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FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 1, 2021

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

SUBJECT: Draft Environmental Assessment and Anticipated Finding of No Significant Impacts for the Wai'oli Valley Taro Hui Long-Term Water Lease for Traditional Lo'i Kalo Cultivation Project in the Hanalei District on the Island of Kaua'i

Dear Mr. Kawaoka,

With this letter, the Department of Land and Natural Resources, Land Division hereby transmits the Draft Environmental Assessment and Anticipated Finding of No Significant Impact (DEA-AFONSI) for the Wai'oli Valley Taro Hui Long-Term Water Lease for Traditional Lo'i Kalo Cultivation Project situated at Tax Map Keys (TMKs) (4) 5-4-003:999, 5-5-005: 999, 5-5-006: 999, 5-5-007: 999, 5-5-008: 999, 5-5-009: 999, 5-6-001: 999, 5-6-002: 999, and 5-6-004: 999 in the Hanalei District on the island of Kauai for publication in the next available edition of *The Environmental Notice*.

We are providing this DEA-AFONSI electronically via the "Submittal Form for HRS Chapter 343 Publications in the Periodic Bulletin." This submittal includes a searchable Adobe Acrobat pdf file of DEA-AFONSI and a .zip file containing a shapefile of the action location boundary.

If there are any questions, please contact Ian Hirokawa at (808) 587-0420.

Sincerely,

Suzanne D. Case
Chairperson

Enclosures

c: A. U'ilani Tanigawa Lum
Kapua Sproat

21-171

From: webmaster@hawaii.gov
To: HI Office of Environmental Quality Control
Subject: New online submission for The Environmental Notice
Date: Tuesday, June 1, 2021 2:49:59 PM

Action Name

Waiʻoli Valley Taro Hui Long-Term Water Lease for Traditional Loʻi Kalo Cultivation

Type of Document/Determination

Draft environmental assessment and anticipated finding of no significant impact (DEA-AFNSI)

HRS §343-5(a) Trigger(s)

- (2) Propose any use within any land classified as a conservation district

Judicial district

Hanalei, Kauaʻi

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

(4) 5-4-003:999; (4) 5-5-005: 999; (4) 5-5-006: 999; (4) 5-5-007: 999; (4) 5-5-008: 999; (4) 5-5-009: 999; (4) 5-6-001: 999; (4) 5-6-002: 999; and (4) 5-6-004: 999

Action type

Applicant

Other required permits and approvals

Right of Entry, Non-Exclusive Easement, Request for Water Lease, Watershed Management Plan, DHHL Reservation or Statement of No Reservation, Interim Instream Flow Standard

Discretionary consent required

Long-term water lease

Approving agency

Department of Land and Natural Resources

Agency contact name

Ian Hirokawa

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Map It

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Yes

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Action summary

The Proposed Action seeks approval for ongoing traditional and customary Native Hawaiian use of water from Waiʻoli Stream for loʻi kalo cultivation, a cultural practice that has fed Waiʻoli Valley and its people for centuries. For the Waiʻoli Valley Taro Hui (Hui), traditional kalo cultivation is its cultural foundation, which connects families and communities over generations, and is a time-honored part of this area's history and legacy. After floods in 2018, the Hui continues to address and mitigate damage. A long-term water lease (HRS §171, because water originates on State land) legally allows the continuation of the ongoing, historic and cultural use of Waiʻoli Stream for traditional kalo cultivation. The Hui's ability to maintain and preserve the Loʻi Kalo Irrigation System and their cultural practice depends on access to cool, fresh flowing water. The Hui will submit a request for a long-term water lease after completing the required HRS chapter 343 environmental review process.

Reasons supporting determination

See Section 7. Findings and Conclusions and Section 7.1. Significance Criteria.

Attached documents (signed agency letter & EA/EIS)

- Final-Waiʻoli-DEA_Submittal_6.1.21.pdf
- OEQC-Transmittal-Letter-for-Wailoi-Taro-Hui-Long-Term-Water-Lease.pdf
- OEQC-Transmittal-Letter-for-Wailoi-Taro-Hui-Long-Term-Water-Lease-part-1-signed.pdf

Action location map

- Waiʻoli-Action-locations-Shapefile.zip

Authorized individual

A. Uilani Tanigawa Lum

Authorization

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

WAIʻOLI VALLEY TARO HUI LONG-TERM WATER LEASE FOR TRADITIONAL LOʻI KALO CULTIVATION

DRAFT ENVIRONMENTAL ASSESSMENT

Kauaʻi Mokupuni, Haleleʻa Moku, Waiʻoli Ahupuaʻa, Hanalei Kalana

Applicant:
Waiʻoli Valley Taro Hui, Inc.

Prepared by:
A. Uʻilani Tanigawa Lum
Terina Faʻagau
Devin Kamealoha Forrest
Gloria Leilani Palma

with
The William S. Richardson School of Law's
Native Hawaiian and Environmental Law Clinics

In partnership with:
Tridason LLC

May 2021

WAIʻOLI VALLEY TARO HUI LONG-TERM WATER LEASE FOR TRADITIONAL LOʻI KALO CULTIVATION

DRAFT ENVIRONMENTAL ASSESSMENT

Kauaʻi Mokupuni, Haleleʻa Moku, Waiʻoli Ahupuaʻa, Hanalei Kalana

TMKs: (4) 5-4-003:999, (4) 5-5-005: 999, (4) 5-5-006: 999, (4) 5-5-007: 999, (4) 5-5-008: 999, (4) 5-5-009: 999, (4) 5-6-001: 999, (4) 5-6-002: 999, and (4) 5-6-004: 999

Approving Agency:
Department of Land and Natural Resources - Land Division
Kalanimoku Building
1151 Punchbowl St. Honolulu, Hawaiʻi 96813

Prepared for:
Waiʻoli Valley Taro Hui, Inc.
PO Box 1289 Hanalei, Hawaiʻi 96714

Prepared by:
A. Uʻilani Tanigawa Lum, Terina Faʻagau, Devin Kamealoha Forrest, and Gloria Leilani Palma
with The William S. Richardson School of Law Native Hawaiian & Environmental Law Clinics

In partnership with:
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PO Box 1361 Honolulu, Hawaiʻi 96807

May 2021

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Appendices

A. Summary of Pre-consultation Outreach for the Waiʻoli Valley Taro Hui Long-term Water Lease for Traditional Loʻi Kalo Cultivation. ("Pre-Consultation").

B. May 18, 2021 Commission on Water Resource Management Staff Submittal: Amend Interim Instream Flow Standards for Waiʻoli Stream in the Surface Water Hydrologic Unit of Waiʻoli (2018), Waiʻoli Stream, Haleleʻa, North Kauaʻi. ("CWRM May 2021 Submittal").

C. I Mano ka Waiʻoli: Sustaining the Joyous Waters, A Cultural Impact Assessment of the Waiʻoli Loʻi Kalo Irrigation System in Kauaʻi Mokupuni, Haleleʻa Moku, Waiʻoli Ahupuaʻa, Hanalei District. Prepared by Nohopapa Hawaiʻi, October 2020. ("CIA: I Mano ka Waiʻoli").

1. Introduction

1.1. Project Summary

Project Name:	Waiʻoli Valley Taro Hui Long-term Water Lease for Traditional Loʻi Kalo Cultivation
Applicant:	Waiʻoli Valley Taro Hui, Inc. PO Box 1289 Hanalei, Hawaiʻi 96714
Agent:	Tridason LLC PO Box 1361 Honolulu, Hawaiʻi 96807 Contact: Tricia Dang, Principal Telephone: 808.542.9251 / Email: info@tridason.com A. Uʻilani Tanigawa Lum Email: anelatan@hawaii.edu
Approving Agency:	State of Hawaiʻi Department of Land and Natural Resources – Land Division 1151 Punchbowl St. Honolulu, Hawaiʻi 96813 Contact: Ian Hirokawa Telephone: 808.587.0400 / Email: ian.c.hirokawa@hawaii.gov
Recorded Fee Owners:	State of Hawaiʻi Department of Land and Natural Resources – Land Division Kalanimoku Building 1151 Punchbowl St. Honolulu, Hawaiʻi 96813
Chapter 343, HRS Trigger:	Use of water that originates on State land and flows through the State Conservation District
Project Location:	Waiʻoli, Kauaʻi (Figures 1 and 2) Hanalei Kalana
District:	Hanalei, Kauaʻi
Tax Map Key (“TMK”):	The TMKs represent the location of Waiʻoli Stream and the Waiʻoli Loʻi Kalo Irrigation System, spanning nine (9) plat maps.

	(4) 5-4-003:999, (4) 5-5-005: 999, (4) 5-5-006: 999, (4) 5-5-007: 999, (4) 5-5-008: 999, (4) 5-5-009: 999, (4) 5-6-001: 999, (4) 5-6-002: 999, and (4) 5-6-004: 999
Existing Use:	Native Hawaiian loʻi kalo (wetland taro) cultivation
Proposed Action:	Waiʻoli Valley Taro Hui, Inc. ("Hui") will be requesting a 65-year water lease from the Board of Land and Natural Resources ("BLNR") for the ongoing traditional and customary Native Hawaiian use of water from Waiʻoli Stream for loʻi kalo cultivation, a cultural practice that has fed Waiʻoli Valley and its neighboring ahupuaʻa and people for centuries. Based on historic and existing use of this traditional irrigation system, and consistent with the Hawaiʻi Commission on Water Resource Management's 2021 numeric Interim Instream Flow Standard ("IIFS") for Waiʻoli Stream of 4.0 million gallons per day ("mgd") the Hui is requesting all water in excess of the amended IIFS, up to 13.5 mgd, as needed to support loʻi kalo cultivation on private land outside the Conservation district.
Project Area:	Waiʻoli is a perennial stream with a length of 5.4 miles and an additional 6.16 miles of actively maintained traditional loʻi kalo.
State Land Use Districts:	Conservation, Agricultural, and Urban (Figure 35)
Kauaʻi County Zoning:	Open Lands ("OP") and Agricultural ("AG")
Flood Zone:	Zones X, A, AE, and AE Floodway (Figure 31)
Anticipated Determination:	Finding of No Significant Impact ("FONSI")

1.2. Abbreviations and Glossary of Hawaiian Terms

Abbreviations

above mean sea level	amsl
Board of Land and Natural Resources	BLNR
Census County Division	CCD
Census Designated Place	CDP
cubic feet per second	cfs
Cultural Impact Assessment	CIA
Department of Agriculture	DOA
Department of Hawaiian Home Lands	DHHL
Department of Health	DOH
Department of Land and Natural Resources	DLNR
DLNR Commission on Water Resource Management	CWRM
DLNR Department of Fish and Wildlife	DOFAW
DLNR Division of Aquatic Resources	DAR
DLNR Office of Conservation and Coastal Lands	OCCL
Environmental Assessment	EA
Fahrenheit	°F
Flood Insurance Rate Map	FIRM
gallons per acre per day	gad
Hanalei Bay Watershed Management Plan	HBWMP
Hawaiʻi Administrative Rules	HAR
Hawaiʻi Revised Statutes	HRS
Hawaiʻi Stream Assessment	HSA
Instream Flow Standard	IFS
Instream Flow Standard Assessment Report	IFSAR
Interim Instream Flow Standard	IIFS
Integrated Report (Water Quality Monitoring and Assessment Report)	IR
mean sea level	msl
million gallons per day	mgd
National Climatic Extremes Committee	NCEC
National Wildlife Refuge	NWR

Office of Hawaiian Affairs	OHA
State Water Projects Plan	SWPP
Tax Map Key	TMK
Total Maximum Daily Loads	TMDL
U.S. Department of Agriculture	USDA
U.S. Fish and Wildlife Service	USFWS
U.S. Geological Survey	USGS
University of Hawaiʻi	UH
Waiʻoli Valley Taro Hui, Inc.	Hui
Draft Waiʻoli Valley Taro Hui Watershed Management Plan	Draft Hui Watershed Management Plan
Water Quality Plan	WQP
Water Quality Standards	WQS
Water Resources Protection Plan	WRPP

A note about language:

This EA relies upon and incorporates ʻōlelo Hawaiʻi[1] words and concepts fundamental to the Proposed Action and Kānaka Maoli[2] practices and worldviews. Often, when translating from ʻōlelo Hawaiʻi to English, or vice versa, a word does not have a direct translation, but rather there may be several interpretations that differ slightly. Further, a word may include layers of meaning and nuances that this Enivironmental Assessment endeavors to explain to accurately encapsulate the worldview and promote a full understanding.

The report uses many commonly used Hawaiian words to support cultural and ʻāina-based education and context. As an official language of the State of Hawaiʻi, we have chosen to use ʻōlelo Hawaiʻi in an effort to document and use Waiʻoli's traditional words and understandings, while also acknowledging that other practitioners may use different words, phrases, and descriptions.

The following glossary provides various context and translations from ʻōlelo Hawaiʻi to English for words that are used more than once in this EA. The translation is also defined in a footnote when it is first used within the body of this document.

Glossary of Hawaiian Terms

ʻai pono	eating healthy foods
ʻai paʻa / paʻi ʻai	cooked taro pounded into a hard mass not mixed with water
ʻāina	land, that which feeds
ahupuaʻa	land division
aloha ʻāina	caring/love for the land

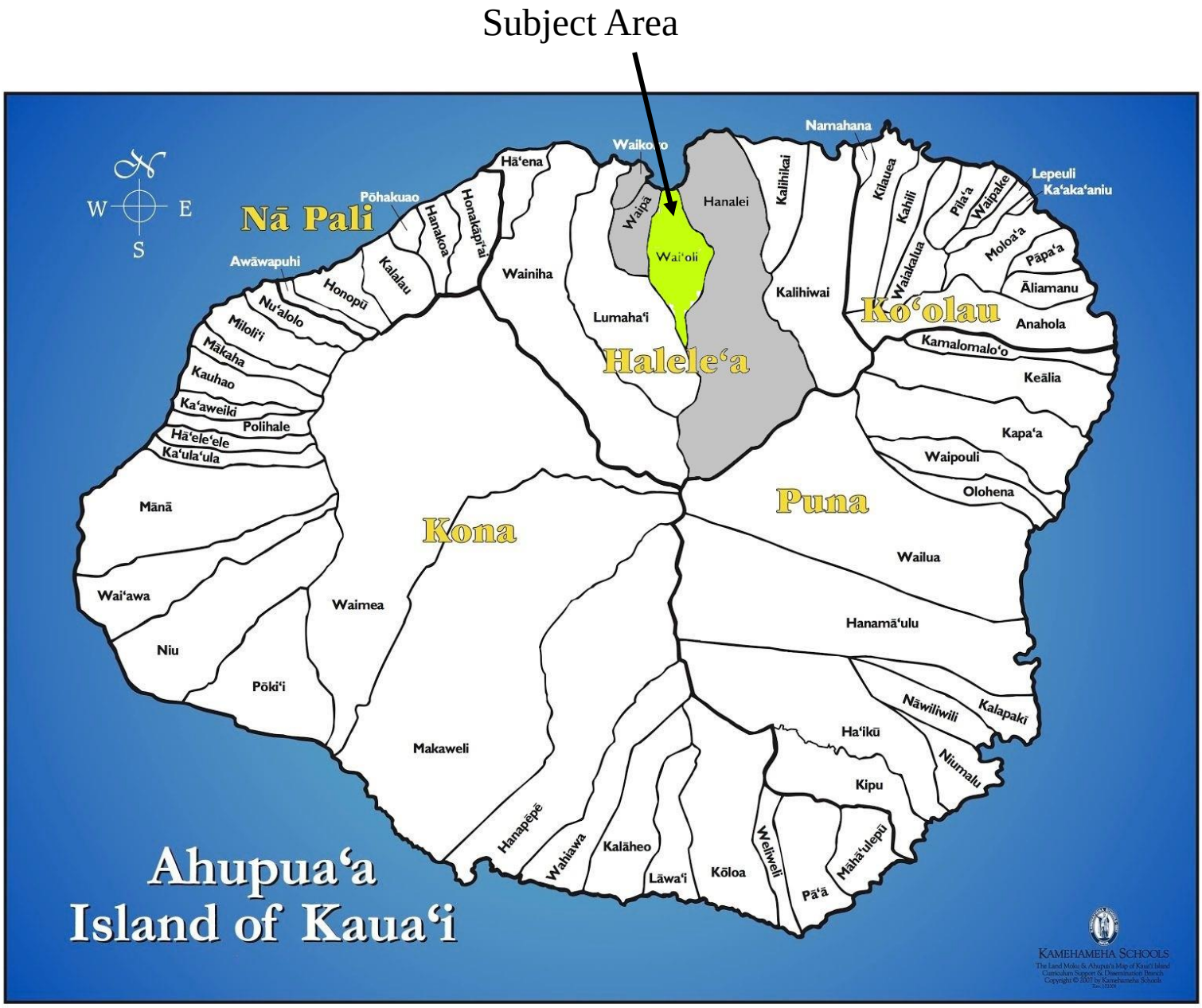
[1] Hawaiian language.
[2] Native Hawaiian.

