century, as contact with the West was growing, the extent of the sandalwood trade was evident as it became one of the earliest commodities of a newly formed market oriented economy.

Similar to the sandalwood trade, was the exploitation of *pulu*, the soft fiber gathered from the buds of the tree fern (*Cibotium* sp.). Pulu was used for stuffing pillows, mattresses, and furniture (Thrum 1929 in Erkelens 1998: 15). The *pulu* trade began in 1851, with shipments to the West Coast of North America and Australia. Like sandalwood, the over-exploitation of this resource also led to its demise. By 1860, the trade had virtually ended (Doyle 1945: 182).

D. Population Estimates

The general impression of the pre-contact settlement pattern, constructed from a variety of archaeological and early historical sources, is one of scattered settlements along Waikōloa Stream (Clark 1987: 103; Erkelens 1998: 11). During subsequent decades, with the arrival of western foreigners and missionaries, impressions of the life and landscape would be recorded for 19th-century Waimea. In 1823, Asa Thurston counted 220 houses in his walk through Waimea. In the section between 'Ōuli and Pu'u Kapu (a distance of approximately 4.8 km or 3 miles), this was interpreted as representing a population of 1,100 to 1,200 individuals (Ellis 1979:399 in Erkelens 1998: 11). Although the population was concentrated at Kea'ali'i (located along Wai'aka Stream) at the time of Thurston's visit, a settlement of 300 to 400 individuals near the present Waimea town is a reasonable estimate (Clark 1987: 103).

It was not, however, until the 1830's that a missionary would be stationed in northern Hawai'i. On July 13, 1832, Lorenzo Lyons and his wife Betsy arrived at Kawaihae by brig from Honolulu to take up residence at Waimea. Lorenzo Lyons had a church and school (for adults) at Waimea in 1835, serving a congregation of from 100 to 500 Hawaiians. In his writings, Lyons stated:

“During the past year I have taken a census of the population of this district and find it to be as follows: Waimea, 1,396; Kohala 6,175; Hamakua 4,015; total 11,586, from which it appears there has been a diminution of the people 3,500, within three and a half years. Marriages are numerous. But the progeny are wanting. Children are not in general, objects of desire. Taxes are in proportion to the number of children. My census may not be correct. Many think I am numbering them for the purpose of taxation, and conceal a part of their number.” [Doyle 1945:82-83]

E. Cattle Industry

An examination of the cattle industry in the Waimea area clearly shows its dominant role. The cattle industry, which eventually changed the economy and lifestyle of Waimea, had its origins in bullock hunting, which was controlled by Hawaiian chiefs. The initial increase in cattle population was aided by a ten year *kapu* placed on hunting or taking of cattle. Feral cattle multiplied rapidly and ran wild on the plains of Waimea. For some two to three decades after the lifting of the protective ban, bullock hunters were employed to hunt down the wild cattle and take them to a market.

In the 1830's, meat, hides, and tallow began to be marketed, and thus formed the true beginning of the cattle industry. By 1847, about two-thirds of Waimea area had been converted to pasture for government herds of cattle, as well as sheep and horses (Doyle 1945). By the middle of the 1800's the Waimea region was the center of the industry.

The cattle industry had two major impacts on Waimea. The first was the effect of marauding cattle on the unprepared Hawaiian farmer (Erkelens 1998:19). As early as 1802, there were complaints concerning the destruction of gardens by feral cattle (Turnbull 1813:243, in Barrera and Kelly 1974:44). In 1836, Waimea was surrounded by a stone wall to protect it from cattle (Baldwin and Lyons 1837).

The second major impact on Waimea was the increase in population as a result of economic opportunities provided by the cattle industry (Erkelens 1998:19). Bishop (Bishop 1828, in Erkelens 1998:19) reports that Kuakini's arrival in Waimea marked the beginning of the cattle industry, as attendance at church services increased to approximately 1,000 individuals from a previous attendance of 200 (Bishop 1828; WMR 1832; Doyle 1945)

Following Kuakini's construction of the road between Kawaihae and Waimea in 1830, ox carts were able to haul commercial items much more efficiently than was previously possible. Although missionary census records for the period from 1832 to 1845 suggest little overall change in the population of Waimea (approximately 1,000 individuals), there was undoubtedly a change in composition of the constituency, from predominantly Hawaiian to a mix of foreigners and Hawaiians.

F. Parker Ranch and the 20th Century

John Palmer Parker, an American born in Newton, Massachusetts in 1790, had intended a sailing career when he left home in 1809. After several years at sea, Parker arrived on Hawai'i Island in 1815 and decided to remain there. By 1819, Parker had a Hawaiian *ali'i* wife, Kipikane, and a baby daughter, Mary. Parker and his family went to live at Waiapuka in Kohala where he farmed on twenty-one acres that had been granted to him by Kamehameha. In this era, most of the ranch work consisted of capturing wild cattle and domesticating them. As the ranching industry expanded, so did responsibilities such as managing the many personnel of the Parker Ranch, building houses and growing food to feed all. Subsequently, Parker hired South American and Mexican horsemen to train his ranch hands to track, rope, brand, and bring in the wild cattle. These "*vaquero*," "*paniolo*," or "*espangnol*" not only introduced the management of cattle and horses, but also brought colorful clothes, hats, and saddles that became the mark of Hawaiian *paniolo*. The first Hawaiian *paniolo*, or cowboys, actually predate many of the mainland western cowboys. The ranch personnel also made most of their own gear and machinery, including saw mills.

In the last years of the 19th Century, Waimea remained a small town concentrating on the shipment of cattle to export markets. The Waimea of 1881, was graced with two stores, a boarding house, lodging house, and a coffee saloon (Bowser 1881:540). Even at this seemingly late date, wild cattle were occasionally a problem. In 1888, Paul Jarrett was the first to commence fencing Parker Ranch lands to segregate the domesticated from the wild cattle (Doyle 1904). The next Parker Ranch manager, A.W. Carter, (manager 1899-1936), consolidated all the Parker family land holdings under the control of his ward, Thelma Parker. A.W. Carter then began in earnest to increase ranch lands, systematically breed for better, stronger, healthier cattle and horse stock, bought a barge to ship cattle with other Big Island ranchers, increased ditches for watering livestock, and imported different grasses and feed for cattle. He provided the U.S. military branches with cavalry horses and ventured for a short time into training horses and horsemen for polo teams. Parker Ranch then became one of the major providers of horses in Hawai'i and abroad for work, pleasure, and shows. A.W. Carter's son, A.H. Carter succeeded him in 1937. The Parker Ranch had become one of the biggest private businesses in Hawai'i and remains the dominant economic force in Waimea.

Since the early 1900s Waimea has been part of a fast paced urbanization of the Big Island. After the World War II (late 1940s-1950s) a small portion of land near South Kohala Distribution Road was used as a dump "and remnant pieces of disposed car parts and miscellaneous "junk" can be seen lying on the surface (personal communication, Woody Ramous in McGuire 2002). More recently new developments such as the Sandalwood Subdivision, the Waimea Center, Carter Professional Center, and the Canada France Hawaii Telescope have added to the growing town of Waimea.

In 1993 the W. M. Keck Observatory was placed on Mauna Kea. The headquarters resides in Waimea Town, south of the Waikōloa Stream and north of Mamalahoa Highway. Waimea continues to grow with further urbanization, though Parker Ranch remains a mainstay of the economy of the area.

IV. PREVIOUS ARCHAEOLOGICAL RESEARCH

A. Previous Studies

A number of archaeological investigations have been conducted in the general vicinity of the project area (Table 1, Figure 3). However, for the purpose of this report, only the studies conducted nearest to the proposed Waimea Trails and Greenways project area were reviewed in detail.

One of the most widely cited studies in this area was completed by Barrera and Kelly (1974). In 1973, the Bishop Museum conducted an archaeological survey and historical review for the proposed Waimea to Kawaihae Road corridor, during which over 4,500 archaeological features were identified, the majority of which were located either near the coast at Kawaihae or in the Lālāmilo area near Waimea.