ʻauwai	irrigation ditch used to transport water from one place to another
hā	stem or petiole of kalo
hoʻi	outtakes or return. The place where the water leaves the loʻi and returns to the stream
hoʻolako	to supply, provide, enrich, having enough to share with others
huli	portion of kalo that is re-planted after removing leaf and corm; similar to the concept of a plant seed or keiki, crown of corm or ʻiʻo
ʻike	knowledge, experience, awareness, the practice of learning by doing and adapting
ʻiliʻili	pebbles, small stones
ʻiʻo	corm
kahawai	stream, a source of water that begins in the mountains
kalo	taro, or *Colocasia esculenta*
kalo paʻa	cooked table kalo
kamaʻāina	people of the place; literally, a child (kama) of the land (ʻāina)
Kānaka Maoli	Native Hawaiian
kalana	area or sub region; a traditional Native Hawaiian land division term associated more with systematic biocultural resource management and community identity rather than governance
kīpuka	a variation or change in form; a hole; as a clear place or oasis of vegetation surrounded by a lava bed
kuāuna	bank or border of a kalo patch
kuleana	responsibility, right, privilege, innate duty
lau, lūʻau	kalo leaf
loʻi	flooded terraces
loʻi kalo	wetland irrigated field for taro where water passes through and corms are submerged
Loʻi Kalo Irrigation System	traditional Native Hawaiian irrigation system used for kalo cultivation; used to divert stream water from the stream

	to the loʻi. Water flowing from the ʻauwai into the loʻi can be controlled. Water eventually returns to the main stream via hoʻi and empties into the sea.
loko iʻa puʻuone	inter-tidal fishpond
loliloli, loli	soft, water soaked
mahiʻai	farmer
ma kai	to / towards the ocean
mālama ʻāina	to care for the land
mana wai	tributary
mānowai	breakaway dam rock structure that slows the water to help channel it into the subsequent Loʻi Kalo Irrigation System
ma uka	to / towards the mountain
moku	division; one smaller than island
moʻolelo	story, tradition, literature, Hawaiian history
muliwai	stream / river mouth
nūpepa	Hawaiian language newspapers
pae ʻāina	archipelago
pilina	relationships, connection, association
pono	just, moral, correct or proper
poʻowai, poʻo	headwater where water enters into the irrigated ditches where it flows until reaching the loʻi
wai	fresh water
wai hālau	an area with a large number of tributaries, similar to a watershed or basin

1.3. Purpose of the Environmental Assessment

As a requirement to secure a long-term water lease, this Draft Environmental Assessment ("DEA" or "Draft EA") has been prepared pursuant to Hawaiʻi Revised Statutes ("HRS") section 171, HRS chapter 343, and Hawaiʻi Administrative Rules ("HAR") title 11, chapter 200.1. Compliance with HRS chapter 343 and HAR title 11 is triggered by the use of water that originates on State land and flows through the State Conservation District and is later used for kalo cultivation on private land located within the State Agricultural District. **See Figure 1, Location Map and Figure 2, Hanalei Bay Watershed and State Land Use District Map.**



Source: KSBE. Kauai a Manokalanipo, 2020

Hanalei Bay Watershed

Waiʻoli Stream Watershed

Ahupuaʻa (land division) Boundaries

Moku (district) Boundaries

Figure 1: Location Map

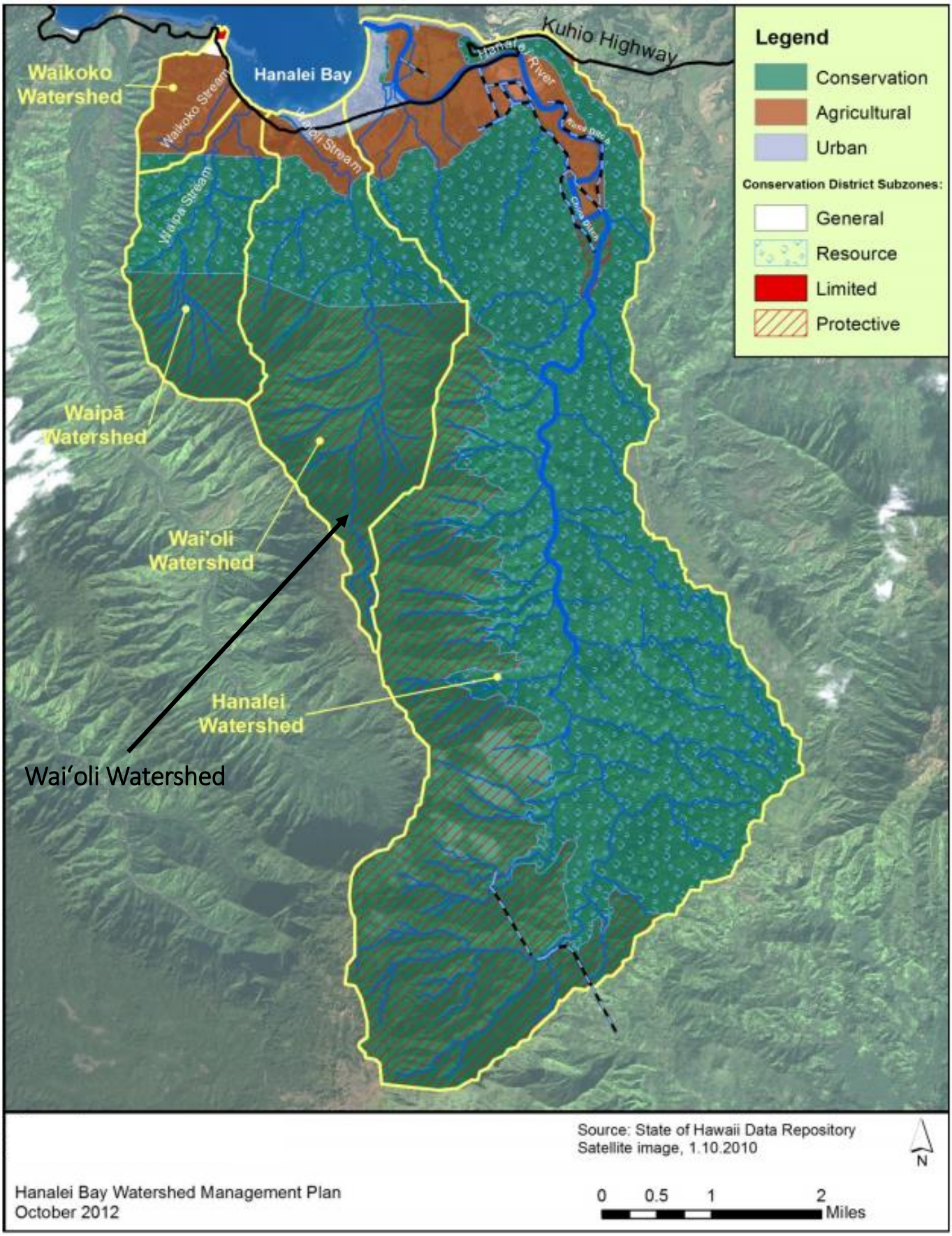


Figure 2: Hanalei Bay Watershed and State Land Use District Map

1.3.1. Framing for the Environmental Assessment

Hanalei, the district traditionally known as Halele‘a, is a revered place. Wai‘oli Ahupua‘a is a part of what was once commonly known as the larger Hanalei Kalana[3] (Ka Leo Hawai‘i, H.V. 24:14, 9 November 1972). Kalana is a traditional Native Hawaiian land division term associated more with systematic biocultural resource management and community identity rather than governance (Winter et al., 2018, 4-5). This Draft EA aims to describe kalo[4] cultivation generally, and in Wai‘oli Valley specifically, while also focusing on the requirements of the Hawai‘i Revised Statutes (“HRS”) chapter 343. **See Figure 3, Wai‘oli Ahupua‘a.**

This document was written on behalf of the Wai‘oli Valley Taro Hui, Inc. (“Hui”) representing a little over a dozen individuals who each have a unique personal and family history with kalo, kalo cultivation, and Wai‘oli Valley. As a reflection of its kūpuna, and as the Hui’s ancestral homeland, most of the Hui can trace their genealogy to Wai‘oli Valley specifically. The practice of kalo cultivation in Wai‘oli is noted extensively and outlined throughout this Draft EA. To understand the purpose of this document, it is important to first provide context about kalo and Kānaka Maoli (Native Hawaiian) history and worldviews.

Kalo cultivation is firmly rooted in mo‘olelo Hawai‘i,[5] traditional and customary practices, and ‘āina.[6] It is a “vital part of the cultural and agricultural traditions of [N]ative Hawaiians” (Gingerich et al., 2007). In Hawaiian cosmology, kalo is revered as the elder brother of Kānaka Maoli and establishes humans’ familial relationship with ‘āina. The first kalo plant sprouted from the grave of Hāloanaka, the first child of Wākea[7] and Ho‘ohōkūkalani.[8] David Malo recalls the origin story of kalo:

> *The first born son of Wakea was of premature birth (keiki alualu) and was given the name Haloa-naka. The little thing died, however, and its body was buried in the ground at one end of the house. After a while from the child’s body shot up a taro plant, the leaf of which was named lau-kapa-lili, quivering leaf; but the stem was given the name Haloa. After that another child was born to them, whom they called Haloa, from the stalk of the taro. He is the progenitor of all the peoples of earth* (Malo, 1903, 320).

Mary Kawena Pukui expounds on Malo’s account with her own Hāloa tradition from her homeland in Ka‘ū, Hawai‘i:

> *The first Haloa, born to Wakea and Hoohokukalani, became the taro plant. His younger brother, also named Haloa, became the ancestor of the people. In this way, taro was the elder*

[3] Area or sub region; a traditional Native Hawaiian land division term associated more with systematic biocultural resource management and community identity rather than governance.
[4] Taro, *Colocasia esculenta*.
[5] Hawaiian history.
[6] Land, that which feeds.
[7] Sky father.
[8] Daughter of Papa, earth mother.

> *brother and man the younger--both being children of the same parents. Because our chiefs were of the senior line, they were referred to in respect and affection as "kalo kanu o ka aina" (The taro grown in the homeland) by the junior branches of the family* (Handy et al., 1991, 80).

Dr. Lilikalā Kameʻeleihiwa notes that this relationship between ʻāina and kānaka[9] is informed by kānaka's role as the younger sibling (Kameʻeleihiwa, 1992). Out of this relationship arises a kuleana[10] and duty to mālama ʻāina.[11] In many ways, kalo cultivation is the manifestation of both aloha ʻāina[12] and mālama ʻāina. Importantly, these concepts go beyond cultural values and mere feelings; they are practices grounded in ʻike[13] and relationships. These lifeways are integral to "Kānaka Maoli survivance for generations" and serve as links to the past and connections to the land and sea as sources of life (Goodyear-Kaʻōpua, 2013).

In addition to kalo itself, wai[14] that flows through and feeds the loʻi kalo is held in highest esteem. For Hawaiʻi's people, culture, and resources, ola i ka wai.[15] Spiritually, water is revered as a kinolau[16] of Kāne, one of the principal akua[17] in the Kānaka Maoli pantheon (Sproat, 2009). Kāne was the "embodiment of male procreative energy in freshwater, flowing on or under the earth in springs, in streams and rivers, and falling as rain (and also as sunshine), which gives life to plants" (Handy et al., 1991, 64).

As a modern day practice, the practice of kalo cultivation is still holistic, with the farmer recognizing the connection of his or her work to the "land, the streams and the reefs" (Taro Security and Purity Task Force, 2009). The details of kalo cultivation are very personal, and like many traditional and customary practices, vary by island, by ʻohana, and by farmer. Describing the Proposed Action under HRS chapter 343 at times seems to be finite or inflexible, especially given that this Draft EA evaluates the use of stream water as opposed to a defined project site. Further, the practice of kalo cultivation is constantly evolving and the Hui feels that they are part of Waiʻoli's kalo growing lineage and continue to learn and grow with the kalo.

This Draft EA outlines techniques and practices that are representative of and specific to the Hui. These practices were learned and refined through actively working on the land, passed down through oral and family traditions, written sources, and from the network of kalo growers and researchers throughout Waiʻoli, Hanalei Kalana, Kauaʻi, and the larger Hawaiʻi pae ʻāina.[18] It is important to

[9] Human.
[10] Responsibility, right, privilege, innate duty.
[11] Care for the land.
[12] Love of the land. *See* NOENOE K. SILVA, THE POWER OF THE STEEL-TIPPED PEN: RECONSTRUCTING NATIVE HAWAIIAN INTELLECTUAL HISTORY 4 (2017) (highlighting that "aloha ʻāina is a complex concept that includes recognizing that we are an integral part of the ʻāina and the ʻāina is an integral part of us."); KEKUEWA KIKILOI, REBIRTH OF AN ARCHIPELAGO 75 (2010) (asserting that "'āina sustains our identity, continuity, and well-being as a people.").
[13] Knowledge, experience, awareness.
[14] Water.
[15] Water is life.
[16] Physical Manifestation.
[17] God or diety.
[18] Hawaiian archipelago.

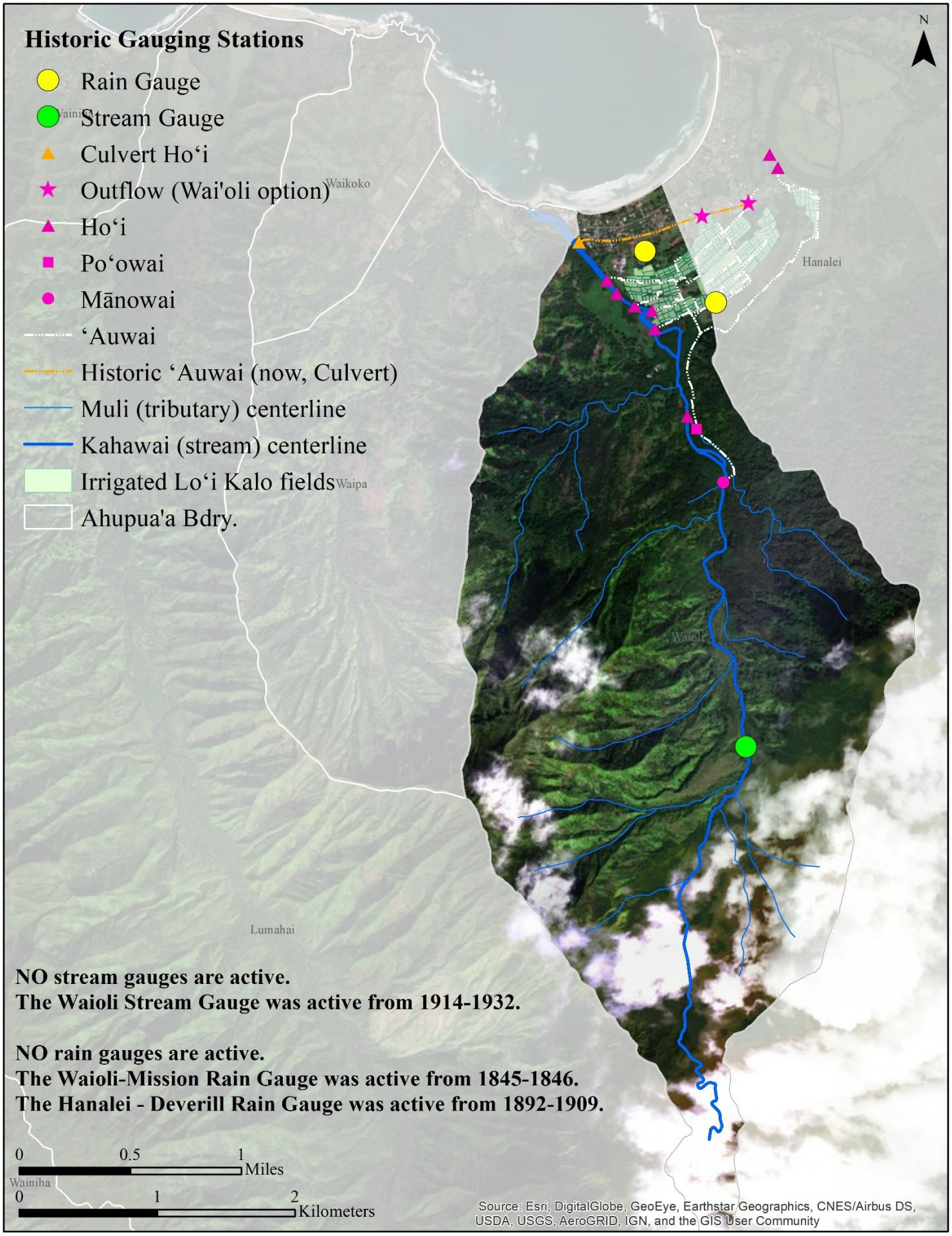


Figure 3: Wai‘oli Ahupua‘a

note that other kalo farmers, practitioners, or researchers may not use these same terms or methods shared within this report. This EA generally encapsulates the array of practices within Waiʻoli and is written by a planning consultant, a malihini[19] to Waiʻoli, to articulate the Proposed Action to fit into the framework of HRS chapter 343.

The Hui's practice of kalo cultivation in a traditional manner is constitutionally protected as a traditional and customary Native Hawaiian practice and is a shining example of one important aspect of the State's environmental policy. In an effort to secure the legal entitlements to effectuate these important provisions, the Hui seeks to secure necessary legal authority to perpetuate kalo cultivation for generations to come.

1.4. Agencies, Organizations and Individuals Contacted in Early Consultation

Following the devastating 2018 floods on the North Shore of Kauaʻi, government agencies, organizations, and community members came forward to address the damage. This included initiating the repair of the the traditional Loʻi Kalo Irrigation System[20] that utilizes Waiʻoli Stream for kalo cultivation. Specific to this Draft EA, pre-consultation included various agencies with jurisdiction over specific permits and organizations and individuals that have expertise and/or connections to the Proposed Action and ʻāina. **See Appendix A, Pre-consultation.**

Agencies expressed support for the Proposed Action as a reflection of community-led collaboration and natural resource management, and they also highlighted the significance of kalo cultivation as a Native Hawaiian traditional and customary practice and kalo's contribution towards food security. Agencies and stakeholders provided background information and related documents and responded to specific questions related to agency and stakeholder-led studies and plans utilized in this Draft EA. The list of agencies, organizations, and individuals contacted is provided in Part 8 of the Draft EA and in Appendix A.

2. Background

The Proposed Action is the use of Waiʻoli Stream water to support traditional loʻi kalo cultivation, a unique, ongoing, and traditional and customary Native Hawaiian practice. It proposes the use of less than what has been historically documented in Waiʻoli Valley – both in terms of kalo cultivation and in water use. The Proposed Action does not propose any structures, infrastructure, or additional use of State land. Rather, this Draft EA is part of the process to request a long-term water lease that will ensure the necessary cool, free flowing water for traditional kalo cultivation. Importantly, disaster recovery efforts in the wake of the 2018 floods determined that the Hui's mānowai[21] was on State Conservation land. So, this EA seeks legal approval for a Native Hawaiian use that has persevered in Waiʻoli Valley for centuries.

[19] Newcomer, guest.
[20] Traditional Native Hawaiian irrigation system used for kalo cultivation; used to divert stream water from the stream to the loʻi. Water flowing from the ʻauwai into the loʻi can be controlled. Water eventually returns to the main stream via hoʻi and empties into the sea.
[21] Native Hawaiian break-away structure that diverts some water from Waiʻoli Stream into the Loʻi Kalo Irrigation System.

Unlike projects typically reviewed under HRS chapter 343, this action does not have a precisely defined perimeter. Water use for kalo cultivation, as the focus of this EA and as this Proposed Action proposes, is a product of the hydrologic cycle; from precipitation that reaches inland that then becomes flowing surface and ground water. The Proposed Action focuses on the surface water that flows through the existing Loʻi Kalo Irrigation System as an instream, throughflow system that works in coordination with the natural environment. Throughflow is water that flows through the loʻi and carries heat away; throughflow is needed to meet the cooling requirements of the loʻi (Gingerich et al., 2007). Throughflow is distinct from water that is "consumed." "Used" water is water that is lost to percolation through the soil, transpiration by the plant, and evaporation. Together, throughflow and used water comprise the total water flowing into the loʻi, or the "inflow." Although water is only one of many physical components needed for kalo cultivation, without its quality and quantity, loʻi kalo cultivation would be impossible.

Pre-contact, Kānaka Maoli engineered loʻi[22] and related agriculture irrigation in alluvial plains and valleys with sufficient stream resources, enabling them to transform vast areas into farmland to support kalo production. Complex ʻauwai[23] were built to direct and redirect water from free-flowing streams, controlling water flow and circulation within the system to prevent stagnation, keep water and also kalo temperatures low to prevent disease (Kurashima et al., 2019).

Like many Indigenous Peoples throughout the Pacific, kalo is the primary staple crop of Native Hawaiians, achieving agricultural dominance prior to Western contact in Hawaiʻi. Thus, kalo nourished the bodies of the earliest Hawaiian people becoming a traditional cultural food source that is the foundation of ʻai pono.[24] Preparing and eating traditional foods such as kalo (e.g., poi, paʻiʻai, kūlolo, laulau, and lūʻau) that incorporate the lau,[25] ʻiʻo,[26] and hā[27] are a bedrock of health in Native Hawaiian communities (Shintani et. al. 1991).

While the vast environmental benefits and habitat creation that loʻi provided for Native species were not always evaluated by Western measurements, recent scholarly research confirms what has sustained Kānaka Maoli for generations: loʻi are instrumental and ideal conservation efforts that promote, protect, and perpetuate Native species because these species have adapted to these ancient systems (USDA, 2009). Loʻi are, therefore, not only culturally important and have significant connections to Kānaka Maoli custom, practices, and communities, but they also play a vital environmental role in the preservation of endemic and Indigenous species, many of which are found nowhere else in the world.

2.1. About the Applicant

The Proposed Action is led by a group of small-scale family farmers who have lived and farmed in Waiʻoli for generations. Collectively, the Hui has been cultivating kalo in Waiʻoli to continue the

[22] Flooded terraces.
[23] Irrigation ditch used to transport water from one place to another.
[24] Eating healthy foods.
[25] Leaf.
[26] Corm.
[27] Stem.

work of their kūpuna and to maintain a traditional food source to feed family, friends and community. The Hui has also assumed primary kuleana over maintaining Wai‘oli Stream (e.g., clearing debris especially after storms, monitoring water flow and quality, etc.). **See Draft Hui Watershed Management Plan.**

The Hui relies and acts upon intergenerational knowledge passed down throughout Kaua‘i generally, and Wai‘oli Valley specifically. By sharing experiences, adapting to natural changes, and stewarding this ‘āina for decades, the farmers of the Hui have practiced kilo[28] and have learned through ma ka hana ka ‘ike[29] (Pukui, 1983). They intimately understand the ‘āina in Wai‘oli, the movement of the earth, and the rhythm and patterns found in the natural environment. This informs and guides their place-based practices and processes of kalo cultivation in Wai‘oli.

The throughflow that supports kalo cultivation naturally flows from its source, its wai hālau,[30] to the ocean. The Proposed Action flows across nine (9) plat maps before reaching Hanalei Bay. The Tax Map Keys (TMKs) that represent Wai‘oli Stream and the Wai‘oli Lo‘i Kalo Irrigation System include: (4) 5-4-003:999, (4) 5-5-005: 999, (4) 5-5-006: 999, (4) 5-5-007: 999, (4) 5-5-008: 999, (4) 5-5-009: 999, (4) 5-6-001: 999, (4) 5-6-002: 999, and (4) 5-6-004: 999. **See Figures 4 to 13, Tax Map Keys of Wai‘oli Stream and Wai‘oli Lo‘i Kalo Irrigation System.**

The Hui’s request for a long-term water lease requires the completion of the HRS chapter 343 environmental review process, consultation with DHHL and DLNR - Office of Conservation and Coastal Lands, completion of a Watershed Management Plan, and the establishment of numeric Interim Instream Flow Standards (“IIFSs”) with the Commission on Water Resource Management. Several of these steps are well underway, if not completed by the time of publication.

For the Hui, kalo cultivation is both an individual and collective kuleana. It connects families over generations and is a time-honored part of this community’s history and legacy. For instance, kalo farming defines the Kaona ‘ohana, whose practice spans four (4) generations. The eldest member of the Kaona family is 100% Native Hawaiian and continues to farm full-time on his ‘ohana’s kuleana land. With a lifetime of knowledge, Clarence “Shorty” Kaona’s understanding of the process of caring for kalo and resources continues to be passed down to the next generation. A portion of this kuleana is ensuring that the lo‘i kalo, the traditional Lo‘i Kalo Irrigation System, and supporting ecosystems are also cared for and balanced as they are all important to sustain generations to come (Kaona, 2019).

In response to the severe April 2018 flooding on the North Shore of Kaua‘i, the farmers formally organized to establish themselves as the Wai‘oli Valley Taro Hui. The Hui is a 501(c)(3) domestic non-profit corporation with federal tax-exempt status for the purposes of education and community engagement to empower future generations with traditional knowledge. The Hui, as a legal entity, has the ability to work directly with government agencies as well as apply for and hold permits. Pursuant to its articles of incorporation:

[28] The practice of keen observation.
[29] The practice of learning by doing and adapting.
[30] An area with a large number of tributaries, similar to a watershed or basin.

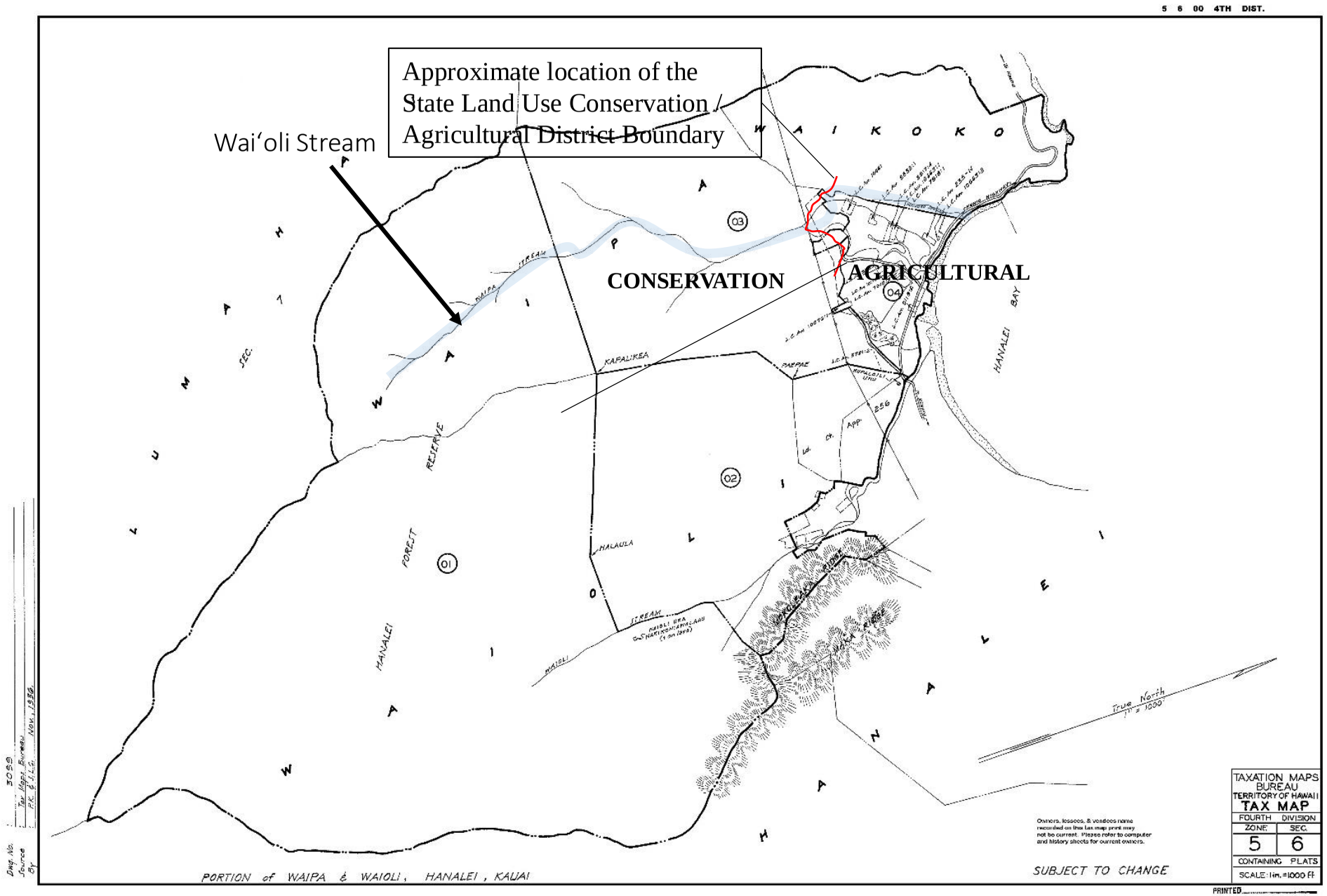


Figure 4: TMK Overview of Upper Wai'oli Stream and Wai'oli Lo'i Kalo Irrigation System

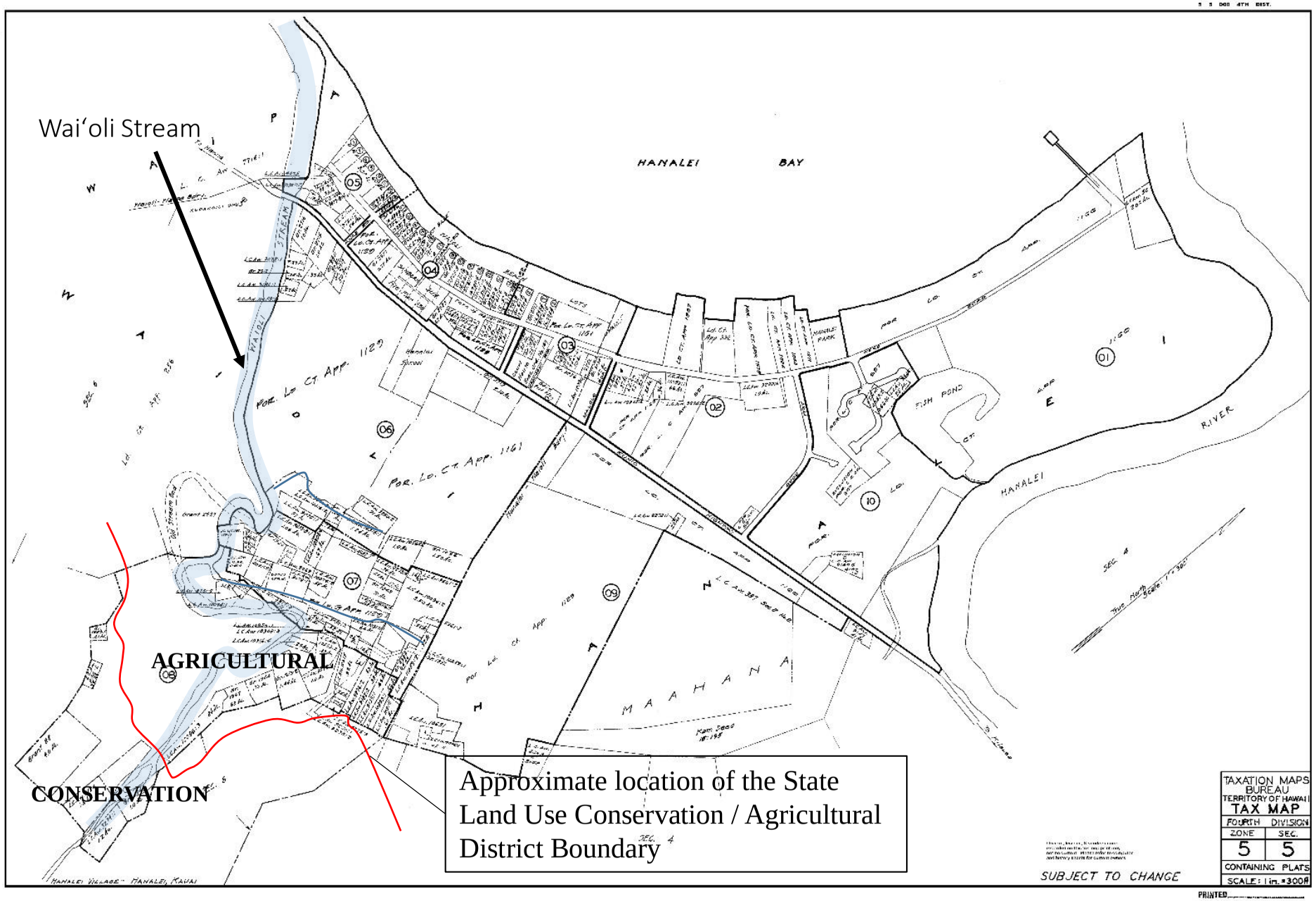


Figure 5: TMK Overview of Lower Wai‘oli Stream and Wai‘oli Lo‘i Kalo Irrigation System