Of particular interest are the sites located in upper Lālāmilo and upper Waikōloa, which are nearest to the current project area. Based on the survey results, Lālāmilo contains nearly 3,500 features (Barrera and Kelly 1974). The study resulted in the designation of the “*Kuleana* and Ranch District” in the Lālāmilo portion of the project area (Ibid.) (Figure 4). This information is important as it indicates the high density of surface archaeology that one can expect to find in upper Lālāmilo near the project area. Sites have been described as being included in an extensive habitation and agricultural system. The findings were later expanded upon in 1981, when the Bishop Museum conducted a survey and excavation project along the Mudlane to Kawaihae Road right-of-way (Clark 1981; Clark and Kirch 1983). These feature complexes were then referred to as the Waimea agricultural system (Figure 5):

The Waimea agricultural system comprises the remains of an extensive series of agricultural features, throughout which are scattered multiple residential structures. The system forms a large arc to the W and S of the present-day village of Waimea. Beginning on the S flank of Kohala Mountain, a short distance below Pu‘u La‘ela‘e, this system extends down the slope and onto the Waimea plain W of town. It then bends to the E, fading out just S of Waimea and W of Kuhio Village (Clark and Kirch 1983: 293).

Excavations associated with the Mudlane to Kawaihae project resulted in a total of 45 charcoal samples undergoing radiocarbon analyses. Approximately 71% of the dates were post 1600 A.D. and considered relatively late (Clark and Kirch 1983). Additionally, the Mudlane to Kawaihae project yielded “evidence that the prehistoric and early historic inhabitants of the Waimea region practiced an intensive form of cultivation, utilizing what Clark has termed ‘supplemental irrigation.’” This differs from the two classic forms of indigenous Hawaiian agriculture, irrigated pondfield cultivation and dryland field-system cultivation. (Ibid.: 528)

As a result of the information gained through the Mudlane to Kawaihae project, Clark went on to develop a settlement pattern model for the Kawaihae-Waimea region (Clark 1987) This settlement pattern included four zones: Coastal Zone, Intermediate Zone, Kula zone, and Wilderness zone. The current project area lies within the Kula Zone, described as follows:

Table 1 Previous Archaeological Studies in the Vicinity of the Project Area

Author (Date)	Location	Nature of Study	Findings
Barrera & Kelly (1974)	Waimea to Kawaihae Road Corridor;	Archaeological Reconnaissance Survey	Approx. 4,561 features were recorded incl. habitation and agricultural complexes. The majority were near coastal Kawaihae or in the Lālāmilo area near Waimea. Of particular interest is the area referred to as the “ <i>kuleana</i> and ranch district.”
Ching (1979)	Lālāmilo	Archaeological Reconnaissance Survey	Many archaeological features recorded incl. habitation and agricultural complexes.
Neller & Beggerly (1980)	Lālāmilo to Pu‘ukapua Irrigation System	Archaeological Reconnaissance Survey	No sites were present in or near the vicinity, although a few buildings were of historic interest.
Clark (1981)	Section 4 (Upland Lālāmilo) Mudlane-Waimea Kawaihae Road Corridor	Archaeological Inventory Survey and Data Recovery	321 sites, including both agricultural and residential features were identified. Extensive agricultural system divided into four complexes, each with its own characteristics.
Clark & Kirch (1983)	Mudlane-Waimea Kawaihae Road Corridor	Archaeological Inventory Survey and Data Recovery	Numerous sites identified, both agricultural and habitation. Project provided a broad data base for comparing site distribution data from the coast to upland.
Bonk (1985a)	Waikōloa, Pu‘ukapu, ‘Ōuli	Archaeological Reconnaissance Survey	11 Sites including habitation and agricultural features
Bonk (1985b)	Waimea to Pa‘auilo Watershed	Archaeological Reconnaissance Survey	Single archaeological site including 2 features
Rosendahl (1985)	Lālāmilo	Archaeological Reconnaissance Survey	No sites located
Hammatt & Borthwick (1986)	Lālāmilo Houselots Subdivision	Archaeological Reconnaissance Survey	8 sites including agricultural features and complexes typical of the Waimea Field System

Hammatt et al. (1988)	Lālāmilo Houselots Subdivision	Archaeological Inventory Survey w/ Subsurface Testing	Seven Archaeological sites recorded and limited subsurface excavation conducted. Both habitation and agricultural sites were documented.
Hammatt & Shideler (1989)	Lālāmilo, Ka La Loa Subdivision	Data Recovery	Data analysis suggested that the informal agricultural activity (represented in ag. mounds) were occurring by the mid 13 th century, and field boundary walls were constructed by the mid-15 th century, with permanent habitation occurring from early 16 th century to the late 18 th century.
Spencer (1989)	Lālāmilo, Waimea-Pa‘auilo Watershed	Archaeological Reconnaissance Survey	No cultural resources observed
Bonk (1989)	Wai‘aka	Archaeological Reconnaissance Survey	Contained “low mildly terraced field ridges” and “larger terraces with broader and flatter surfaces behind soil embankments.” Falls into field complex #1 (Clark 1981).
Clark et al. (1990)	Waikōloa, Waimea School Improvements	Archaeological Testing and Data Recovery	Profiles of 3 ‘auwai suggest a historic period origin, prehistoric construction possible. Charcoal sample yielded an age range with preferred date range is A.D. 1449 to 1674
McEldowney (1991)	Pu‘ukapu pastoral lot #100	Field Check	stone complex of 2 enclosures
Thompson & Rosendahl (1992)	Potential Sites for North Hawai‘i Community Hospital / Waimea Elderly Housing Project	Archaeological Inventory Survey	Backhoe testing of ‘auwai features encountered charcoal samples which yielded radiocarbon dates as early as 770-1020 A.D.
Erkelens (1993)	Waimea Town Center Project	Review of Historical Documents and Background Literature	Review of the Waimea Town Center survey indicated that information previously gathered is incomplete for the project area. Not all archaeological sites and features are presently known.

Schilz (1994)	‘Ōuli	Archaeological Inventory Survey	Total of 75 sites recorded including 45 military sites, 14 ranching sites, 9 historic sites, and 7 traditional Hawaiian sites.
Franklin et al. (1994)	Hawaʻii Preparatory Academy Waimea Campus Expansion	Archaeological Inventory Survey	7 sites associated with agriculture and habitation identified. The sites comprised the formal types: water channel, cemetery, terrace, concrete foundation, and alignment
Erkelens (1998)	The Kuleana Lots at Pukalani Waimea Town Center Project Area	Archaeological Inventory Survey w/ Subsurface Testing	Sites include 3 19 th century house lots, historic cemetery, 4 historic structures, a burial. Skeletal remains of two individuals were encountered during subsurface testing.
Haun et al. (2002)	Lālāmilo, DHHL Residential Development	Archaeological Inventory Survey w/ Subsurface Testing	Identified 75 sites including 818 agricultural and habitation features. Radiocarbon dating indicated utilization as early as 1500s A.D.
McGuire and Haun (2002)	DHHL Residential Development at Lālāmilo South Kohala District	Cultural Impact Assessment	No on-going cultural practices identified
Kikilo and Borthwick (2002)	Waimea Trails and Greenway Project	Archaeological Assessment	During the assessment they concluded that the trail corridor intersects a number of features, such as ‘auwai and field walls and recommended an inventory survey.

Table 2 Field Complexes of the Waimea Agricultural System (per. Clark and Kirch 1983)

Field Complex	Location	Description
1	On the Kohala Slope, between Lanikepu and Hale‘aha Gluches, N of Keanu‘i‘omanō and Kohākōhau Streams	Upper elevation portion dominated by low, mildly terraced field ridges. Lower portion has larger, broad and flat terraces behind soil embankments. Water channels run down slope for drainage. Main channel of ‘auwai diverted from Kohākōhau Stream.
2	Bounded on N by Keanu‘i‘omanō and Kohākōhau Streams, and on S by Waikōloa Stream	Low terraces with retaining faces or ridges of soil and/or stone. Long axes of fields oriented perpendicular to prevailing winds. Main channels of ‘auwai diverted from Kohākōhau Stream and drain into Waikōloa Stream. Residential features scattered

		throughout area.
3	Between Waikōloa Stream on the N and Pu‘u Pā hill on the S.	Largest field complex. Both residential and agricultural features scattered throughout. Dominant agricultural features include: bounded field units; small planting swales; pondfields; ‘ <i>auwai</i> ’; minor planting features (mounds, small terraces, modified outcrops). Evidence of ‘supplemental irrigation’ system.
4	Directly S of the Village of Waimea	Long, narrow fields demarcated by low soil ridges. ‘ <i>Auwai</i> ’ divert water from Waikōloa Stream. Also includes residential structures. Similar to Field Complex 3