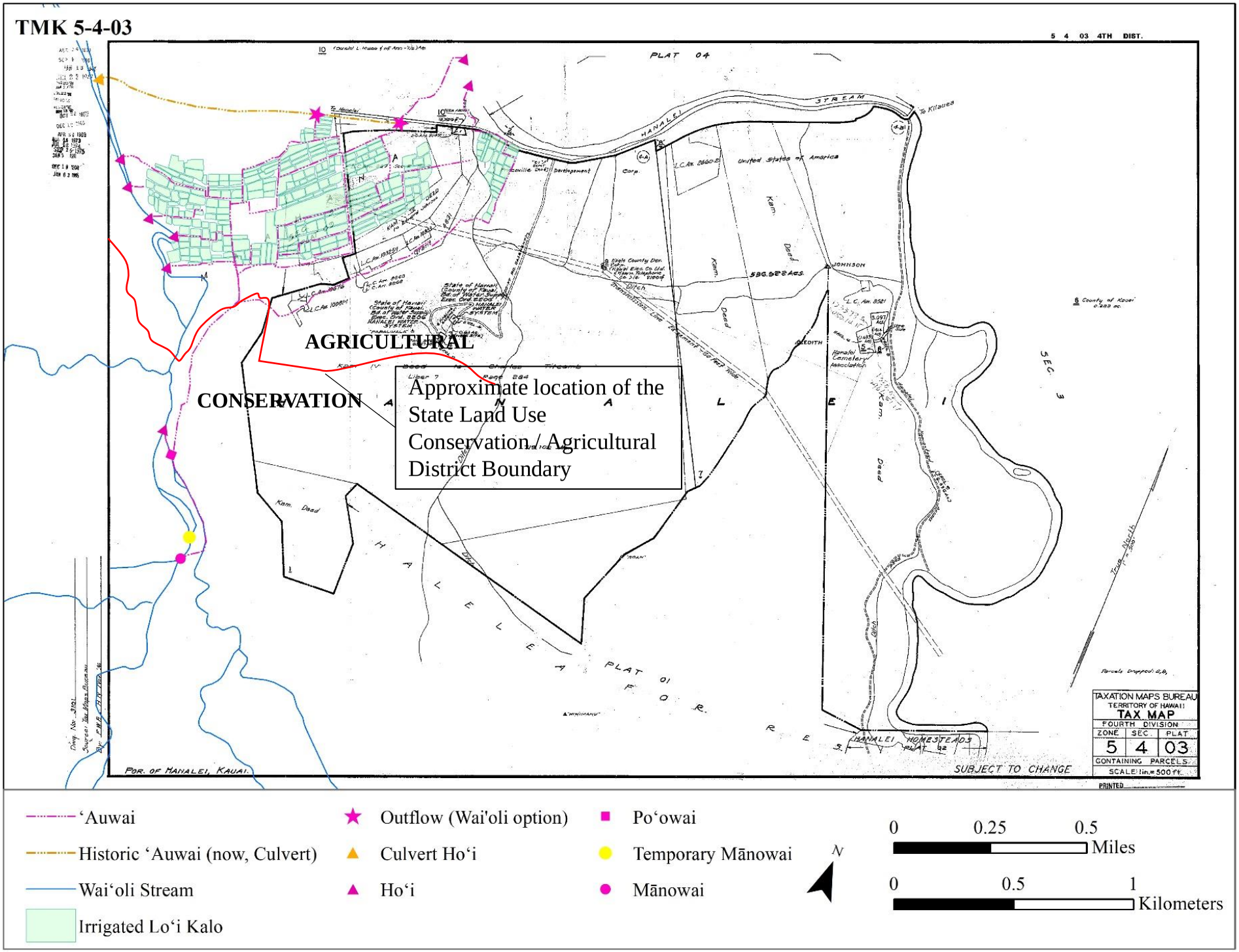


Figure 6: TMK 5-4-003:999

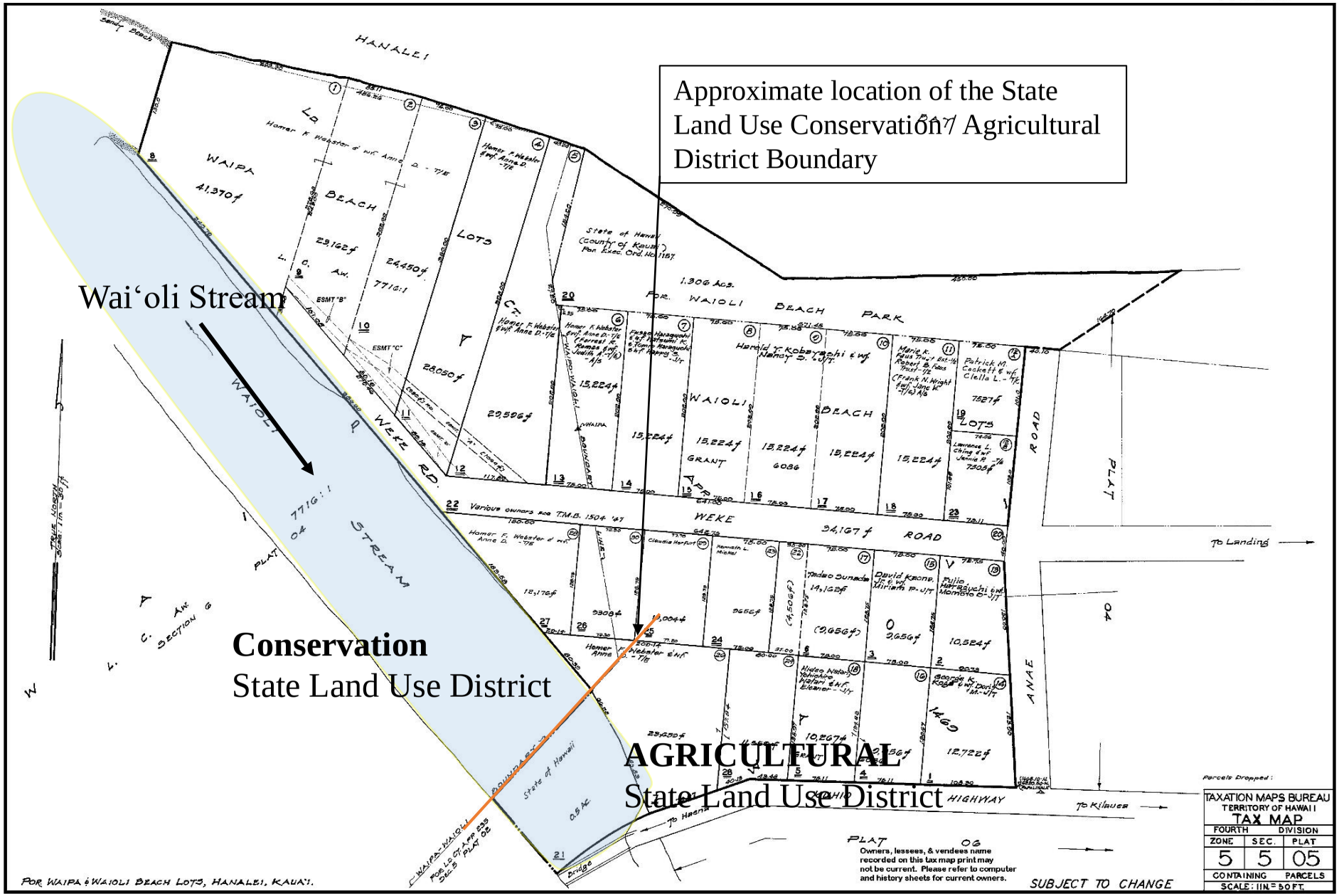


Figure 7: TMK 5-5-005:999

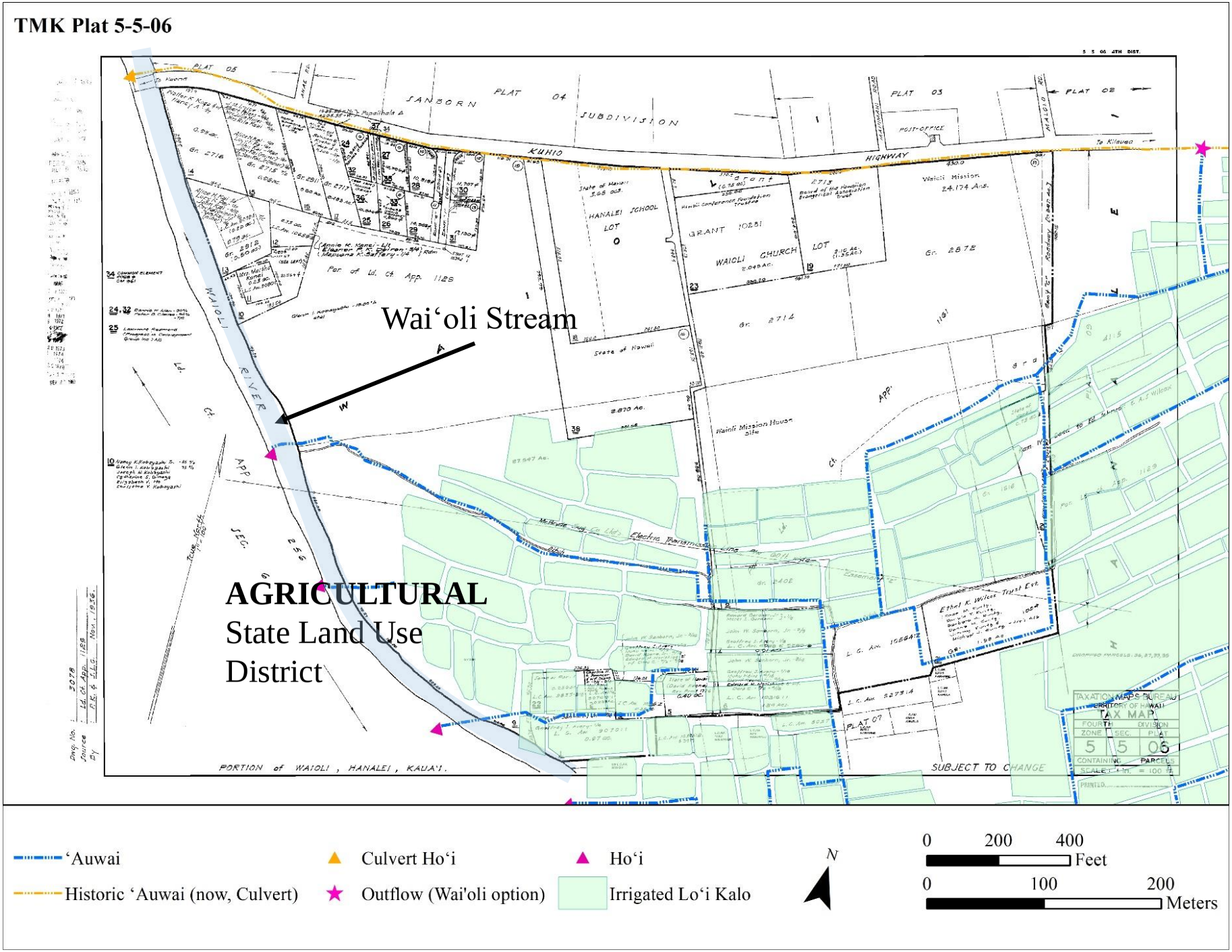


Figure 8: TMK 5-5-006:999

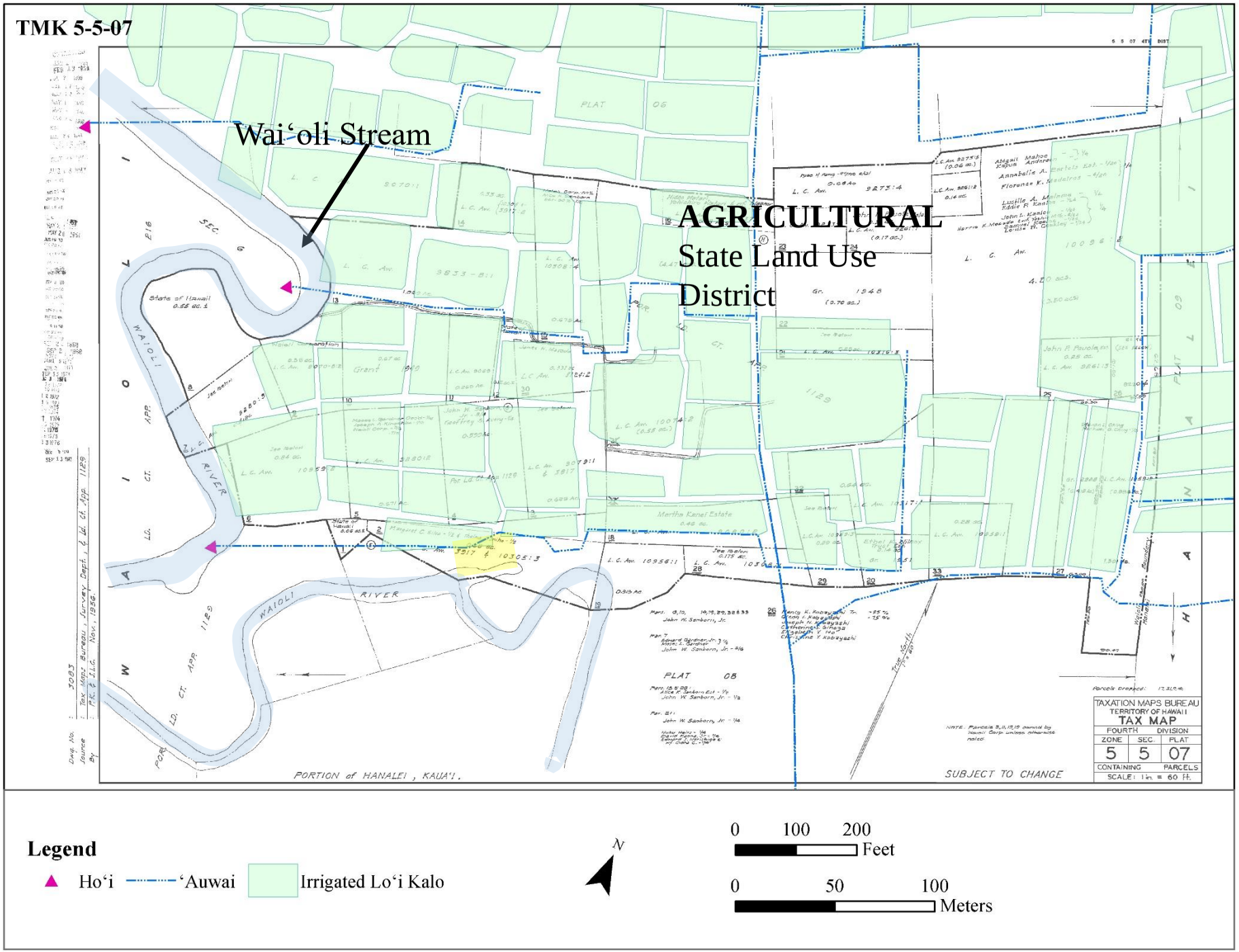


Figure 9: TMK 5-5-007:999

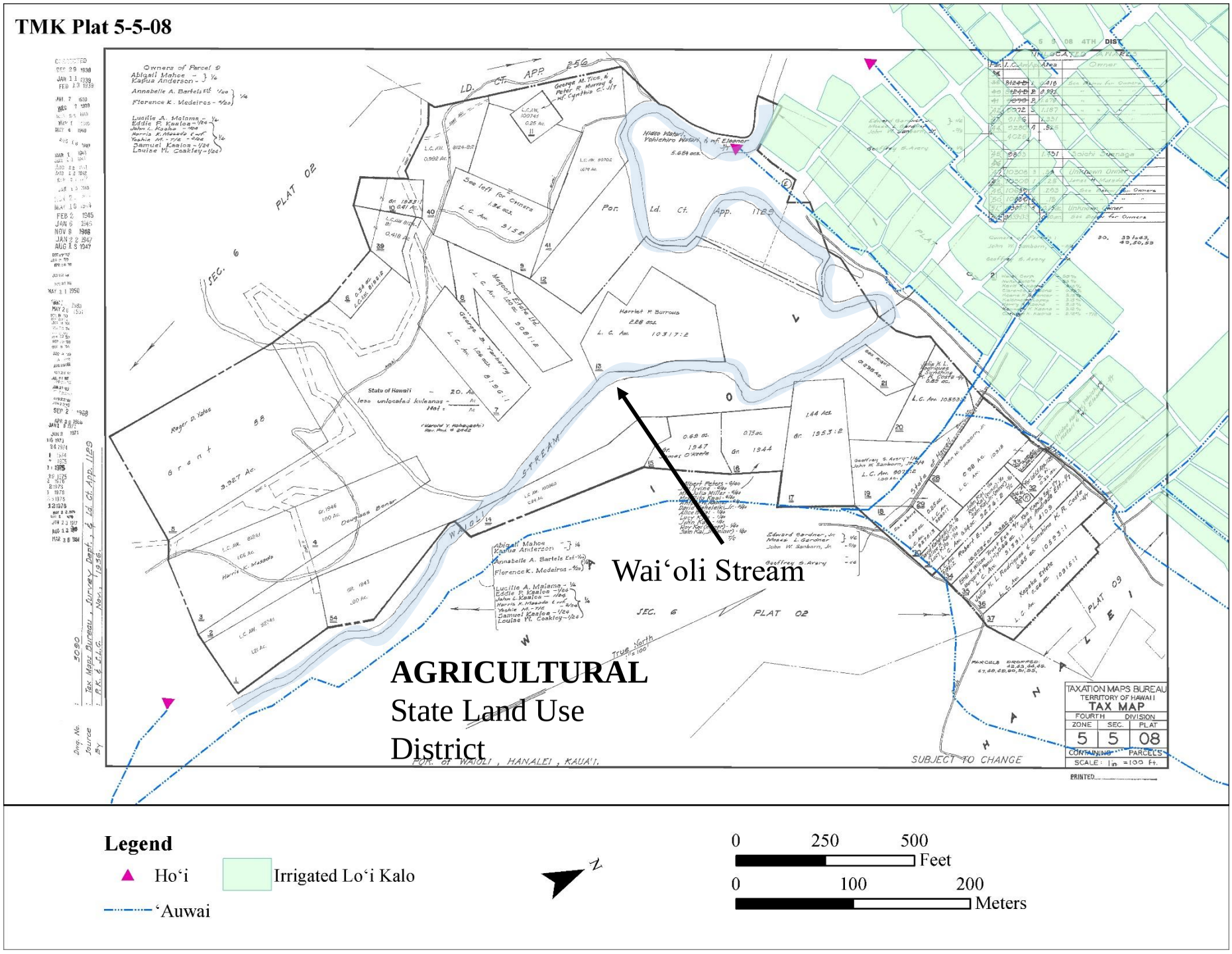


Figure 10: TMK 5-5-008:999

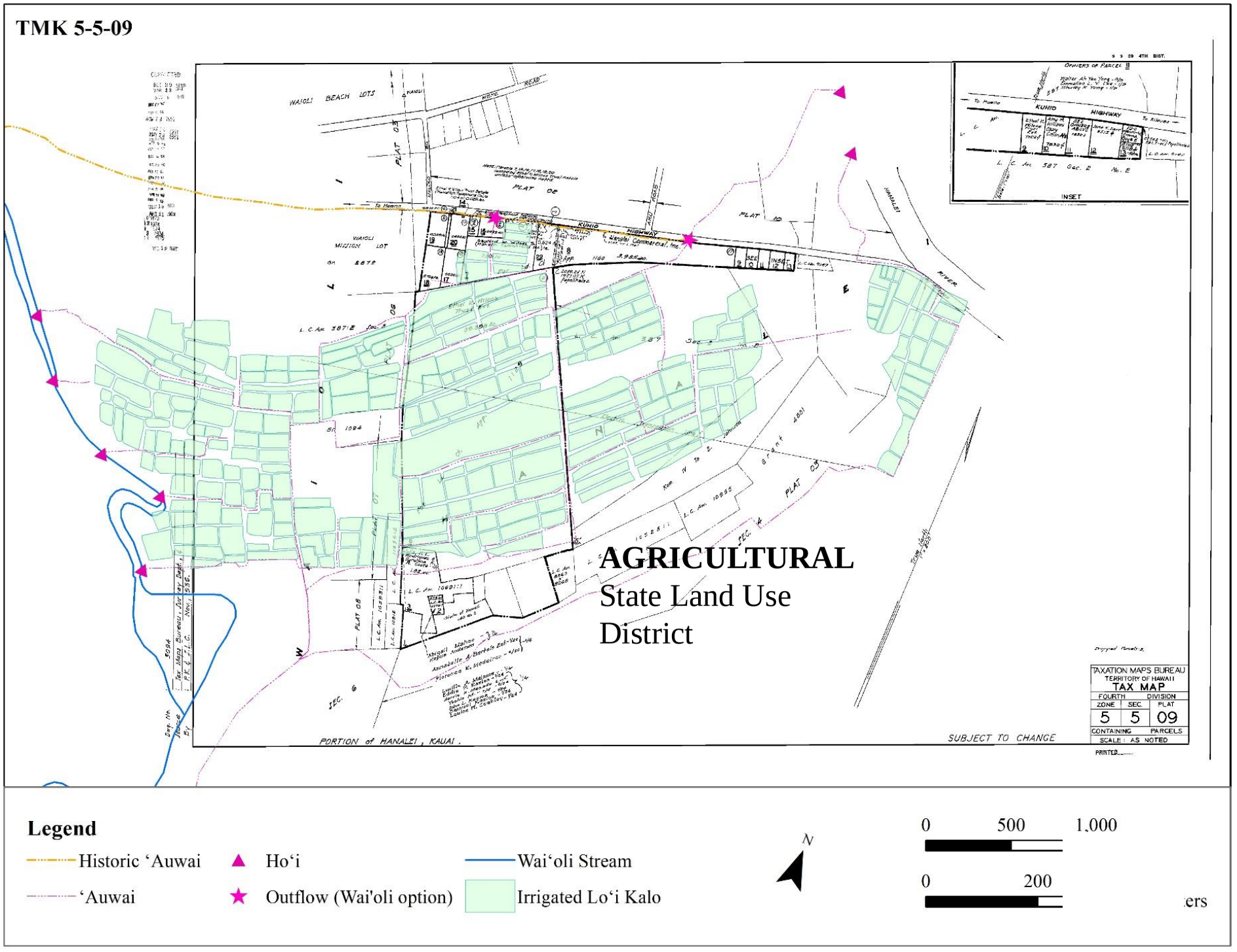


Figure 11: TMK 5-5-009:999

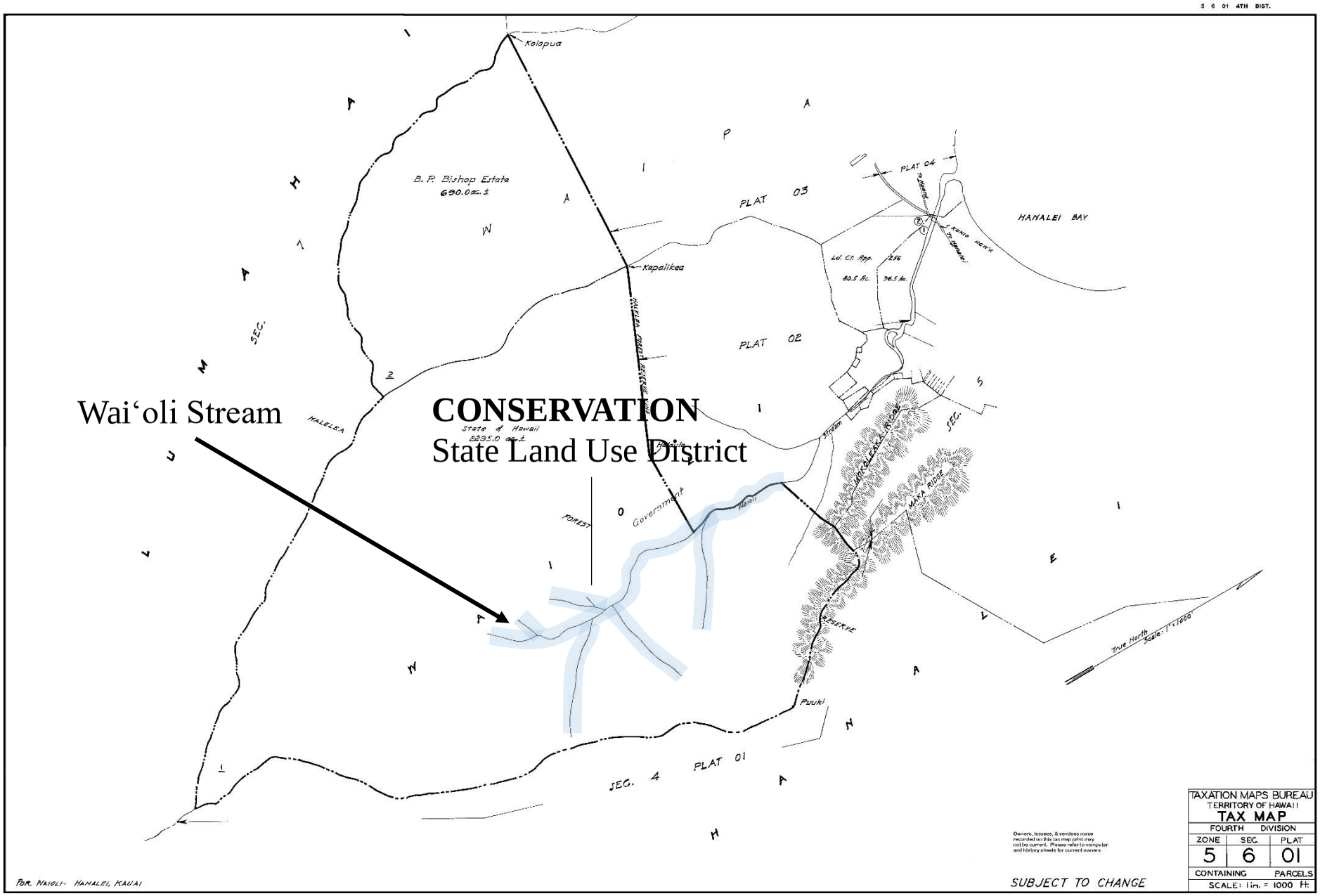


Figure 12: TMK 5-6-001:999 (Upper Reach)

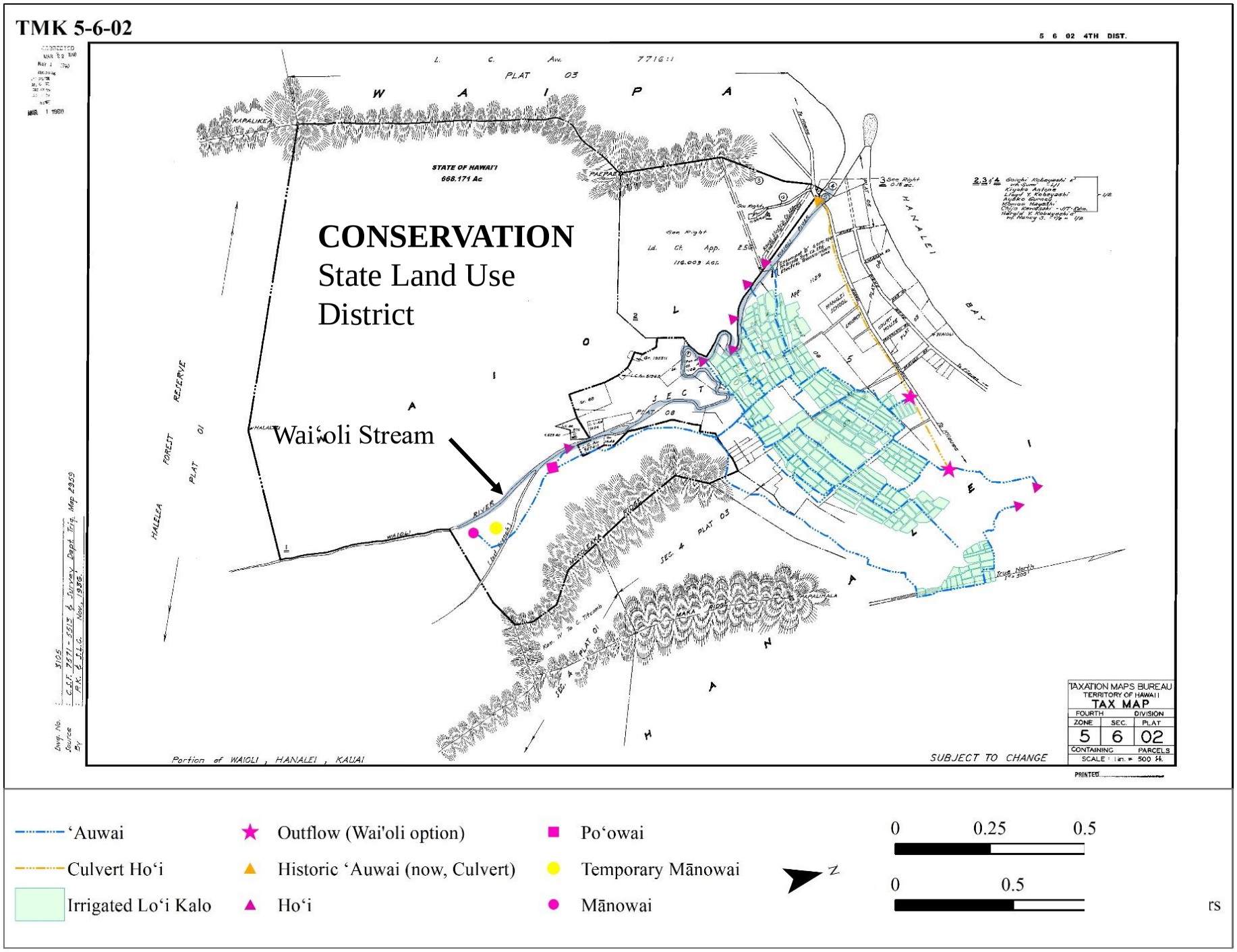


Figure 13: TMK 5-6-002:999

> *The Hui supports and enhances mauka to makai biocultural resources in the Waiʻoli Valley watershed, protects natural and cultural resources that enable traditional and customary Native Hawaiian practices, maintains habitat(s) for endangered Hawaiian waterbirds, and engages the larger Kauaʻi communities through educational outreach programs and initiatives related to kalo farming and community-based stewardship of water resources.*

Today, the Hui consists of 14 farms and 16 kalo farmers in Waiʻoli Valley, whose families have been living and working in Waiʻoli for generations. These families operate small-scale farms that range from half (1/2) an acre to eight (8) acres in size with a majority on the smaller size. The farmers primarily farm on privately owned lands in Waiʻoli Valley. At most, the Hui identifies approximately 84 acres of loʻi kalo within its collective complex. Together, the Hui historically produced an estimated two (2) to three (3) million pounds of kalo annually. An additional 45 acres of both leased and privately-owned lands include loʻi kuāuna,[31] access roads, and pathways. These lands also host a variety of other plants gathered and utilized by the Hui (e.g., hala, kukui, kī, maiʻa, hau, etc.).

The Hui has collaborated informally for over a century to steward and maintain Waiʻoli Valley's natural and cultural resources. Within the Hui, nearly all the farmers were raised growing kalo in Waiʻoli, learning the practice from their parents, grandparents, and, for some, their great grandparents. Today, the Hui still maintains pilina[32] to this ʻāina; and, while many of the farmers still live in Waiʻoli Valley, others live in nearby communities, including Hawaiian Home Lands in Anahola.

As a constitutionally protected traditional and customary Native Hawaiian practice, kalo cultivation is a cultural lifeway and is foundational to the community's identity. For many kalo farmers, kalo cultivation actively maintains their connection to ʻāina and ʻohana. The Hui humbly recognizes the importance of passing on generational knowledge and this cultural practice to their families and others committed to learning and practicing this way of life. The Hui does not wish to engage in or create a profit-driven system; rather, the Hui seeks to continue to uphold the nohona[33] of the North Shore of Kauaʻi. The Hui also aims to hoʻolako[34] and feed kamaʻāina[35] as a means to sustain and maintain a relationship-based economy with shared values of aloha ʻāina – aloha for each other and aloha for the land – as a kahua[36] for Haleleʻa.

The Hui, similar to many loʻi kalo farmers across Hawaiʻi, relies on the surrounding watershed, its water, and the Loʻi Kalo Irrigation System to support and perpetuate kalo cultivation. For Waiʻoli, the system of interconnected fields and flowing water has defined the Waiʻoli plain for hundreds of years, producing Native and rare kalo varieties. Once harvested, this important food source is processed into poi and other kalo products (e.g., lūʻau leaf, kalo paʻa, etc.). Majority of the Waiʻoli kalo is processed by Waipā Foundation in the neighboring ahupuaʻa of Waipā. In line with Kānaka Maoli familial ties to kalo as their elder brother, community members in Haleleʻa, Kauaʻi measure

[31] Bank or border of loʻi kalo.
[32] Relationships, connection, association.
[33] Lifeway, mode of living, life.
[34] To supply, provide, enrich.
[35] Locals; literally, child of the land.
[36] Foundation.

wealth in hoʻolako – having enough to share with others. Farmers participate in trade or exchanges for other resources and distribute poi or other kalo products at or below cost. Local organizations also buy kalo directly from the Hui. In most cases, any potential revenues from the commercial aspects go directly back into their farming operations. **See Section 5.8.3, Economic Characteristics**.

The Hui is memorializing Waiʻoli's traditional kalo cultivation practice through the modern legal system by securing a variety of permits and required approvals. HRS chapter 171 governs water leases, revocable permits, and the appraisal methods by which these entitlements are valued. The long-term water lease will legally ensure the continuation of Waiʻoli Stream water for traditional loʻi kalo cultivation. In 2016, Hawaiʻi's First Circuit Court determined "holdover" revocable permits were unlawful. Later that year, through Act 126, the Legislature amended HRS section 171-58 to require "holdover" revocable permits to convert to long-term water leases by June 30, 2019. The Hawaiʻi Supreme Court is currently in the process of deciding *Carmichael v. Board of Land and Natural Resources*, an appeal that is expected to resolve the allowable duration for revocable permits. Some may assert that for a number of reasons – including the Hui's continuous use since time immemorial and the fact that many have appurtenant,[37] riparian,[38] and traditional and customary Native Hawaiian rights – the Hui should be exempted from this onerous process altogether. The Hui is still undertaking the kuleana to apply for a water lease from the State Department of Land and Natural Resources ("DLNR"). This process entails approval of a Watershed Management Plan, consultation with the Department of Hawaiian Home Lands ("DHHL") and the Office of Conservation and Coastal Lands ("OCCL"), the adoption of numeric interim instream flow standards ("IIFSs") by the Commission on Water Resource Management ("CWRM"), as well as compliance with HRS chapter 343.

In tandem, as part of the Hui's mission and a lifelong commitment to the preservation of natural and cultural resources, the Hui is dedicated to activities and efforts that are beneficial to Waiʻoli Stream, Waiʻoli Watershed, and its resources. This includes maintenance and restoration, experiential educational opportunities, and community outreach, thereby creating a highly effective educational method to cultivate pilina ʻāina[39] and to further understand kalo cultivation as a means towards food security, Native species habitat protection, a cultural practice, and longstanding practice of aloha ʻāina.

2.2. Project Location and Site Characteristics

The Proposed Action uses water from Waiʻoli Stream and directs water through the Loʻi Kalo Irrigation System before returning it to Hanalei Bay. **See Section 3.2.1., Waiʻoli Loʻi Kalo Irrigation System**. As a part of Hanalei Bay Watershed and within Waiʻoli Ahupuaʻa, Waiʻoli Stream is located on the island of Kauaʻi, along its north-facing coast in the traditional district, or moku, of Haleleʻa and the State District of Hanalei. Haleleʻa extends from Kalihiwai to Hāʻena, and

[37] Appurtenant rights attach to land that used water, usually to cultivate the traditional staple kalo, at the time of its conversion to fee simple (usually, the Māhele of 1848).
[38] Riparian rights protect the interests of people who live along river or stream banks to the reasonable use of water from that river or stream on the riparian land.
[39] Relationship to ʻāina.

includes seven (7) ahupuaʻa.[40] The State District of Hanalei is slightly smaller and extends from Princeville to Hāʻena. **See Figure 1, Location Map**.

Waiʻoli Valley is situated within Hanalei Bay Watershed which is comprised of four (4) traditional ahupuaʻa: Hanalei, Waiʻoli, Waipā, and Waikoko. From the mountains of these four (4) ahupuaʻa, four (4) perennial streams (Hanalei River, Waiʻoli Stream, Waipā Stream, and Waikoko Stream) flow their lengths and empty into Hanalei Bay (DLNR, 2008; Tetra Tech-DOH, 2008). Hanalei River returns to the eastern portion of the Bay, while the remaining three (3) streams return to the westernmost portion of the Bay. The four (4) ahupuaʻa in Hanalei Bay Watershed share similar environmental landscapes. Sandy shores along Hanalei Bay give way to low dunes. Immediately inland of the dunes are loʻi that stretch into the upper valleys and into the shallower valleys on the western portion of the Watershed.

Waiʻoli translates to "joyous waters" (Handy et al., 1991) and is the legendary "birthplace of rainbows" (Handy et al., 1991, 419). Waiʻoli Ahupuaʻa is near the center of the Hanalei Bay Watershed, between Waipā Ahupuaʻa and Hanalei Ahupuaʻa. The Waiʻoli Watershed and Ahupuaʻa is 3,483 acres and includes the majority of Waiʻoli Stream (Waiʻoli's estuary crosses into the neighboring Waipā Ahupuaʻa). Waiʻoli Valley is smaller, but much broader and shorter than the valleys surrounding it. **See Figure 2, Hanalei Bay Watershed and State Land Use District Map and Figure 3, Waiʻoli Ahupuaʻa.**

Waiʻoli Stream is perennial with a total length of 5.4 miles from the mouth to the base of Nāmolokama Mountain (State OP-GIS, 2020). The stream is fed by at least ten (10) well-formed, intermittently flowing mana wai,[41] originating at the wai hālau on Nāmolokama, Hīhīmanu, and Māmalahoa. The centerline of Waiʻoli Stream is dynamic, and it is historically documented to have changed course within its basin. Even with these shifts, all historic maps show a clear stream channel (Kīpuka Kuleana, 2020) **See Figure 3, Waiʻoli Ahupuaʻa.**

As a whole, the larger Hanalei Bay Watershed has been described as a kalana, a traditional Native Hawaiian land division term associated more with systematic biocultural resource management and community identity rather than governance (Winter et al., 2018, 4-5). For centuries, Kānaka Maoli have managed natural and cultural resources within the Hanalei Bay Watershed as a single integrated system to maximize the cultivation of traditional crops and lifeways and to distribute water resources, which has the ability to further mitigate the impacts of flooding. For example, the Waiʻoli Ahupuaʻa, in particular, shares stream resources with the ahupuaʻa of Waipā and Hanalei. The muliwai[42] of Waiʻoli is located within the Waipā Ahupuaʻa, and two (2) hoʻi[43] from Waiʻoli return water to Hanalei River, all eventually terminating in Hanalei Bay. Waiʻoli's traditional Loʻi Kalo Irrigation System supports continuous stream flow – a necessary component for Native stream animals and wetland kalo farming. The use of water for kalo irrigation is largely non-consumptive, instream, almost entirely within the Waiʻoli Watershed, and completely within the Hanalei Bay Watershed,

[40] Land division.
[41] Tributaries.
[42] Stream/river mouth.
[43] The place where the water leaves the loʻi and returns to the stream.

consistent with the Indigenous tradition of this kalana (DLNR - Land Division, 2020). **See Figure 2, Hanalei Bay Watershed and State Land Use District Map.**

2.3. 2018 Floods

From April 13 to 16, 2018, severe flooding caused major disruption to farmers, residents, visitors, and businesses, triggering State and County Emergency Declarations. Both the Governor of Hawaiʻi and the County of Kauaʻi Mayor's emergency proclamations were extended into October 2020 (County, 2020; State, 2020). In addition, the subsequent March 2020 flood triggered a new County Emergency Decalaration that was extended under the Fourth Supplementary Emergency Proclamation to January 2021. The recent March 2021 severe weather damage triggered the latest Emergency Proclamation that is still in effect as of May 2021. In Governor Ige's 2018 initial proclamation, he observed the severity of the occurrence as "of such a nature as to warrant rehabilitative assistance from the State." (State, 2018, 1). **See Figure 14, Site Photos from the 2018 Flooding**.

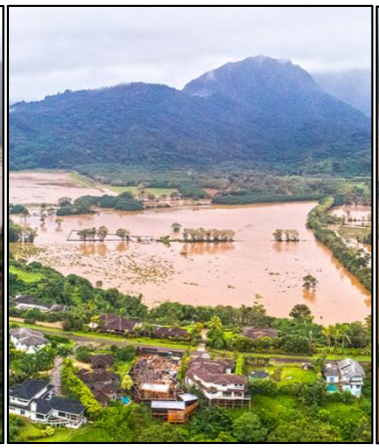
The most severe flooding occurred over north Kauaʻi from Hanalei to Hāʻena (NWS, 2018). During the floods, water overflowed the banks of Waiʻoli Stream and spread out across the loʻi and into Hanalei Town. At several points, water flowed parallel to the coast; the opposite of its usual pattern of flowing towards the ocean (WVTH, 2018). Around midnight on April 15, the second rainfall episode recorded peak rates of five (5) to seven (7) inches per hour. Because the heavy rainfall covered most of the northern drainage basins, stream and river responses created flash flood conditions throughout the area. Documented flash flooding in the adjacent Hanalei River submerged portions of Kūhiō Highway near Hanalei Bridge five (5) to eight (8) feet under water. Around mid-morning on April 15, the thunderstorms anchored themselves further up the slopes of north Kauaʻi, sending another flood wave across area streams and rivers (NWS, 2018). The flash flooding on Kauaʻi destroyed seven (7) homes, with another 65 homes sustaining major damage, and 119 homes sustaining minor damage (State, 2018). Hanalei and Waiʻoli loʻi kalo were flooded with silt, mud, and debris that ruined crops and destroyed agricultural infrastructure. Four months later, in August 2018, the indirect impact from Hurricane Lane in August 2018 compounded the April damage.

The April 2018 storm produced 53.57 inches of rain in 48 hours, including 49.69 inches during the 24-hour period ending at 12:45 PM on April 15. This 24-hour total has been certified by the National Climatic Extremes Committee ("NCEC") and now stands as the 24-hour record precipitation for the United States (NCEC, 2019). For perspective, this value supersedes the previous records of 43 inches on July 25-26, 1979 at Alvin, Texas and 38 inches on January 24-25, 1956 at Kīlauea, Kauaʻi (NWS, 2018).

The storm generated unprecedented and large-scale flooding of upland and lowland stream corridors, wetlands, and developed communities. The increased energy produced by the streams further mobilized bed load and debris. The transport of debris downstream incised streambanks and cut channels deeper (by as much as four (4) feet) (State DLNR-CWRM FIR, 2019). The flooding and heavy rain immediately changed the landscape and created several new random channels of water. The historic mānowai was destroyed and filled-in with boulders. Further down, the ʻauwai was filled

Above: Images taken from the western side of Hanalei Bay looking toward the south and southwest. *Wai'oli* Stream is in the foreground. Some of the scars are old, there are fresh landslide scars clearly evident.
Source: NWS, 2020

2018 Flooding
Source: Hui, 2018



Above and right: 2018 Flooding in nearby Hanalei
Source: Hui, 2018

Obstructions along Waioli Stream Intake has reduced water flow to taro fields by 60%, leaving the majority of highly productive taro fields fallow. One year after the DLNR granted the County a right-of-entry to fix the upper intake and remove debris, no contract has been issued.

Source: Nakamura, 2020.

Figure 14: Site Photos from the 2018 Flooding

with materials from the landslide in several areas, fallen trees, debris, and ʻiliʻili.[44] In some places, ʻauwai banks were completely washed away. The impact of debris and fallen trees caused water to be redirected, resulting in the immediate halt of all water flow into the loʻi. The following weekend, over sixty farmers and community members from across the island joined the Hui to remove fallen trees, rocks, boulders, and debris. This enormous and urgent work was done by hand using hand tools, and manually restored stones to allow for the temporary water flow through the poʻowai.[45]

The damage from the 2018 flooding destroyed most of the crop and what was left had to be harvested prematurely before it went bad. It also forced loʻi out of production, and significantly altered the timing and sequence of loʻi preparation, planting, kalo growth, and harvesting. Blockages and reduced water flow dried out individual loʻi and exposed mature-stage kalo. The kalo quickly rotted and attracted feral animals, like pigs, that destroyed the huli – the portion of the kalo that farmers use to propagate the next generation of kalo plants. Some Hui members lost multiple crops in varying stages of growth, a process that typically takes at least a year (**see Section 3.2.2 Kalo Cultivation in Waiʻoli**), while many lacked sufficient water to plant new loʻi. To compound the normal day-to-day challenges in any given year, every farmer had equipment or tools that were flooded, permanently damaged, or required significant repair (WVTH, 2020).

Approximately a year after the flood, in 2019, in support of the Hui's efforts to maintain its Loʻi Kalo Irrigation System, a team from the University of Hawaiʻi ("UH") at Mānoa Department of Natural Resources and Environmental Management ("NREM") and UH Sea Grant interviewed over 70 community members, government representatives, first responders, and nonprofit leaders about lessons emerging from the floods. One of the study's key findings was the importance of maintaining streams and waterways, as well as preventing future flooding by strategically clearing invasive plants and overgrowth that have the potential to create dams or redirect floodwaters to prevent future flooding.

By experiencing the immediate and crippling effect of water shortages amplified by upstream overgrowth, the Hui recognizes the critical need for collective coordination of ongoing maintenance and a commitment to continuous water flow to ensure a future for Waiʻoli kalo cultivation.

[44] Pebbles.
[45] Headwater where water enters into the irrigated ditches where it flows until reaching the loʻi.