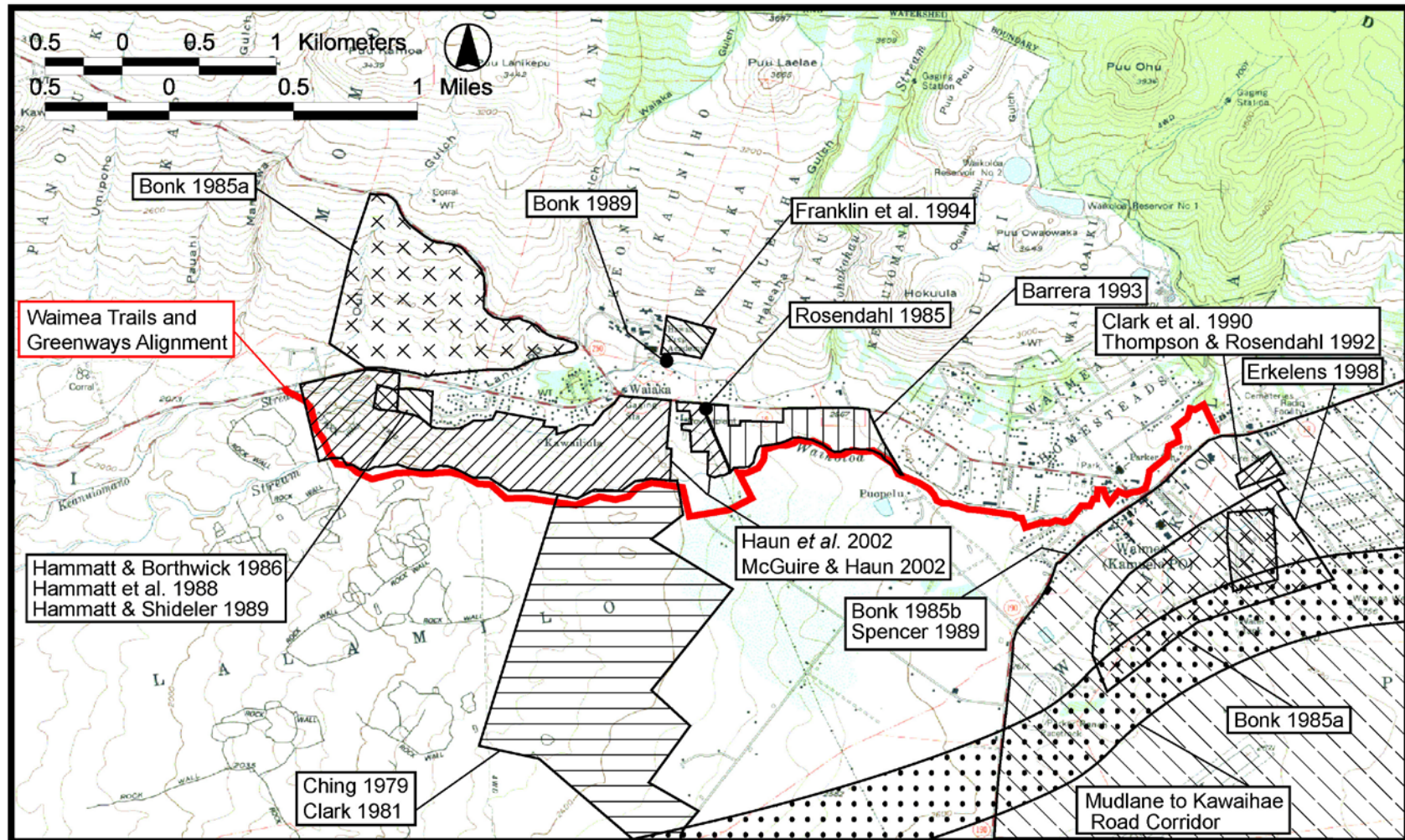


Figure 3 Previous Archaeological Studies in the Vicinity of the Project Area.

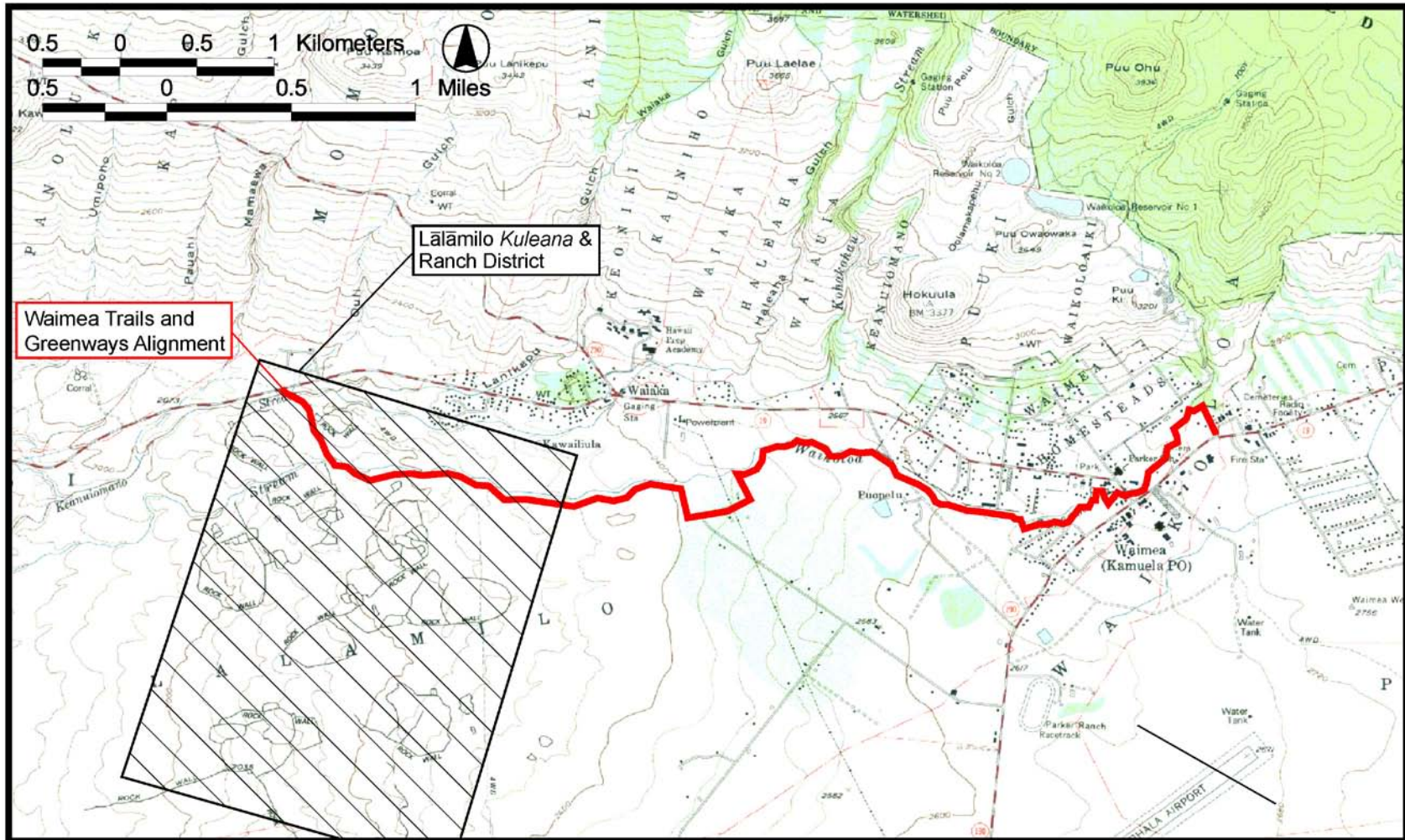


Figure 4 USGS Map Showing the Location of the *Kuleana* and Ranch District Designated by Barrera and Kelly (1974).