2.3.1. Flood Relief Efforts

During the disaster recovery and repair efforts, the Hui was informed that a portion of the Loʻi Kalo Irrigation System, including the mānowai and upper portions of the ʻauwai that the Hui has stewarded for many generations, is located on State Conservation land. Thus, to complete the necessary repairs and ensure the ongoing use of Waiʻoli Stream for traditional loʻi kalo cultivation, the Hui would be required to understand government compliance rules that could trigger a variety of permitting and related approvals.

Since the 2018 floods, the Hui has worked closely with the County and State to understand and pursue entitlements that ensure the long-term viability of loʻi kalo cultivation. Given the severity of the damage caused by the 2018 floods and the potential for future destruction, other community partners have come forward to support immediate and long-term solutions. In January 2019, the Hui began collaborating with UH Mānoa's William S. Richardson School of Law's Environmental Law Clinic and Native Hawaiian Rights Clinic ("Clinic")[46] to establish a more streamlined process with government agencies to permit and repair the Waiʻoli Stream mānowai and ʻauwai.

With the Clinic's support, the Hui established itself as a 501(c)(3) nonprofit, formally organizing to apply for and hold permits, easements, and water leases, and to work with State, County, and Federal agencies as a legal entity. Next, the Clinic submitted the Hui's application to the State Board of Land and Natural Resources ("BLNR") for an easement to repair, maintain, and steward the historic Loʻi Kalo Irrigation System. During the process, the Hui consulted with DLNR, CWRM, and OCCL. The mānowai is now registered with State entities, including CWRM and DLNR's Land and Engineering Divisions. In addition, staff from CWRM and the Attorney General's office have conducted site inspections of the mānowai system (State DLNR-LD, 2020).

In May 2019, BLNR voted unanimously to approve a gratis, 55-year Non-Exclusive Easement for the Hui for surface water diversion and irrigation purposes as well as an immediate right of entry. Then, in February 2020, the Board determined that a perpetual (versus 55-year term) easement was appropriate for this situation, noting research conducted by the Office of Hawaiian Affairs, which "concludes that this [irrigation] system existed in pre-contact times; e.g., prior to the arrival of Captain Cook in about 1778." (State OHA, 2019, 5) The easement allows the Hui to construct, use, maintain, repair, replace and remove surface water diversion and irrigation systems over, under, and across State-owned land. The easement area spans approximately 6.627 acres within TMK (4) 5-6-002:001 and (4) 5-5-008:018. Located in the State Conservation District, the non-exclusive easement was deemed exempt from HRS chapter 343 review (State DLNR-LD, 2020). **See Figure 15, BLNR Non-Exclusive Easement Area**.

Notably, during this process, BLNR praised this partnership as the first co-management of natural and cultural terrestrial resources between a community group and BLNR. The Hui has agreed to share its intergenerational and local knowledge and expertise to guide and coordinate stewardship of this invaluable natural and cultural resource, along with the work it is already undertaking to restore the health of the Waiʻoli Stream, Waiʻoli Watershed, and ʻauwai system (Kīpuka Kuleana, 2020;

[46] As a second and third year course at the William S. Richardson School of Law, the Native Hawaiian Law Clinic and Environmental Law Clinic provide students with practical legal experience working on issues pertaining to environmental and Native Hawaiian rights and provides direct legal services to rural Hawaiʻi communities.

WVTH, 2020). Because of the Clinic and the Hui's efforts, repair and restoration of these areas begun in earnest in July 2020. In 2021, the Hawaiʻi State Legislature passed HCR 163 – a resolution authorizing the Hui to engage in direct negotiation with BLNR for a water lease after the completion of Chapter 343 requirements. Today, the Hui, implementing its organizational mission, is actively stewarding both the watershed and Waiʻoli Loʻi Kalo Irrigation System. As part of this effort, the Hui has drafted the Waiʻoli Valley Taro Hui Watershed Management Plan ("Draft Hui Watershed Management Plan") pursuant to the DLNR water lease requirements under HRS section 171-58.

With support from natural and cultural resource partners and the County of Kauaʻi, the Hui continues to mitigate the damage caused by the devastating 2018 floods and more recent weather events. The County of Kauaʻi has expressed its commitment to repairing the traditional mānowai and supporting the work to repair other portions of the Loʻi Kalo Irrigation System. At present, however, no government organization has taken responsibility for clearing the significant amount of invasive debris from Waiʻoli Stream, which continues to clog the waterway, impeding the water, and contributing to water quality and flood conditions. The Hui has taken the initiative to formalize programmatic care of the larger Waiʻoli Ahupuaʻa and Watershed. The Hui has also worked to request a County of Kauaʻi Grant to strategically clean Waiʻoli Stream. The Hui also seeks to submit proposals and grant requests to remove debris and damage caused by the 2018 floods. These additional efforts could allow the Hui to collect baseline data on water quality, stream flow, Native aquatic species, and Native fauna in Waiʻoli Stream as well as conduct outreach and educational efforts. Initial restoration analysis and strategic efforts could begin at the Waiʻoli Stream hoʻi and additional baseline data could inform a strategic long-term stream cleaning plan. Realizing the importance of this work, the Hui also plans to collaborate with other partners and organizations working within the Hanalei Kalana and Watershed.

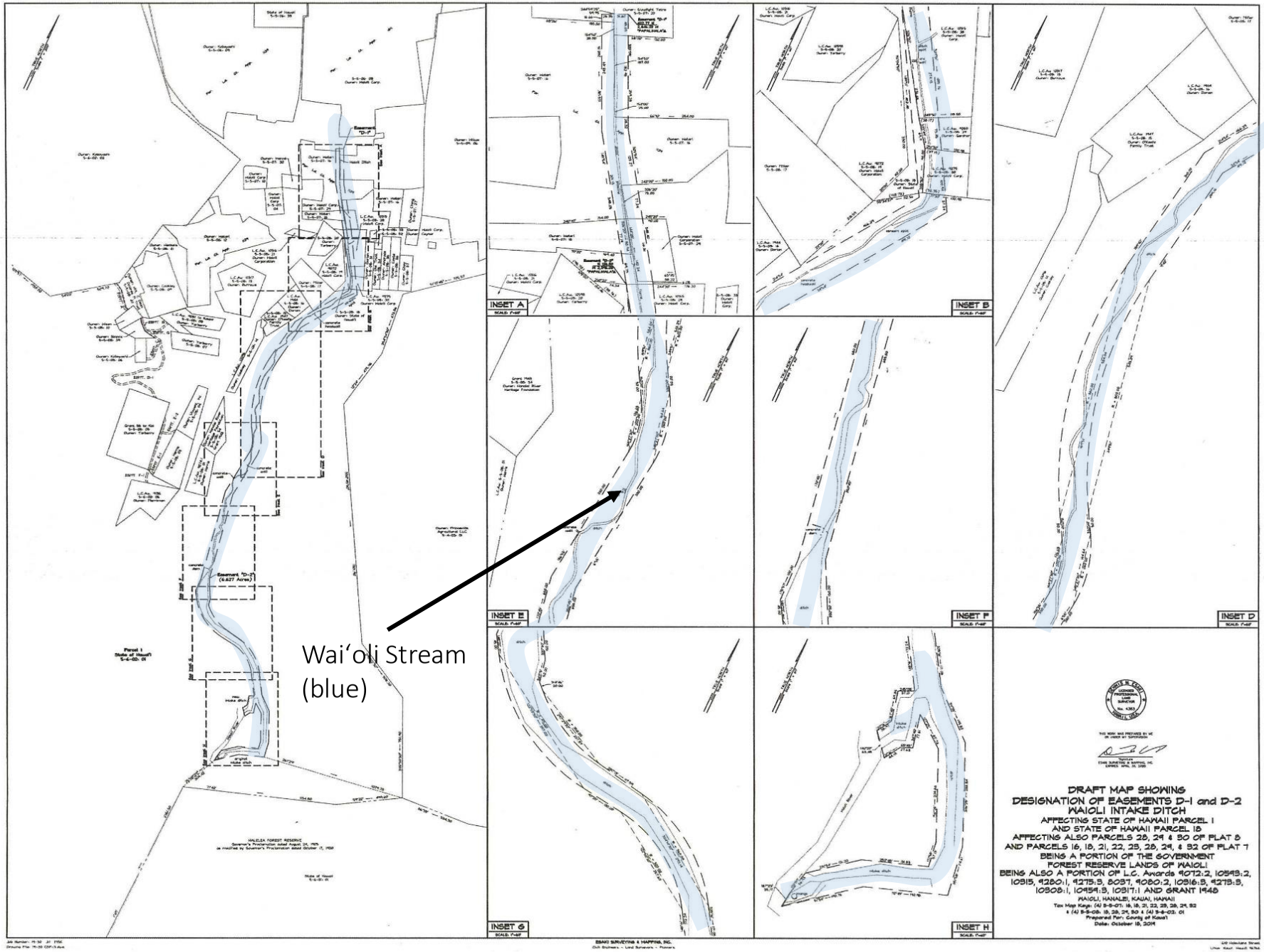


Figure 15: BLNR Non-Exclusive Easement Area

2.3.2. Loʻi Restoration

Following the 2018 flood, the Hui began the slow and tedious work of restoring the physical Loʻi Kalo Irrigation System in order to reorient the important cycles of kalo cultivation. Just as in generations past, the Hui continually addresses and mitigates potential and future damage caused by the severe weather events that have historically affected Waiʻoli Ahupaʻa and the larger Hanalei Kalana (Leu Cordy & Merrin, 2020, 20-22). While loʻi maintenance is part of the Hui's regular day-to-day farming operations, loʻi restoration, entails more time- and labor-intensive work. Restoration work outlined below is often required after large rain and weather events when farmers must restore the system both in their individual loʻi as well as with the greater irrigation system. Naturally, loʻi restoration efforts overlap with loʻi maintenance, which is outlined in greater detail in **Section 3.2.2, Kalo Cultivation in Waiʻoli.**

Removing Debris & Unblocking Waterways

After a flood or a prolonged water event, silt and other debris (e.g., leaves, downed trees, etc.) accumulate in the stream and Loʻi Kalo Irrigation System and restrict water flow. In the stream and ʻauwai, shallow-rooted fast-growing trees like Albizia and Trumpet Tree fall over easily and block or damage the intake. Hau bush is also prevalent in the area and creates debris. ʻIliʻili and silt that have been pushed into the Loʻi Kalo Irrigation System are dug out with shovels. The silt is then used to reinforce the banks of the ʻauwai or loʻi around the area in which it had settled. There is no dredging or hauling of silt and sediment outside of or away from the area in which the waters have deposited it. The Hui uses hand tools like sickles, shovels, cane knives, loppers, and chain-saws to remove debris such as fallen trees, branches, and other plant matter from the ʻauwai to prevent clogging and jamming in the system.

Due to its impermanent nature, the mānowai may also break due to severe water flow(s). The rocks of the mānowai are loosely stacked which allows the dam to break away as a means to prevent flooding in the area. This prevents the full force of the water from rushing into the Loʻi Kalo Irrigation System that could totally undermine banks and push more debris and sediment into the main ʻauwai. Because this affects the water flow to the loʻi, the mānowai is repaired by restacking the rocks by hand.

Restoring Loʻi And ʻAuwai Integrity

After severe floods like those in April 2018, ʻauwai banks are often completely washed away or breached in a way that water flows out of the main channel. Thus, banks must be restored and loʻi must be re-leveled to adjust and adapt to changes in water flow. The Hui uses the silt that usually washes down into the ʻauwai and loʻi to shore up the breaches or reinforce the banks. They use shovels to scoop out the silt and place it on the nearby bank. No machinery is involved in silt removal from the ʻauwai or the loʻi. After this is done, the farmer will prepare their loʻi for planting by tilling about four (4) to six (6) inches into the topsoil of their individual loʻi. The dirt is then leveled to see if the outflow or intake pipes need to be adjusted due to a possible increase in dirt height and depth. After the 2018 flood, machines were needed to dig out silt that covered the loʻi and parts of the ʻauwai system because of the severity of the damage and the amount of silt and debris.

Retaining Access To Areas Requiring Restoration

Especially after floods that change stream courses and the natural environment, retaining access to areas requiring maintenance and restoration of the Loʻi Kalo Irrigation System is a challenge. After the 2018 flood, debris and trees limited the Hui's access to the mānowai, poʻowai and some areas of ʻauwai. Similarly, the recent March 2021 flood ruined parts of the access road. Because parts of the system are located on State lands and this restoration work requires cooperation among all stakeholders, restoring parts of the Loʻi Kalo Irrigation System necessarily includes collaboration with State and County agencies and officials.

Reconfiguring Preparation, Planting, & Harvesting Plans

Severe weather events interrupt the normal kalo cultivation cycle. After severe floods, the Hui must assess a number of factors: the weather, how damaged the system is, whether crops can be harvested or recovered, and whether equipment is working. Crops ruined in floods are used in several ways: huli may be taken and saved for replanting future crops, some parts are fed to animals, and others are plowed back into and feed the soil. Once weather permits and loʻi are dry enough, or "reset," the farmers must start the year-long planting process from the beginning. If farmers cannot recover huli, then planting is set back further, and they may have to acquire huli from others or wait until they can get a new generation of keiki.[47]

Mitigating Invasive Vegetation & Overgrowth

As further discussed in Section 3.2.2, weeds are also an ongoing problem for all farmers – especially after heavy flooding (Evans, 2008). Like most kalo farmers, the Hui's weed management strategy is to suppress, or eliminate weeds long enough to get a kalo leaf canopy that shades the soil and prevents weed growth. (Evans, 2008, 95). "Weeds can out-compete a young kalo plant and are particularly damaging during the first four months of kalo growth. Weeds can also harbor kalo parasites, such as insect pests, apple snails, and plant pathogens. When the maturing taro is in the final growth stages, weeds can reduce corm yields and make harvesting more time- and labor-intensive if left unchecked" (Evans, 2008, 95). Apple snails damage kalo plants by chewing into the iʻo or eating the younger shoots.

Overgrowth of vegetation and trees threaten ʻauwai integrity and restrict water flow through the Loʻi Kalo Irrigation System. Downed trees also cause landslides because of their shallow roots. Hau can get thick and block waterways, causing a rush of floodwaters when it does break through. Floods bring in other weeds or move weeds and seeds, like buffalo grass, into the loʻi fields themselves. If the loʻi are dry because the ʻauwai is damaged and cannot channel water into the loʻi, then weeds will continue to grow without the water level to drown-out weeds, and kalo leaf canopy that typically shades out weeds. When the fields are dry and unplanted, sickles or weedwackers are used to cut down grass and weeds in the loʻi and along the banks. If the patch is already planted, all weeding is done by hand.

Combatting Pests & Feral Animals

While recovering from floods, the Hui must regularly monitor and control pests, animals, and any diseases they might carry. After severe flooding, there is often less food for pigs up ma uka,[48] so

[47] Young kalo.
[48] To / towards the mountain.

they come down to eat out of the fields and break up banks, threatening the loʻi integrity and setting back cultivation further if huli are ruined and unable to propogate the next generation of kalo. Flood waters also carry snails and other pests into the Loʻi Kalo Irrigation System, including into individual loʻi. In addition to causing agricultural damage, these pests, and apple snails in particular, are also a threat to human health as well.

3. Project Description

3.1. Proposed Action

For the Hui and the Waiʻoli community, traditional kalo cultivation is a crucial part of the fabric of this small town's identity. Located on the North Shore of Kauaʻi, and like many kalo farmers throughout Hawaiʻi pae ʻāina, kalo cultivation is an integral part of the Hui's kuleana ʻāina[49] and tie that binds them to Native Hawaiian customs, traditions, and worldviews. Waiʻoli kalo cultivation connects families through generations and is a time-honored part of Waiʻoli's history and legacy. The water that flows through Waiʻoli's ancient Loʻi Kalo Irrigation System is a lifeway that supports kalo cultivation traditions and perpetuates a living Hawaiian culture; it feeds the community, facilitates pilina,[50] and prepares the next generation to carry on this vital practice. Ma ka hana ka ʻike – the learning is in the doing (Pukui, 1983). For the farmers of the Hui, their ʻike has been cultivated and refined by generations of kamaʻāina of Waiʻoli.

The Hui seeks a long-term water lease for up to 13.5 million gallons per day ("mgd") of instream, throughflow water to support up to 84-acres of existing loʻi in Waiʻoli Valley. In 1989, the Hui declared and in the early 1990s the Water Commission verified that Hui members were using this amount of water for the same loʻi they continue to cultivate today. There is no expansion of use. The Hui seeks only legal permission for the same amount of water necessary to cultivate the same fields these same families have stewarded on private land outside the Conservation Zone for four or more generations. Moreover, these 84 acres, are not in production at the same time because the cultivation cycle and process includes fallow loʻi. **See Section 3.2.2, Kalo Cultivation in Waiʻoli**. The Proposed Action seeks the necessary throughflow to perpetuate traditional kalo cultivation, an ongoing traditional and customary Native Hawaiian practice; supports the stewardship of biocultural watershed resources that are closely intertwined with stream flow; contributes to local food security; sustains this small community of farmers; and, maintains an ancient system that has been vital to Waiʻoli for centuries.

The 2021 Draft Hui Watershed Management Plan, referenced in this Draft EA, outlines the Hui's intentions to establish baseline conditions to better assess threats and vulnerabilities into the future; identify best management practices to enhance watershed health; facilitate and monitor restorative work in the forested uplands; and maintain and improve surface and ground water quality. The Draft Hui Watershed Management Plan is informed by and enacts aspects of existing watershed management plans. The Hui seeks to identify and actualize best management practices as a means to embrace the community's sense of kuleana as a means of fostering long-lasting sustainable

[49] Responsibility to land.
[50] Relationships.

management practices grounded in traditional Native Hawaiian biocultural knowledge (Draft State DLNR-DOFAW & Hui, 2021).

This Draft EA will detail the potential environmental impacts of continued traditional water use in an effort to "fit an old [traditional] system into a new legal system" as BLNR Chair Suzanne Case highlighted (BLNR Meeting, Feb. 28, 2020).

3.2. Purpose of the Project

The purpose of this project is to secure legal approval for existing loʻi kalo cultivation use of throughflow water from Waiʻoli Stream, a unique and place-based traditional and customary use. Based on and in line with historic and existing use of this traditional irrigation system, and consistent with the State Commission on Water Resource Management's 2021 numeric Interim Instream Flow Standard ("IIFS") for Waiʻoli Stream, the Hui is requesting all water in excess of the amended IIFS of 4.0 million gallons per day ("mgd"), up to 13.5 mgd as historically used to support loʻi kalo cultivation on private land outside the Conservation district.

The Hui's use of throughflow water – cool, fresh water flowing through the loʻi – is for kalo cultivation. The usage is not "consumed" like typical off-stream users because the water returns to the stream over the course of a short period of time (CWRM, 2019). For these reasons, instream, in-watershed kalo cultivated in a traditional manner has earned special protection and respect under our State Constitution (including Article XI, sections 1 and 7 and Article XII, section 7), Water Code (HRS chapter 174C-101), and court decisions (*In re Waiāhole Combined Contested Case*, 94 Hawaiʻi 97, 132, 9 P.3d 409, 444 (2000)).

Globally, kalo cultivation is lauded as a symbol and representation of Hawaiʻi, its rich culture and its history. In Hawaiʻi, the vast extent of kalo cultivation covered nearly 250,000 acres and supported between 300,000 to 800,000 people pre-contact (Kagawa-Viviani et al., 2018). Waiʻoli Valley, and Waiʻoli Stream in particular, is exceptional because of its historic and ongoing commitment to traditional kalo cultivation in a traditional manner. As a cultural practice, kalo cultivation's significance is also found in its spiritual foundation and its connection to the past (UH-DURP, 2002). Kalo cultivation specifically within Waiʻoli Valley has been widely recorded in historical reports, journals, and nūpepa[51] since the mid-1830s (Ka Nupepa Kuokoa, 1865). More recently, the State's 1990 Hawaiʻi Stream Assessment ("HSA") recognizes Waiʻoli Stream as one of only six (6) streams throughout the pae ʻāina that historically supported more than fifty (50) acres of kalo cultivation; HSA's largest category in terms of acreage of cultivation supported by a stream (Hawaiʻi Stream Assessment, 1990).

This Loʻi Kalo Irrigation System is a lifeway that supports kalo traditions – cultivation, harvest, preparation and sharing food – all of which create close ties within and among families and community. These traditions perpetuate a living Hawaiian culture. For Waiʻoli and Haleleʻa, these communities' genealogical connection and social relationships are intricately connected to ʻāina, its diverse ecosystems, and natural resources (Vaughn, 2018, 91). As described by Mehana Vaughn, a kupa (native, well-acquainted) of Haleleʻa moku herself, in her 2018 book "Kaiāulu: Gathering Tides":

[51] Hawaiian language newspapers.

> *ʻĀina needs people to connect, call out, and care for it in order to retain its character, just as families need ʻāina to retain who they are. A place and its people are one and the same. Relationships to land are inseparable from the exercise of kuleana. People of a place have responsibilities that take work: perpetuating stories and names, watching for changes and chronicling them, protecting, welcoming, learning, and teaching. These responsibilities are larger than any one [isolated] piece..." (124).*

In ancient Hawaiʻi, "a farmer took as much as he required and then closed the inflow so that the next farmer could get his share of water - and so it went until all had the water they needed. This became a fixed thing, without greed or selfishness" (Handy et al., 1991, 58). This practice of cooperation is grounded in one's contribution, and one's acknowledgement of his/her kuleana to other kamaʻāina and to ʻāina itself. As they have for generations, the Hui is always cognizant of the availability of water, the health of the ʻāina, how their use affects others, which means sharing the water with the other kalo farmers, especially those who are on the lower end of the ʻauwai system.

The Hui's water use is generally non-consumptive and an instream, traditional and customary Native Hawaiian practice used for a public trust purpose. The State's 2019 Water Resources Protection Plan notes that "typically, all water use in Hawaiʻi is consumptive, with the exception of stream diversions for ornamental ponds or taro loʻi that return water to the stream over the course of a short period of time and at a point relatively near the initial diversion. Water loss due to evaporation, seepage, and evapotranspiration in such diversion scenarios can be considered as negligible, due to the relatively small displacement in location and limited time frame" (CWRM, 2019, 72).

This traditional Loʻi Kalo Irrigation System is consistent with the Indigenous tradition of this specific kalana that is associated with systematic biocultural resource management and community (State DLNR-LD, 2020; Winter et al., 2018). Water use in this context not only supports kalo growth, but also supports Native habitats and mitigates other technical challenges (weeds, pests, and disease) when cultivating kalo. To meet kalo's biological needs, cool water must flow over plant roots to ensure the health and productivity of the kalo (Gingerich et al., 2007). Kalo grown in loʻi requires "cool water flowing over plant roots to ensure the health and productivity of the crop. Irrigation, therefore, needs to provide more water than what is consumed in the loʻi through evaporation from open water, transpiration through the kalo leaves, and percolation through the loʻi bottom and sides" (Gingerich et al., 2007, 2).

The water use, or "water duty," includes both the amount needed for actual consumption by the kalo plant and the amount required to flow through the loʻi to maintain the naturally cool water temperatures, preventing unfavorable growing conditions that lead to crop failure (i.e., pests and diseases). Both amounts are necessary to farm kalo successfully and to calculate a realistic measure of water use. Thus, the per acre water use of kalo cultivation is an average over the entire area; including fallow loʻi and uncultivated areas (i.e., kuāuna). Generally, areas with greater proportions of loʻi that are in the planted and growing phase (i.e., not fallow) will approach the upper end of this range and require more water (Reppun, 2007).

Water duty – and securing a long-term water lease – is integral to kalo cultivation's ongoing success in Waiʻoli. Paul Reppun, a kalo farmer with over three decades of experience, is an expert witness

on kalo cultivation and its water duty in multiple proceedings before CWRM. In 2007, he was also a consultant on the United States Geological Survey's ("USGS's") study "Water Use in Wetland Kalo Cultivation in Hawaiʻi," which broadly documented and confirmed water use and temperatures in wetland kalo farming operations across Hawaiʻi, including Waiʻoli. The actual volume of water needed is location specific and dependent on a host of factors including elevation, soil type, percent shade, growth stage of the plant, variety of kalo, whether it is an individual loʻi or part of a loʻi complex, and where along the ʻauwai an individual loʻi is situated (Reppun, 2007).

Recognizing that an appropriate water duty is site specific, the Hui recognized early on that the water duty is likely aligned with the 1989 CWRM's verification in the range of 10 to 13.5 mgd. Moreover, the Hui will, in line with traditional practices and as it has for more than a century, divert only the amount needed with all remaining and excess water remaining in or returning to Waiʻoli Stream or Hanalei River – both of which return to Hanalei Bay. As part of the water lease process, the Hui worked with CWRM to establish a numeric IIFS of 4 mgd for low flow conditions, which is approximately 50% of Waiʻoli Stream's flow. This model was designed to support the Native Hawaiian custom of keeping half of the stream's flow remaining in the stream. **See Appendix B, CWRM May 2021 Submittal**.

3.2.1. Waiʻoli Loʻi Kalo Irrigation System

Since time immemorial, the Waiʻoli Loʻi Kalo Irrigation System was created and maintained for subsistence and cultural purposes.

> *"The earliest depictions of water in the Waiʻoli Loʻi Kalo Irrigation System appear on a map surveyed and drafted 147 years ago. Surveyed depictions of the ʻauwai and recorded descriptions and testimonies of loʻi kalo in the Waiʻoli System, by Hawaiian farmers, date back 169 years. The written history of Waiʻoli and records of irrigated kalo extend back 185 years. This research reveals not just the presence, but the abundance, of irrigated loʻi kalo cultivation for hundreds of years in this specific area"* (Leu Cordy & Merrin, 2020, 73).

This system, beginning with the mānowai, directs water through the ʻauwai to loʻi and then returns it to the Waiʻoli Stream through hoʻi, with minimal loss to evapotranspiration and seepage (Draft State DLNR-DOFAW & Hui, 2021). **See Figure 16, Waiʻoli Loʻi Complex Landscape and Figure 17, General Loʻi Kalo Irrigation System.** The following describes the Loʻi Kalo Irrigation System that begins at the historic traditional mānowai, which is 1.8 stream miles from the Waiʻoli Muliwai. **See Figure 18, Waiʻoli Loʻi Kalo Irrigation System and Figure 16, Waiʻoli Loʻi Complex Landscape.**

Mānowai: Located 1.8 stream miles[52] from the Waiʻoli Muliwai, the mānowai is an impermanent traditional Native Hawaiian water intake system. The mānowai utilizes strategic natural rock placements to slow the speed and intensity of the stream, channeling some water to the poʻowai, a secondary water intake. The mānowai is where a portion of water from Waiʻoli Stream begins to flow towards the loʻi. The impermanent rocks are designed to breakaway during heavy rains and

[52] Stream miles are based on ESRI ArcGIS measurements taken from the centerline of State GIS stream data. number was calculated using GIS measurements along the stream.

flooding. The historic mānowai location is ideal because of the grade and slope in the Stream. **See Figure 19, Site Photos – Upper Reaches (State Conservation District).**

The significance of the mānowai is found in ʻōlelo Hawaiʻi. A mānowai is the origin of any ʻauwai or traditional Loʻi Kalo Irrigation System. In ʻōlelo Hawaiʻi, mānowai is also the word used to describe the human heart and circulatory system that pumps blood through the body's veins. This dual meaning is an appropriate analogy for the way that the Loʻi Kalo Irrigation System's mānowai channels water through the various ʻauwai and the body of the Loʻi Kalo Irrigation System.

Poʻowai: The poʻowai is the headwater and is located 1.42 flowpath[53] miles from the muliwai, and 0.38 flowpath miles downstream from the mānowai. The water then enters the ʻauwai where it flows until reaching the individual loʻi. At the poʻowai, the water splits into two paths, with both paths running parallel to Waiʻoli Stream. The first path immediately returns water back into the Waiʻoli Stream (the first hoʻi). Thus, the poʻowai acts as a spillway, further regulating the speed and intensity of water entering into the Loʻi Kalo Irrigation System, returning water back to the stream. The second path sends water along the main ʻauwai north into the Waiʻoli side of the Loʻi Kalo Irrigation System and then flows east towards the Hanalei side of the Loʻi Kalo Irrigation System. The poʻowai's second path splits 0.96 flowpath miles from the muliwai at Hanalei Bay, entering the Waiʻoli plain, which is dotted with loʻi.

ʻAuwai: From the poʻowai, the water enters into the ʻauwai where it flows until reaching the loʻi. With 6.16 flowpath miles of actively maintained ʻauwai, this particular irrigation ditch is used to transport water from one place to another and is fed by Waiʻoli Stream. From the main ʻauwai, many smaller ʻauwai branches flow in and out of individual loʻi before returning to the main channel through eight (8) hoʻi that mark the terminus of the Loʻi Kalo Irrigation System. From the poʻowai to the hoʻi, this system of interconnected fields and flowing water has defined the Waiʻoli plain for hundreds of years (Handy et al., 1991, 420).

Loʻi: The loʻi are the fields or complexes of individual loʻi where kalo is grown and through which water flows. The loʻi range in size from 0.08 acres to 0.6 acres. Just as kalo cultivation practices vary by individual farmer, the individual loʻi also vary in size. To thrive, loʻi kalo rely on the availability of continuously flowing cool, fresh water. Water use varies throughout the kalo growth stages and in response to unique natural environmental conditions such as rain or drought, sun or cloud cover, humidity, and temperature (Gingerich et al., 2007). The farmer must intimately understand the natural environment along with its relationship to kalo farming in order to successfully support kalo growth. This is done through the management and control of the water levels within each individual loʻi and throughout the entire Loʻi Kalo Irrigation System itself. **See Figure 20, Site Photos of Waiʻoli Loʻi (State Agricultural District).**

Inflow and Outflow: Each individual loʻi requires an inflow and outflow to accomodate throughflow water in the loʻi kalo. The Hui farmers typically use an open ditch or a PVC pipe. Depending on the size of the loʻi, larger loʻi may utilize six-inch pipes or additional smaller pipes.

[53] Flowpath miles are based on ESRI ArcGIS measurements from the auwai centerline; shapfile data are from A.Strauch and D.Cordy.

A few medium-sized stones are usually positioned around the mouth of the pipe to prop up the pipe. Stones are also used at the inlet so water splashes on the stones as not to erode the dirt at the intake. Water does not continuously flow through all loʻi at all times during the year. Rather, there are periods when some loʻi are dry, or fallow, and require no water. There are also periods when the water inflow is limited and stages when the outflow is closed. To manage water needs, farmers often use elbow pipefittings. The elbow is fitted to the pipe that connects the loʻi and ʻauwai. The elbow fitting creates a lock to stop water from entering the loʻi and/or flowing out of the loʻi. The elbow allows the farmer to adjust water flow by angling the top of the elbowed pipe so that the pipe's opening is above water (no flow), skims the top of the water (limited flow), or is level with the water. This allows the farmer to control the volume of water flowing into or out of the loʻi. Prior to the use of elbow pipefittings, farmers would limit water flow by using a flat surface such as a wood board, utilizing natural water pressure to stop the water flow into or out of the loʻi. **See Figures 20a and 20b, Site Photos of Waiʻoli Loʻi (State Agricultural District).**

Hoʻi: Water flowing through the Loʻi Kalo Irrigation System, specifically the ʻauwai, is returned to Waiʻoli Stream or Hanalei River through eight (8) hoʻi. The hoʻi is a natural ditch or return that cannot be closed off. Of the eight (8) hoʻi, six (6) are staggered at 1.43, 0.89, 0.72, 0.64, 0.54 and 0.46 flowpath miles from the Waiʻoli muliwai at Hanalei Bay, and two (2) additional hoʻi support a further branch of the ʻauwai to the east located 0.92 and 1.01 flowpath miles from the Hanalei muliwai at Hanalei Bay. In relation to the poʻowai, the hoʻi are located 0.07, 0.61, 0.78, 0.86, 0.96, and 1.04 flowpath miles from the poʻowai. The two (2) additional hoʻi that return to Hanalei River are 1.71 and 1.56 flowpath miles from the Waiʻoli poʻowai (State OP-GIS, 2020). In addition to these eight (8) hoʻi, a historic ʻauwai has been transformed into a storm culvert by the County of Kauaʻi. The water still leads back to a culvert hoʻi into Waiʻoli Stream. The Loʻi Kalo Irrigation System has two outflows into this historic ʻauwai. The culvert hoʻi and historic ʻauwai are no longer under the control of the Hui. **See Figure 20a, Site Photos of the Hoʻi at Waiʻoli Stream and Figure 20b, Site Photos of the ʻAuwai to Hoʻi at Hanalei River.**

The Hui has the kuleana of maintaining the hoʻi, primarily keeping them clear of debris and overgrowth that may hinder the Loʻi Kalo Irrigation System. As a key component of the Loʻi Kalo Irrigation System, the hoʻi also tempers and distributes any overflow from heavy rains and floods, reducing the force and impacts of floodwaters on the main stream and the residential and commercial areas further ma kai[54] (Kīpuka Kuleana, 2020). **See Figure 21a, Site Photos of the Hoʻi at Waiʻoli Stream and Figure 21b, Site Photos of the ʻAuwai to Hoʻi at Hanalei River.**

Muliwai: Upon exiting the Waiʻoli Loʻi Kalo Irrigation System, stream water flows ma kai, moving between, through, and alongside privately owned properties. These properties include residential dwellings, vacation rentals, pastures, open lots, and general agricultural lots. Then water then flows under Kūhiō Highway to Hanalei Bay. Finally, the water reaches the estuary and the muliwai at Hanalei Bay. Here, the water feeds Halulu Fishpond, a traditional loko iʻa puʻuone[55] located within Kamehameha Schools' land before entering the western side of Hanalei Bay. **See Figure 22, Site Photos of the Waiʻoli Estuary and Muliwai (State Conservation District).**

[54] To/towards the ocean.
[55] Inter-tidal fishpond.

Source of Water – Nāmolokama – November 2019

Wai‘oli Stream Early Morning – January 2020

Planting huli – June 2020

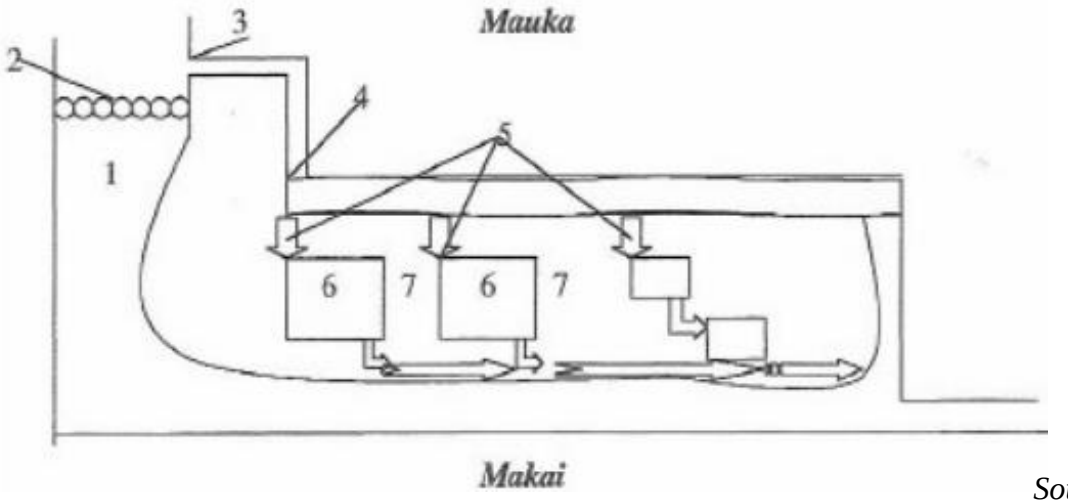
Wai‘oli Valley – Hihimanu (left), Nāmolokama (center), and Māmalahoa (right) – July 2017

Harvesting – June 2020

Active lo‘i at various stages of kalo growth – 2020

Figure 16: Wai ʻoli Lo ʻi Complex Landscape

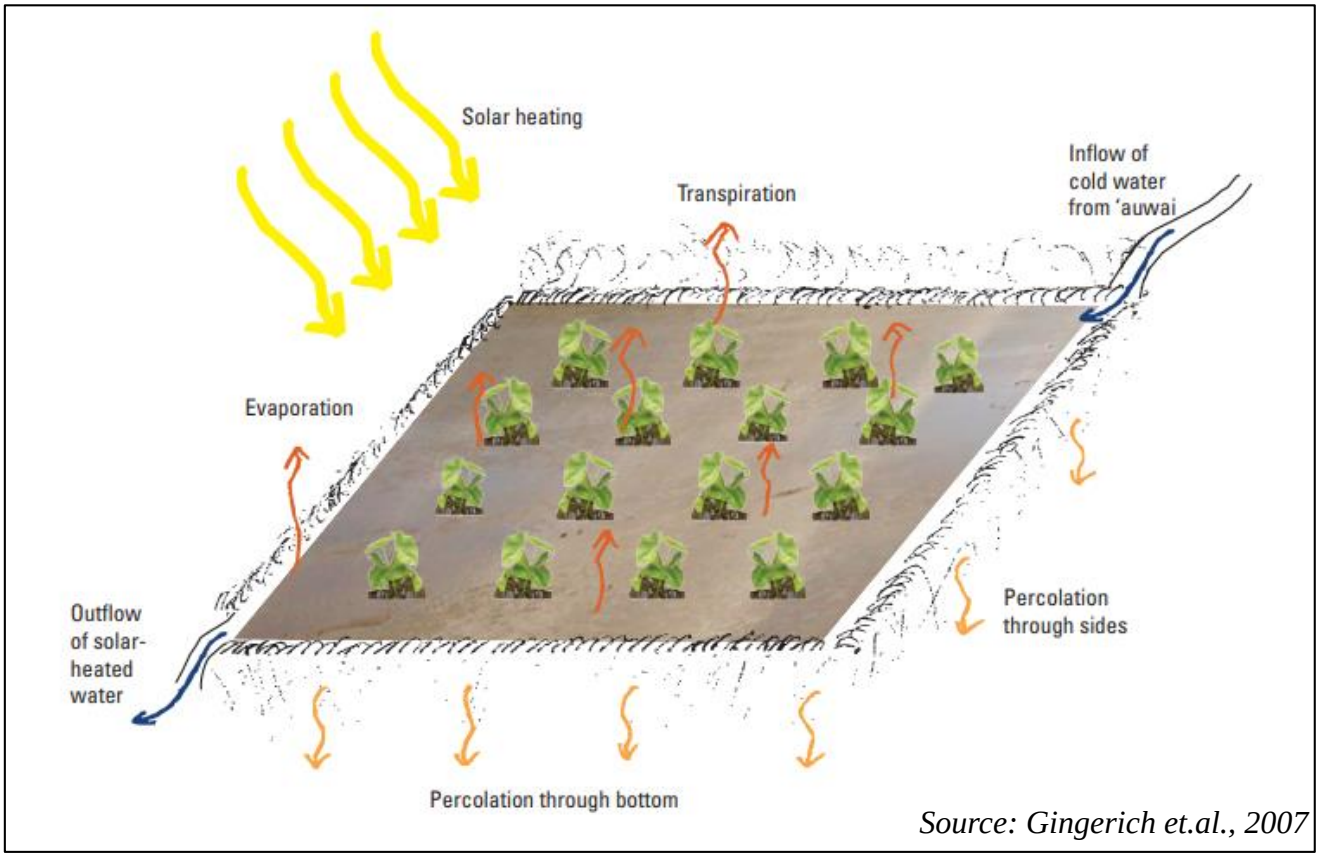
Source: Wai‘oli Valley Taro Hui



Source: DURP, 2002, p. 59

1) Kahawai: main stream flow
2) Manōwai: dam barrier that redirects water flow from the kahawai into the ʻauwai
3) Poʻowai: headwaters of the ʻauwai system
4) ʻAuwai: irrigation ditch that takes water from the kahawai into the loʻi
5) Makawai: inflow points that regulate water flow from ʻauwai into loʻi
6) Loʻi: wetland taro patch
7) Kuāuna: embankment areas separating the loʻi