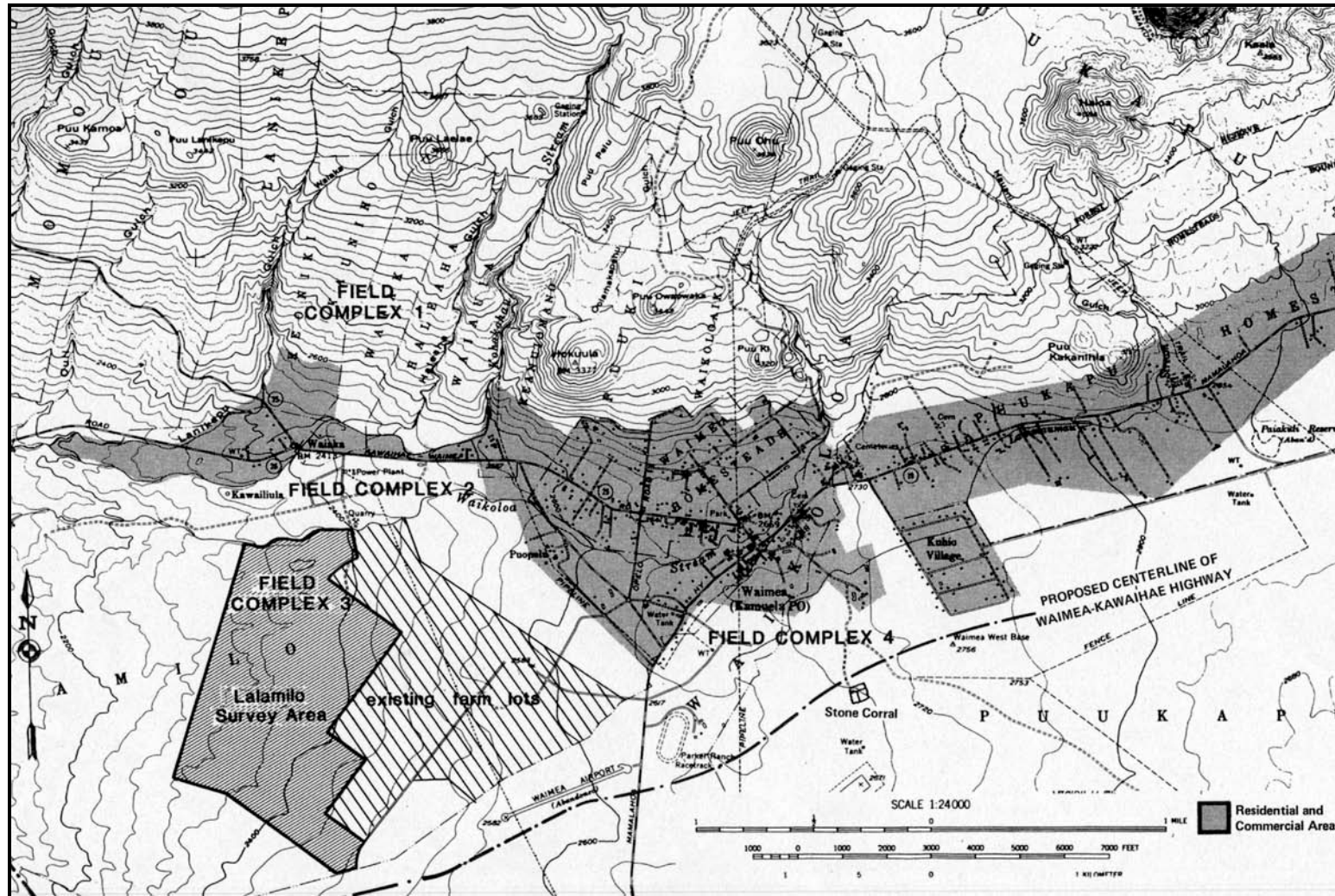


Figure 5 Map Showing the Location of Field Complexes 1-4 of the Waimea Agricultural System, Lālamilo Survey Area, and Existing Farm Lots (Clark and Kirch 1983) Note Field Complexes are General Areas and Do Not Have Definite Boundaries.

Extends from the Intermediate Zone to between 7.3 and 9.7 km inland. It ranges in elevation from 585 m to 830 m (1,919-2,722 ft) in elevation, with small sections extending to as much as 975 m (3,198 ft) elevation. Subsistence activity is dominated by agriculture...Crops included sweet potatoes, dry-land taro, gourds, and *wauke*. Habitation sites included single use sites, extended and recurrent occupations, and permanently occupied sites. Habitation features include small walled shelters, caves, overhangs, terraces, platforms, and enclosures. The more intensively occupied habitation sites are clustered in neighborhoods sometimes larger wards. Burial features are also present (Clark 1987).

In 1985, a reconnaissance survey of four parcels proposed for residential developments was completed (Bonk 1985a). Areas I and II of the survey, located south of Waimea Town, contained both agricultural and residential complexes (portions of Field Complex 4). Area IV, located west of Wai'aka, contained several residential sites (portions of Field Complex 2). Also in 1985, a reconnaissance survey of three reservoir sites and a large watershed area extending from Waimea to Pa'auilo was conducted, in which both residential and agricultural features were located (portions of Field Complex 4) (Bonk 1985b).

In 1986, Cultural Surveys Hawai'i (Hammatt and Borthwick 1986) conducted an archaeological reconnaissance survey on approximately 50 acres located immediately north of Waikōloa Stream. Eight sites, typical of the Waimea Agricultural System, were located (portions of Field Complexes 1 and 2). This work was followed by a detailed archaeological survey and subsurface testing of 12 acres of the original study area (Hammatt et al. 1988). Seven sites were documented including both agricultural and habitation complexes. Excavations revealed an abundance of indigenous artifacts and *midden*, indicating "this small agricultural-habitation complex was in use in the late prehistoric period and was abandoned before European manufactured goods were available (probably 1820 or before)" (Hammatt et al. 1988:69) Data recovery of sites yielded radiocarbon dates which "suggest an initial low investment agricultural effort probably in sweet potato production, followed by a gradual intensification of effort just to the west over a period of several centuries" (Hammatt and Shideler 1989:50).

A reconnaissance survey of approximately 100 acres was conducted at Hawai Preparatory Academy in Wai'aka (Bonk 1989). Agricultural features associated with Field Complex 1 were located.

In 1990, an inventory survey with subsurface testing and data recovery was conducted at the Waimea School improvements Lot A (Clark et al. 1990). Various agricultural features were located (portions of Field Complex 4). Radiocarbon dating of charcoal recovered during subsurface testing yielded a date range of A.D. 1449 to 1674.

Thompson and Rosendahl (1992) conducted an inventory survey of potential hospital sites in several locations around Waimea. Numerous agricultural features were located, comprising portions of Field Complexes 2-4.

Recent archaeological investigations in the Waimea Town Center project area have further documented 19th and early 20th century habitation and associated sites (Erkelens 1998). The

investigations included surface and sub-surface surveys. Five sites were identified, including house, burials, and agricultural sites (portions of Field Complex 4). All sites and materials observed were historic either from the mid 19th or early 20th century. The sub-surface investigations also indicted that extensive bulldozing had disturbed large areas of the 10+ acre parcel (Ibid.).

An archaeological inventory survey for a proposed DHHL residential development at Lālāmilo bordering the western portion of the proposed trail was completed in 2002 (Haun et al. 2002). During the inventory survey 75 sites with 818 features were identified and documented. Feature types included, agricultural, permanent and temporary habitation, burial, military defensive position, historic foundation, storage, and a quarry. Based on radiocarbon dating, artifact analyses, and historic documentary research, traditional Hawaiian utilization of the project area was posited to be as early as the 1500s and extending into the mid-1800s (Haun et al. 2002). The DHHL Development Survey area bordered portions of the proposed trail corridor. The proposed trail corridor west (*makai*) of the County Transfer Station would include similar site types.

A cultural impact assessment was also conducted for the same DHHL parcel (McGuire and Haun 2002). The assessment included a detailed background history and a single interview. No present-day cultural practices of any kind were identified though past cultural practices were discussed:

Past cultural practices identified were related to agricultural practices and the utilization of an ancient *'auwai* or ditch system which traversed much of the Lālāmilo area. The project area is part of the larger Lālāmilo field system evidenced by remnant *'auwai* and dryland terraces. Hawaiian burial practices (pre-contact and historic) were conducted in the project area as evidenced by the presence of burials and graves sites (McGuire and Haun 2002:47).

An archaeological assessment was conducted for the Waimea Trails and Greenway Project (Kikiloi and Borthwick 2002). During the assessment they concluded that the trail corridor intersects a number of features, such as *'auwai* and field walls. On the western end of the project there were site complexes associated with agriculture and habitation sites from pre-and-post contact eras (Barrera and Kelly 1974, Clark and Kirch 1983, Clark 1987). There are historic features previously documented such as the Imi'ola Church State Site #50-10-06-7151 and associated cemetery, the Spencer Cemetery, and a concrete ford with a date of 1943 suggesting a pre crossing clearly indicating World War II use. This assessment recommended that an archaeological inventory survey be carried out.

V. BACKGROUND OF *KAMA'ĀINA* INTERVIEWEES

Kama'āina and *kūpuna* with knowledge of the Waimea area were interviewed for this assessment. Four of the interviewees Melvin Hewett, Hisao Kimura, Alan Lindsey, and Lynn Taylor participated in formal interview sessions that were taped and transcribed.

Presented below are backgrounds of the four interviewees. Excerpts from the interviews are incorporated in Section VI TRADITIONAL PRACTICES OF WAIMEA RELATIVE TO THE WAIKŌLOA STREAM.

MELVIN HEWETT

Mr. Hewett grew up in Waimanalo homestead on the Island of O'ahu. He later moved to the Island of Hawai'i and is currently a trustee for Parker Ranch. Mr. Hewett started with Parker Ranch in 1991. Mr. Hewett has been involved in long range planning (eg. Waimea 20/20) for Parker Ranch and is well aware of the many issues that go into good planning in the Waimea, Kohala region.

HISAO KIMURA

Hisao Kimura was born in a leap year so he is either 90 or 91 years of age. He attended Waimea School then went to work for Parker Ranch in 1931. Mr. Kimura was the supervising horticulturist for the nursery and responsible for planting and importing of grasses in the ranch paddocks and pastures. He retired from Parker Ranch in 1978.

ALAN LINDSEY

Alan Lindsey was born in 1931 and was raised in Māhukona. The Lindsey 'ohana goes back 6 generations in the Waimea area. He attended Kamehameha Schools in 1941. In 1948 was employed by Parker Ranch as a cowboy, he later became supervisor. He retired in 1988 from the ranch.

LYNN TAYLOR

Lynn Taylor moved to Waimea, Hawai'i in 1954 along with her husband James M. Taylor, the head master of Hawai'i Preparatory Academy (HPA). Mrs. Taylor started the elementary school for HPA. Mr. Taylor accepted a job in 1975 as head master at La Jardin in Kailua O'ahu, where they both moved for twenty years. Lynn Taylor now resides in Waimea and is involved in many community activities and organizations such as Waimea Outdoor Circle, and the Waimea Trail Committee.

VI. TRADITIONAL PRACTICES OF WAIMEA RELATIVE TO THE WAIKŌLOA STREAM

This project seeks to assess traditional cultural practices as well as resources along the trail way. This section will express the different types of traditional practices, cultural resources associated with Waimea. Excerpts from interviews are incorporated throughout this section where applicable.

A. Gathering for Plant Resources

No specific documentation was found in regards to gathering of plants along Waikōloa Stream. However, Mr. Lindsey mentioned that there was a lot of plants near the stream “There was a lot of *‘ilima* before ...It used to be all the *‘olena* and use to have the *poha*” .Mr Lindsey also mentioned he used the root of the *kowali* (morning glory) plant to heal the broken bones of his dogs. He would pound the root with Hawaiian salt place it in the *ti* leaf and apply it on the dogs wound. Other long time residents Mr. Kimura and Mrs. Taylor indicated that they remember the banks of the stream as just low pasture grasses and that the vegetation adjacent to the stream now is relatively recent (ie post 1960). The majority of vegetation present now are invasive imports. During this assessment, there were no current practices related to traditional gathering rights identified.

B. Gathering Resources from the Waikōloa Stream

No specific documentation was found in regards to gathering for subsistence from the stream. From the *kama‘āina* interviewees Alan Lindsey expressed his knowledge of the different types of riparian resources in the stream such as tilapia and *‘ōpae*:

They have the shrimps. The *‘ōpae*, but you have to get them with the net that they cannot see, if they see that net they swim some place else. So you know how we used to catch them, you know the oranges used to come in the orange bag or the potatoes bags, they get the orange or green bags. What we do we put them underneath where the *‘ōpae* going come down and hook them up with ropes catch these 2 sides. And then when they drop inside they cannot go through because it is just like a net, like a strainer, like when you mix your poi, same thing. It is orange or green that they cannot see when they drop down it is too late they are in the bag already. Then all they do is take them home and boil them and you get fresh *‘ōpae*. If you put a white bag there they move somewhere else. I think up there still get yet, but I don’t know if anybody go up.

Other interviewees mentioned the absence of people fishing and gathering from the stream. Long time resident and Parker Ranch employee H. Kimura who was the ranches’ horticulturalist did not recall anyone ‘fishing’, other than kids just having fun. Based on informant information there was limited varieties of plants and fish in the stream and that the precious resources was the water.

C. Historic Properties

Imi‘ola Church and an associated cemetery are located at the eastern terminus of the trail. The church is on the State and National Register of Historic Places and has been allotted State Site # 50-10-06-7151. Relatively close by on Mamalahoa Highway is the Spencer Family Cemetery.

The proposed trail intersects a number of agricultural features, such as, ‘*auwai* and field walls *makai* (west) of the County Transfer Station adjacent to the DHHL property. Other site types in that area include, house sites and burials. The area *makai* of the transfer station has been altered far less than the urban core of Waimea. The area is referred to as a portion of the ‘Waimea Agricultural System’ and the ‘Lālāmilo *Kuleana* Ranch District’ (Barrera and Kelly 1974). Site types include late prehistoric to historic agricultural features, consisting of modified outcrops, mounds, terraces, field boundaries and irrigation ditches (‘*auwai*). During the archaeological assessment a number of concrete fords and remnant structures related to a pipeline crossing were observed within and along the banks of Waikōloa Stream.

D. Burials

No specific documentation was found regarding ‘*iwi* in the project area. However, there are church (ie Imi‘ola) and family cemeteries (ie Spencer Family) within the Waimea Town area. When asked about burials along the stream Mr. Lindsey mentioned “No not in that area because all what is up on the ranch Mānā all the burials are in their own cemetery, Parker Ranch got their own cemetery, they have their own family in there”. Previously undocumented burials and possible burial sites were documented *makai* (west) of the County Transfer Station (Haun et al. 2002) in areas through which the trail is planned. Additionally, south of the Waikōloa Stream in the ‘*ili* of Pukalani two unmarked burials were encountered (Erkelens 1998).

E. Trails

None of the interviewees mentioned any historic trails that could be affected by the proposed trail.

Based on late 19th and 20th century maps the primary transportation routes *mauka/makai* correlate closely to the existing major roadways. The primary transportation route the Waimea-Kawaihae Road is north of the proposed trail. The Hawi Mountain Road intersects the Waimea/Kawaihae road at Wai‘aka near HPA also north of the proposed trail corridor. Mamalahoa Highway (and its predecessor) enters Waimea Town south of the proposed trail corridor. The proposed trail corridor will have certain access points to existing transportation corridors. The informants indicated that they had no knowledge of any historic trails that might be affected by the proposed greenway trail.

F. Nā Mea ‘*Uhane*

There are some things in life that people just can’t explain, things not seen or heard but felt deep in your *na‘au* (gut). Alan Lindsey mentioned the “calling tree” a tree that has strong spiritual powers:

... You know by Kohala Estates, you go right across that banyan tree. You know what they call that banyan tree? The “calling tree”, when they used to take cattle down in the morning, I used to get up at twelve at night, one o’clock we used to meet at the Ranch Restaurant, eat our breakfast. That banyan tree calls people and some guys...sometimes they go straight for the banyan tree, we say, “where you going?” They hear voices, that are the dead, that is the old Hawaiian dead people, and sometimes you can hear them, they call. But you know I am not afraid of that kind of stuff see because my dad never did make me scared. That is why I could ride any bucking horse and everything. I used to ride bucking bull. ...They say it’s a “calling tree”. But I don’t believe in that, the only guy that can call me is the heavenly father, then I go to that tree. It is all superstition.

A few of the interviewees mentioned a “Rain Rock” which is located north of the project area. Alan Lindsey stated that this “rain stone” was down by Anna’s Ranch and people used to believe in it. Mr. Kimura (HK) mentioned that people would pray on this rock for rain:

HK: ...we have the famous well known “Rain Rock” that the Hawaiians have told us to respect and worship.

CSH: Oh, the rain rock!

HK: On the *ma uka* side.

CSH: Kind of by Anna Perry Fiskes old place.

HK: That’s right. You could lie on it.

CSH: Did it rain?

HK: Sometime you got to believe, yeah.

CSH: What is the story that they used to tell you about that rock?

HK: Well...whenever you need...every so often we get slight drought season and sometimes more severe than others then we go there *pule*.

.....

HK: My family (father worked for Parker Ranch) lived in the ranch house with a water tank. Water was collected from the roof of the house. Neighbors came and helped them whenever there was a severe drought. We shared this water, when condition-weather was dry.

CSH: They were catching water on the water tank? Or was it still piped in from the stream?

HK: Yeah, water tank. Catchments, from your roof and it accumulates because we use it only on severe drought.

CSH: So all the individual houses had their own individual pipeline in the stream?

HK: From the stream, The County Water Department would see that homes be supplied by piped in water system and each home-the source of the water is form the running water. Yeah. So what we used for a strainer was the Bull Durham bag, everybody had Bull Durham, everyone smokes Bull Durham.

CSH: Put the bag at the end of the pipe.

HK: You collect all of that. You would be surprised.

G. Climate Changes in Waimea

As we sat and talked with different people from the community regarding Waikōloa Stream, many were concerned that occasionally the stream ran dry. In fact, the *kama'āinas* mentioned that it doesn't rain as much as it once did. Cattle ranching has played a large part in deforestation which has resulted in less rainfall. Complicating the situation is the tapping and redirecting of streams which has reduced the water flow in a number of streams.

In 1856 the Waimea community was concerned about water issues and how it would affect their community in the future. With the introduction of cattle and the clearing of the forest there was less of an orographic precipitation process. (Orographic Precipitation- precipitation caused by the lifting of moist air over a mountain barrier).

It is in the memory of many foreigners now living there, when the whole of these plains were covered with a thick wood, to the very edge of the slope. Where hardly a tree is to be seen for miles, we were informed by an old resident, that twenty-five years ago he lost himself with his team in the weeds. He also stated that at that time there was far more rain at Waimea than there is now, which indeed might be readily inferred, as clearing the land has been almost entirely effected by the cattle. The few head brought by Vancouver in 1793 increased so rapidly, that early in the present century thousands of them were killed for their hides. At this moment they swarm in the thick jungle that covers the windward or eastern slopes towards Hamakua. They are now gradually destroying this, and thousands of old dead trees both standing upright and lying prostrate, from the present boundary of these woods, and exhibit the mode in which the destruction is effected; for whilst the old trees die of age, no young ones are seen taking their places, as during the last thirty or forty years, the cattle have eaten or trodden them down.

At the present time the vapors and rain which are brought across the plain by the trade winds, area generally dissipated between Waimea village and Lihue, which latter place is something under a mile nearer the brow of the hill, and it is quite usual to notice that at Lihue the weather is fine and the sun shining, whilst at Waimea it is wet, raw and misty. This spot where the vapors now commonly terminate, is three or four miles from the debatable ground between the two winds before alluded to. (Sandwich Islands monthly Magazine, February 1856:44-47 in Barrera and Kelly 1974)

Further in the early 1900's Alfred Carter, of Parker Ranch, filed a petition against the Territory of Hawaii for wrongfully diverting water from the Waikōloa Stream. The residents of Waimea used the stream for basic normal household usage and for pasture lands. It was not used for large scale irrigation system. In the days of traditional farming Waimea was known for it's famous *Kipu'upu'u* rains, only at times did the fields need irrigation. This was acknowledged the by the Supreme Court:

The evidence is to the effect that there were a very few *lois* of *taro* in the locality in questions. It was shown that the Hawaiians habitually raised in their house-lots dry land taro, bananas and vegetables as well as sugar cane which they cultivated for human consumption as well as for food for their animals. And it is a fair inference from the evidence that the ditch system at Waimea was constructed from the purpose of supplying water to the inhabitants for household purposes and for the irrigation, when the natural rainfall was insufficient, of their cops (Hawaiian Reports Vol. 24: in McGuire and Haun 2002).

In 1917 the case was appealed and the Hawai'i State Supreme Court maintained their decision that the Territory owned all the waters of Waikōloa stream, and that the waters were "subject to reasonable use" by both the Territory and the petitioner (Hawaiian Reports Vol. 24: in McGuire and Haun 2002).

Lynn Taylor observed more of a water flow between 1954-1974 and has a theory of why it rains less:

Most local inhabitants will tell you that it rains less now then formerly, and I think this is true. I do have a theory that the clouds, which have been built up by the trade winds blowing across the Pacific, are no longer almost constantly seeded by the moisture rising from the plunging waterfalls and streams which aren't there, so they often blow away without dropping their precious rain.

In support of Mrs. Taylor's theory there is an article in the Journal of Geophysical Research, they state that "Numerous studies with general circulation models suggest that tropical deforestation can result in regional-scale climate change, namely increased air temperature and wind speed and reduced precipitation and relative humidity".(Hoffmann, WA, W Schroeder, RB Jackson. 2003).

All the informants mentioned water resources, or lack there of, as one of Waimea's primary concerns. None of those interviewed, however, felt that the proposed trail would adversely affect stream resources.

VII. SUMMARY AND RECOMMENDATIONS

Summary

Based on background studies much of the project area has been urbanized to such an extent that no surface historic properties exist, except for concrete and boulder stream crossing structures. However the area *makai* of the county transfer station has been slightly altered and contains complexes associated with agriculture and habitation sites from the pre-and post-contact eras. The trail corridor intersects a number of features, such as *'auwai*, and field walls. The area includes a wide array of site types including documented burial sites.

A cultural impact assessment of an approximately 266.4 acres of the DHHL property west of the County Transfer Station documented numerous historic properties. The consultation process included a single knowledgeable individual who indicated that there were no on going cultural practices. It was noted that past cultural practices were evident by remnants of *'auwai* and dryland terraces, as well as presence of burials and graves sites (McGuire and Haun 2002:47).

This cultural impact assessment did not identify any cultural practitioners or any on going practices within the project area.

There were some concerns the community had regarding the project corridor. The stream should be kept clear of any brush to reduce any overflow during a high volume periods. Second, safety of residents who live along the proposed trail. Melvin Hewett expressed his concern stating that “I think from our (Parker Ranch) standpoint, security, and people not wandering right into the homes is the biggest concern”. The area that Mr. Hewett is referring to is Parker Ranch’s “Heritage Area” which includes Pu‘u Opelu the home of Richard Smarts estate. However all of the interviewees expressed the opinion that the trail was a good community based project.

Recommendations

Based on the above findings, it is recommended that no further formal cultural impact mitigations measures are warranted. However, informants wanted the consultation process to continue through the build-out phase of the project.

It should be noted, however, that historic properties associated with former traditional Hawaiian activities in the project area, such as artifacts, cultural layers, and burials may be present despite the decades of cattle ranching and associated activities in the area west (*makai*) of the county transfer station.

It is our understanding that Waimea is a very close and family oriented community. Thus we feel that it would be educational to have some interpretive themes for the proposed trail corridor. Themes referenced by the informants included history, legends, and how the environment has changed water resources of the Waimea area.

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- WMR (Waimea Mission Reports)
1832 Mission Station Reports, Hawaii Island, Waimea 2. Hawaiian Mission
Children’s Society Collection, Mission Houses Museum Library,
Honolulu.



U.S. Department
of Transportation
**Federal Highway
Administration**

Hawaii Federal-Aid Division

December 22, 2010

300 Ala Moana Blvd., Rm 3-306
Box 50206
Honolulu, HI 96850
Phone: (808) 541-2700
Fax: (808) 541-2704
<http://www.fhwa.dot.gov/hidiv>

In Reply Refer To:
HDA-HI

CERTIFIED MAIL
7010 1060 0000 9538 1201

Dr. Pua Aiu, Administrator
State Historic Preservation Division
Kākuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, Hawai`i 96707

Dear Dr. Aiu:

Subject: Section 106, National Historic Preservation Act Consultation
Ke Ala Kahawai O Waimea, Waimea Trails and Greenways
Waimea, South Kohala District, Hawai`i Island
Various TMKs

The Federal Highway Administration (FHWA), in cooperation with the County of Hawai`i, is initiating consultation in accordance with Section 106 of the National Historic Preservation Act (NHPA) and the Advisory Council on Historic Preservation's regulations for Protection of Historic Properties (36 CFR Part 800) for a proposed undertaking that may affect historic properties.

Ke Ala Kahawai O Waimea ("the stream trail of Waimea") will be a multi-use bicycle and pedestrian path extending approximately 6.4 miles through Waimea on the Island of Hawai`i. The trail is proposed by the County of Hawai`i, Department of Parks and Recreation (DPR) in collaboration with the Waimea Trails and Greenways Committee of the Waimea Preservation Association. A Draft Environmental Assessment (DEA) is currently being prepared for the project in accordance with the Federal National Environmental Policy Act (NEPA) and the State of Hawai`i's Chapter 343 HRS environmental regulations.

The purpose of this letter is to request your agency's input regarding any issues or historic properties with religious or cultural significance that may be affected by this undertaking. We are also seeking names of other organizations or individuals who should be contacted as part of this Section 106 consultation process.



Purpose and Need for Project

A major objective of *Ke Ala Kahakai O Waimea* is to provide an alternative form of transportation that will link major destination points including residential areas, schools, office and commercial areas, and recreational areas. The streamside multi-use path will also provide recreational and fitness opportunities and enhance natural, open space areas which can be enjoyed by all segments of the community.

As part of the NEPA environmental process, a number of alternative alignments were considered, including segments located mauka of Kawaihae Road. However, the preferred alignment which follows Waikoloa Stream was found to be superior in meeting the project's purpose and need with minimal environmental impacts.

Project Description

Ke Ala Kahakai O Waimea will be a shared use path extending approximately 4.5 miles through Waimea, through urban and agricultural lands. The path begins at Church Row in Waimea Town, moves west following the meandering course of Waikoloa Stream, and ends at a future county park (former Clark property) opposite the South Kohala View Estates subdivision. The path will be paved, 10 to 12 feet in width and accessible to pedestrians, bicyclists, and other non-motorized vehicles. It is intended that the path will comply with Americans with Disabilities Act (ADA) guidelines for outdoor areas for the majority of its length.

Development of *Ke Ala Kahawai O Waimea* may be implemented by the DPR or through joint efforts with other County, State or Federal agencies, or community groups. Because of its length, the project will be constructed in phases or increments, as shown in the attached Figure. Increment 1, which is currently in design, encompasses the segment between Lindsey Road and Kahawai Street. Subsequent increments will be developed as funding becomes available and as required easements are secured.

The project also includes an option for a separate, dedicated equestrian trail in the area west of the County refuse transfer station. The equestrian trail would roughly parallel, but be physically separated from the main shared use path. If an equestrian trail were built, a trail head and horse trailer parking could be constructed on State-owned land adjacent to the County Transfer station. From this point, the equestrian trail could head west on State land, where there is sufficient land for it to be safely separated from the main path.

The Area of Potential Effect (APE)

For purposes of Section 106, the Area of Potential Effect (APE) is defined as the entire path alignment following Waikoloa Stream, as well as existing road segments that will provide access to the path. The road segments, including sections of Opelo Road, Kahawai Street, and South Kohala Distribution Road, will not be modified, but will be signed and serve as designated connecting points to *Ke Ala Kahawai O Waimea*.

In the area west of the County Refuse Transfer Station, the APE encompasses a corridor up to 200 feet wide, since it may include a separate equestrian trail in addition to the main bicycle and pedestrian shared use path.

Historic Properties within the APE

A number of archaeological and historic surveys have been completed within the APE. These include a literature review and field inspection of the entire alignment between the South Kohala View Estates and Church Row conducted in 2000 (Cultural Surveys Hawai'i, Kikiloi et al. 2002), an inventory survey of the 1.1 mile Increment 1 (Cultural Surveys Hawai'i, Yucha et al. 2009), and an updated literature review and field inspection (Cultural Surveys Hawai'i, 2010). The findings are discussed below.

2002 Literature Review and Field Inspection

This literature review and field inspection consisted of a pedestrian inspection of a route which roughly corresponds to the currently proposed *Ke Ala Kahawai O Waimea* alignment. The inspected area was divided into five different sections based on terrain type, degree of urbanization, and the potential for cultural resources. The study found that most of the area has been urbanized to such an extent that no surface historic properties exist, except for concrete and boulder stream crossing structures. One section in the western portion contained historic property complexes associated with agriculture and habitation from the pre- and post-contact eras. The APE intersected a number of features such as 'auwai, and field walls. Because the corridor was not staked, a precise inventory of possibly affected historic properties and features was not possible. The study recommended that an inventory survey investigation of the final, staked alignment be conducted.

2009 Archaeological Inventory Survey, Increment 1

In 2009, Cultural Surveys Hawai'i conducted an archaeological inventory survey of an 8.96-acre portion of the APE, representing Increment 1 of the project. This section measured approximately 1.1 miles in length, and is located at the eastern end of the preferred alignment, between Kahawai Street and Lindsey Road.

A complete pedestrian survey identified three historic properties consisting of four features within or adjacent to the 8.96 project area along Waikoloa Stream. These historic properties consisted of a collapsed and severely damaged concrete ford or bridge (SIHP #-26871, Feature A), a remnant portion of paved road (SIHP #-26871, Feature B), an earthen ditch segment (SIHP #-26872), and an intact concrete ford and adjoining roadway (SIHP #-26873).

The collapsed ford and paved road were determined to be WWII-era constructions associated with Camp Tarawa. The irrigation ditch was determined to be a remnant portion of a mid-19th century irrigation ditch used for irrigating sugar cane fields. Both the collapsed ford and irrigation ditch would not be adversely affected by the proposed project, but were recommended for preservation in the form of avoidance and protection. No further work was recommended for the other two properties.

2010 Literature Review and Field Inspection

An updated literature review and field inspection was conducted by Cultural Surveys Hawai'i in 2010. The purpose of this study was to confirm the findings of the earlier 2002 study, and to investigate the signed, shared roadway sections and possible equestrian trail which were not included in the earlier (2002) study. The 2010 study also discussed the alternative alignments that were evaluated as part of the NEPA process, but which have subsequently been dismissed in favor of the preferred alignment.

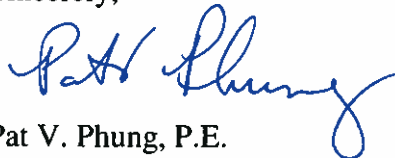
The 2010 study reiterated the earlier recommendation for an archaeological inventory survey as the various increments of the trail are implemented and a staked alignment is available. This will ensure that historic properties are accurately located in relation to the alignment. No further work is recommended for Increment 1, where an inventory survey has already been completed.

Input is Requested

We are seeking your agency's input on historic or cultural resources as part of the Section 106, NHPA consultation process. We also ask for the names of other organizations or individuals who should be consulted as part of this process.

Please transmit your comments to us *within 30 days upon receipt of this letter*. If you need additional review time or would like additional information, please contact Mr. Pat Phung at (808) 541-2305. Thank you for your assistance.

Sincerely,

A handwritten signature in blue ink that reads "Pat Phung". The signature is fluid and cursive, with the first name "Pat" and last name "Phung" clearly legible.

Pat V. Phung, P.E.
Lead Civil Engineer

Enclosure

FHWA Letterhead

(date)

Dear:

Subject: Section 106, National Historic Preservation Act Consultation

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[Agency Name]

date

Page 4

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Sincerely,

Pat V. Phung, P.E.

Lead Civil Engineer

Enclosures

By certified mail

Cc: Mr. Bob Fitzgerald, County of Hawai'i Department of Parks and Recreation
Mr. Glenn Kimura, Kimura International, Inc

**Waimea Trails and Greenways
Section 106 NHPA Contact List**
Revised 11/30/2010

Government Agencies

Dr. Pua Aiu, Administrator
State Historic Preservation Division
Kākuhihewa Building, Room 555
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Kapolei, Hawai'i 96707

Mr. Dan Quinn, Administrator
State of Hawai'i
Department of Land and Natural Resources
State Parks Division
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Honolulu, Hawai'i 96809

Mr. Aric Arakaki
Ala Kahakai National Historic Trail
National Park Service
73-4786 Kanalani Street, #14
Kailua-Kona, HI 96740

Mr. Clyde Namuo
State of Hawaii
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Honolulu, Hawaii 96813

Hawaii Island Burial Council
c/o SHPD Hawaii Island Office
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Hilo, Hawaii 96720

Mr. Leningrad Elarionoff, Member
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Kamuela, Hawaii 96734
Phone: 885-1895

Mr. Charles Young, Vice Chair
Hawaii Island Burial Council
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Honaunau, HI 96726

Organizations/Registered NHOs

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Historic Hawai'i Foundation
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Ku'ulei Keakealani, Director
Kaupulehu Cultural Center at Kalaemano
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Kamuela, HI 96743

Mr. Samuel A. "Bunny" Kahanamoku
P.O. Box 2158
Kamuela, HI 96743

Hui Ho'oniho
c/o Honorable Edward Halealoha Ayau
622 Wainaku Ave.
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Hawaiian Civic Club of Hilo
Mr. Arthur Hoke
P.O. Box 543
Hilo, HI 96721

The I Mua Group
Mr. Melvin Soon
422 Iliaina Street
Kailua, HI 96734

Hui Kako‘o ‘Aina Ho‘opulapula
767 Kailua Road
Kailua, HI 96734

Hawaii Maoli
Mr. Henry Gomes
P.O. Box 1135
Honolulu, HI 96807

Royal Hawaiian Academy of Traditional
Arts
Mr. L. Sukanuma
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Honolulu, HI 96821

Na Ku‘auhau ‘o Kahiwakaneikopolei
H. Kanoekalani Cheek
P.O. Box 5411
Kaneohe, HI 96744

Malu‘ohai Residents Association
Ms. Shirley Swinney
P.O. Box 700911
Kapolei, HI 96707

The Friends of ‘Iolani Palace
Kippen de Alba Chu
P.O. Box 2259
Honolulu, HI 96804

Papa Ola Lokahi
Ms. Vivian Ainoa
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Honolulu, HI 96813

Council for Native Hawaiian Advancement
Mr. Robyn Danner
1050 Queen Street
Honolulu, HI 96814

Native Hawaiian Economic Alliance
Ms. Vickie Smith
1050 Queen Street
Honolulu, HI 96814

Mr. Keoni Kealoha Alvarez
RR3 Box 1043
Pahoa, HI 96778

Other WTG Project Stakeholders

Pastor Dean T. Kauka
Imiloa Congregational Church
65-1084 Mamalahoa Highway
Kamuela, HI 96743

Waimea Hawaiian Homesteaders
Association
PO BOX 6753
Kamuela, HI 96743

Puukapu Homesteaders??
(address)
(address)

Mr. Keith Wallis
E Mau Na Ala Hele
P.O. Box 6384
Kamuela, HI 96743

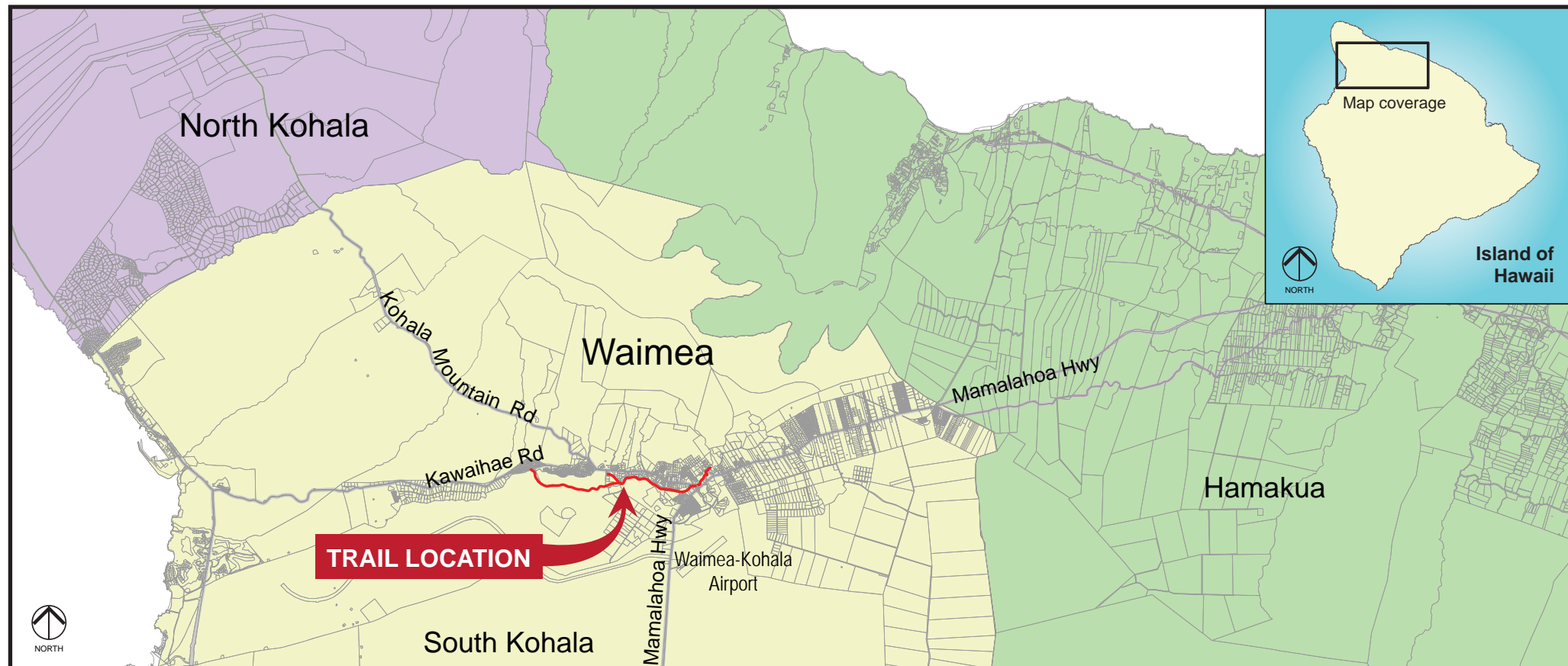
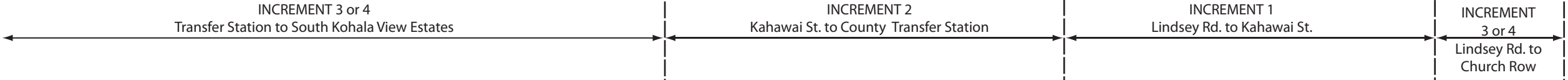
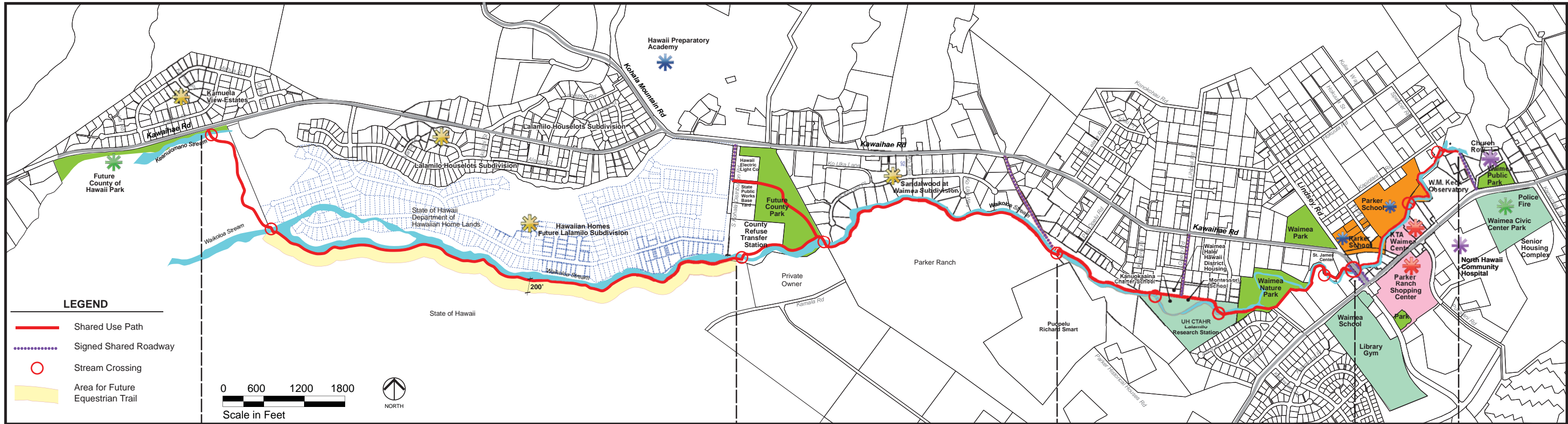
Mr. Brandi K. Beaudet
Parker Ranch, Inc.
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Ms. Taffi Wise
Kanu O Ka Aina Learning Ohana
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Kamuela, HI 96743

Dr. Billy Bergin
Paniolo Preservation Society
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Kamuela, HI 96743

Mr. Bill Sanborn
Waimea Preservation Association
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Kamuela, HI 96734

Ms. Mabel Tolentino
Waimea Hawaiian Civic Club
P.O. Box 6305
Kamuela, HI 96743



WAIMEA TRAILS AND GREENWAYS
 Ke Ala Kahawai O Waimea
 SHARED USE PATH

SECTION 106 National Historic Preservation Act