Source: Waipi'o Valley: Towards Community Planning and Ahupu'a Management, 1999



Source: Gingerich et.al., 2007

Figure 17: General Loʻi Kalo Irrigation System

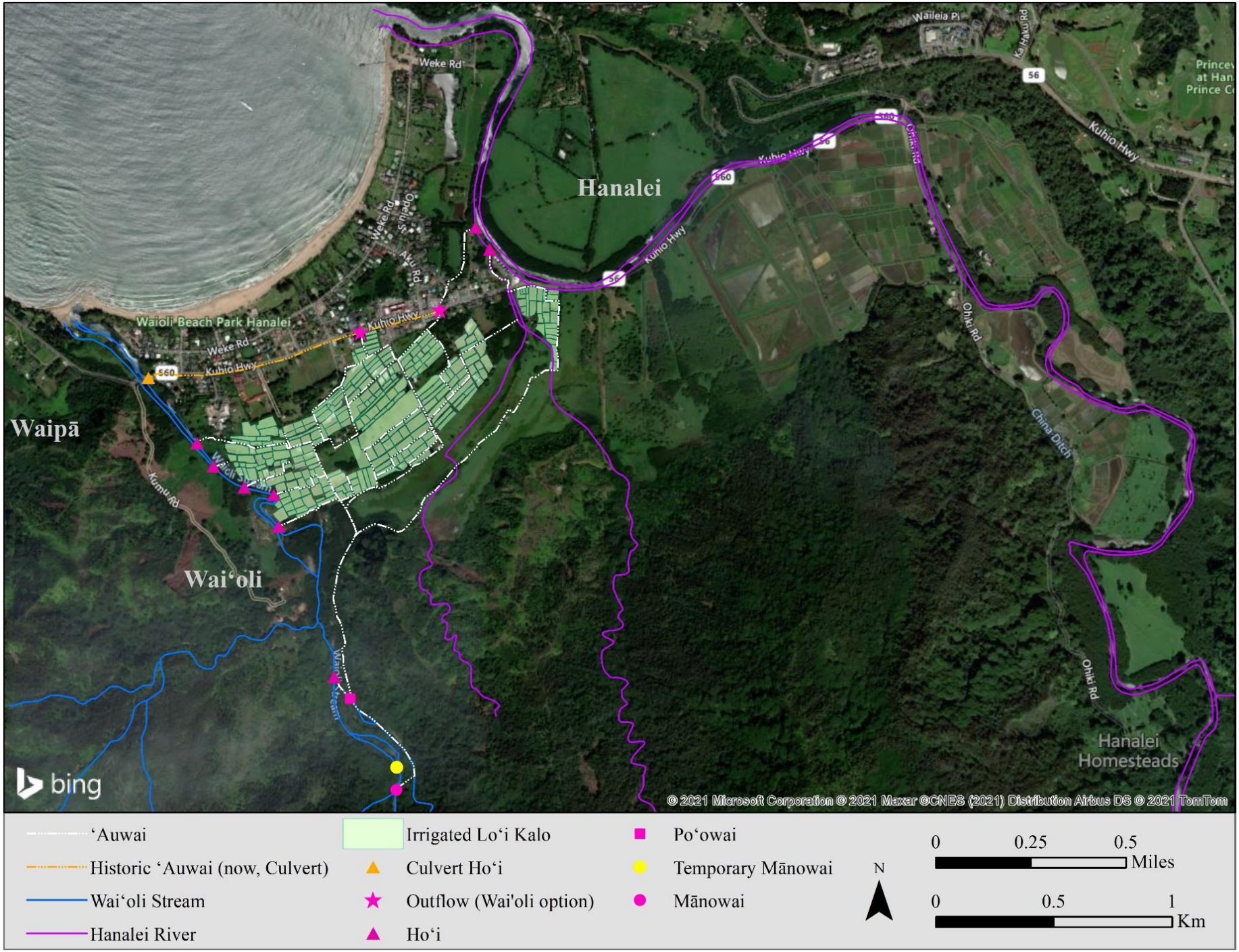


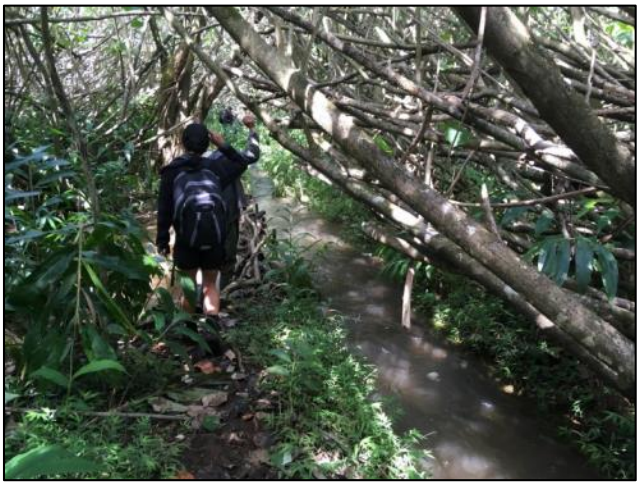
Figure 18: Waiʻoli Loʻi Kalo Irrigation System

Mānowai - Near historic mānowai location looking upstream.
Source: Waiʻoli Valley Taro Hui, August 2020

Mānowai – Downstream view from historic mānowai.
Source: Waiʻoli Valley Taro Hui, February 2020

Poʻowai "Lower" Diversion – Upstream view of "lower" diversion on tributary of stream.
Source: Site 2, DLNR - CWRM, 2019

Poʻowai "Lower" Diversion – Downstream view of East Waiʻoli ditch.
Source: Site 2, DLNR - CWRM, 2019



East Waiʻoli ʻAuwai: Downstream view of ʻauwai near hau bush.
Source: Site 7, DLNR - CWRM, 2019

East Waiʻoli ʻAuwai: ʻAuwai split above various loʻi complexes.
Source: Site 7, DLNR - CWRM, 2019

Figure 19: Site Photos – Upper Reaches (State Conservation District)

Waiʻoli Loʻi Complex - August 2020

Waiʻoli Loʻi Complex – August 2020

Waiʻoli Loʻi and ʻAuwai – May 2020

Waiʻoli Loʻi and ʻAuwai – October 2020

Source: Waiʻoli Valley Taro Hui

Figure 20a: Site Photos of Waiʻoli Loʻi (State Agricultural District)

Above: Using tractor to till the dry fallow field.
Source: Hui, 2020

Above: Inflow connecting ʻauwai and loʻi.
Source: Hui, 2021

Above: Outflow connecting loʻi and ʻauwai.
Source: State DLNR-CWR, 1992

Above: Closed outflow connecting loʻi and ʻauwai. *Source: Hui, 2020*

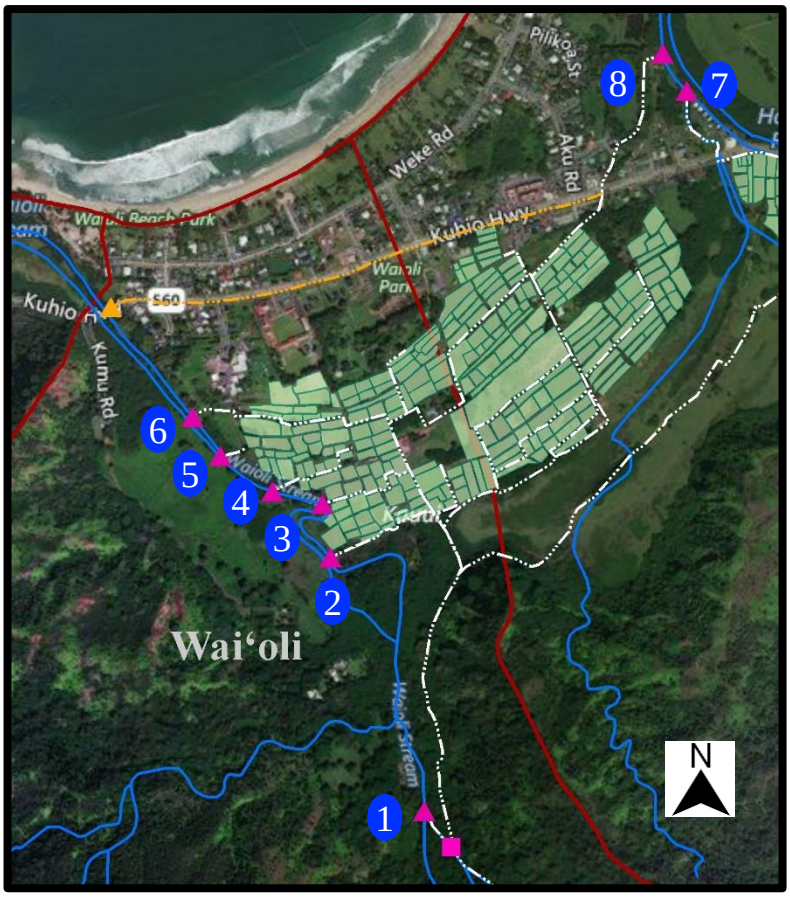
Above: Outflow connecting loʻi and ʻauwai.
Source: Hui, 2021

Figure 20b: Site Photos of the Waiʻoli Loʻi (State Agricultural District)

Above: Hoʻi 2 located 1.43 miles from Waiʻoli Stream Mouth and 0.07 miles from the poʻowai.

Above: Hoʻi 2 located 0.89 miles from the mouth of Waiʻoli Stream and 0.61 miles from the poʻowai.

Above: Hoʻi 3 located 0.72 miles from the mouth of Waiʻoli Stream and 0.78 miles from the poʻowai.



Location Map of Hoʻi

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Above: Hoʻi 4 located 0.64 miles from the mouth of Waiʻoli Stream and 0.86 miles from the poʻowai.

Source: Hui, 2020

Figure 21a: Site Photos of the Hoʻi at Waiʻoli Stream

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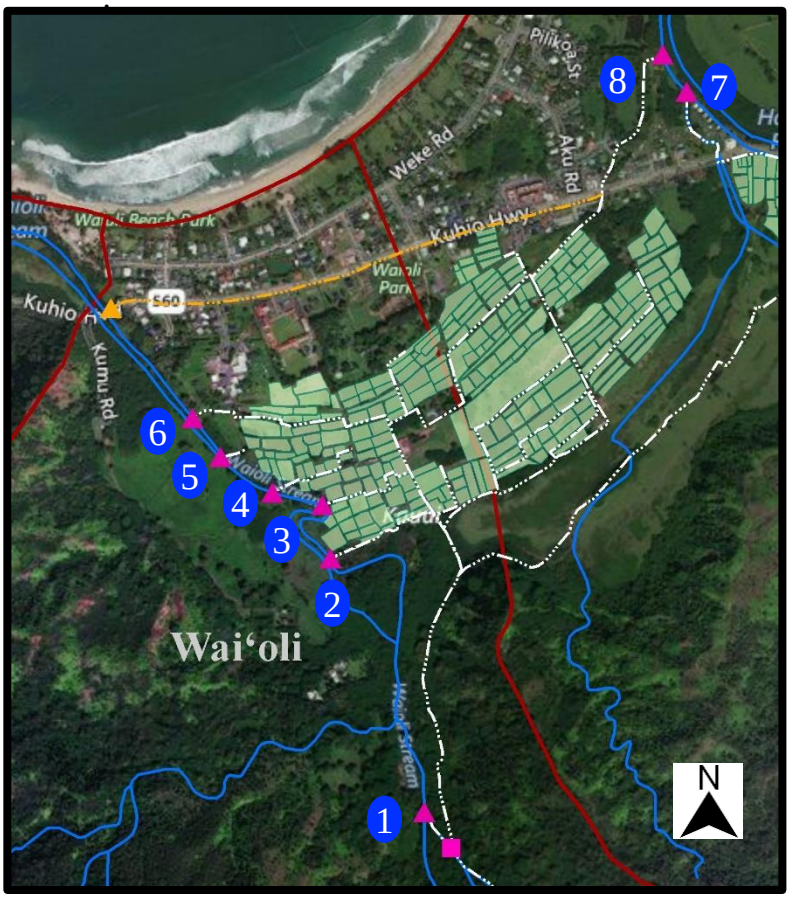
Above: Hoʻi 5 located 0.54 miles from Waiʻoli muliwai and 0.96 miles from the poʻowai.

Above: Hoʻi 6 located 0.46 miles from Waiʻoli muliwai and 1.04 miles from the poʻowai.

Above: Hoʻi 7 located 0.92 miles from Hanalei muliwai and 1.71 miles from the poʻowai.

Location Map of Hoʻi



Above: Hoʻi 8 located 1.01 miles from Hanalei muliwai and 1.56 miles from the poʻowai.

Figure 21b: Site Photos of the ʻAuwai to Hoʻi at Hanalei River

Source: Hui, 2020.

Ma uka of Kūhio Highway

Ma kai of Kūhio Highway

Ma kai of Kūhio Highway

Ma uka of the Hanalei Bay

Above: Sand bar formation closes the mouth of the Wai‘oli Stream off from Hanalei Bay in the summer.

**The river mouth changes based on environmental conditions and seasonality. Photo reflects a point in time, and does not represent the various changes that occur through the year.

Source: Google Maps, 2020

Figure 22: Site Photos of the Wai‘oli Estuary and Muliwai (State Conservation District)

3.2.2. Kalo Cultivation in Wai‘oli

The farmers of the Hui strategically time their lo‘i to grow at different stages. This ensures a regular harvest and consistent process, while allowing for adequate fallow resting periods to ensure the health of the next generation of kalo. **See Figure 23, Lo‘i Kalo Maturity and Dissection**, **Figure 24, Working in the Lo‘i Kalo Irrigation System, and Figure 25, Kalo Cultivation and Use.**

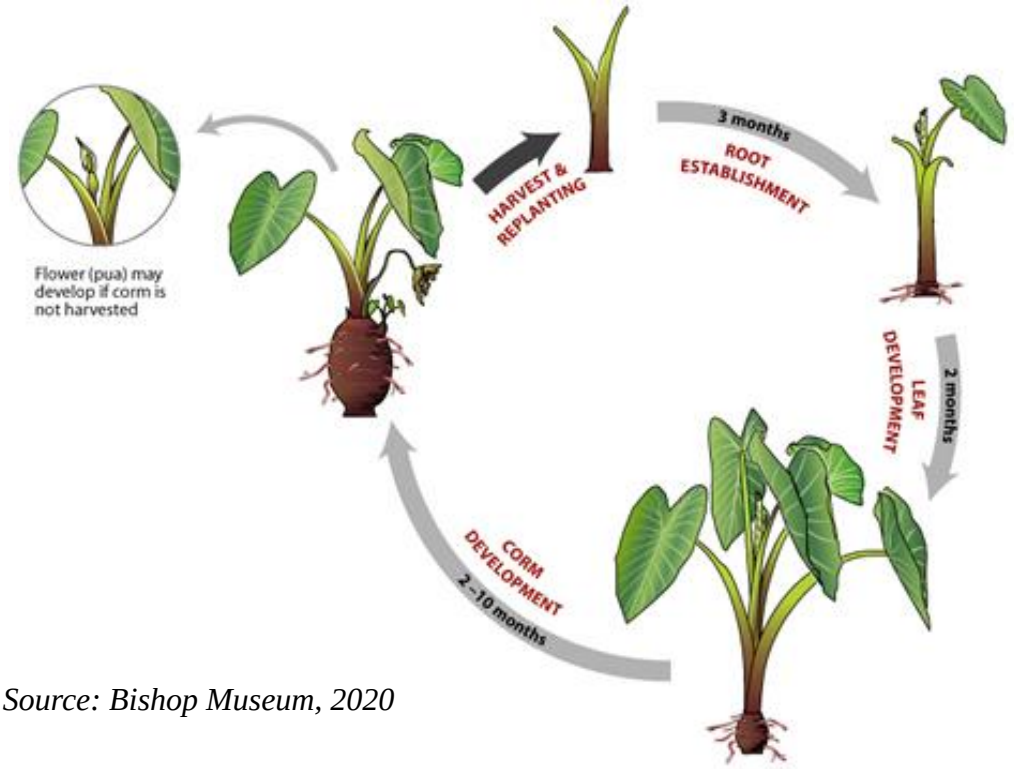
Cultivating lo‘i kalo requires an intimate understanding of ‘āina. As described by master navigator Nainoa Thompson in terms of deep sea voyaging, yet relevant to the practice of kalo cultivation, a practitioner such as a kalo farmer will make thousands of observations of nature, leading to hundreds of choices and decisions to support kalo growth. In the case of this Hui, these observations – or the practice of kilo – have been noted over decades, spanned generations, and are specific to Wai‘oli itself. The Hui members observe and anticipate needs of both the kalo and its surrounding ‘āina in order to make decisions that are in turn beneficial to the kalo and the long-term health of the lo‘i complex and watershed. The Hui recognizes that the health of the ‘āina – the stream, soil, forest, etc. – is integral to their practice; and in turn, they undertake the kuleana to care for the place. Farmers constantly observe the stream, Lo‘i Kalo Irrigation System, and crops to determine when to adjust water levels, apply amendments, and adjust methods to address recent/current/anticipated atmospheric and environmental conditions (e.g., stream cleaning). Often times, the farmers are able to predict what is going on upstream just by looking at the condition of the water flowing through their lo‘i kalo.

While specifc kalo cultivation practices vary from farmer-to-farmer throughout Wai‘oli and especially throught Hawai‘i, this document generally outlines the process of kalo cultivation by the farmers in the Hui. Kalo cultivation in any individual lo‘i can span an estimated two (2) years in duration from fallowing to harvest. This includes:

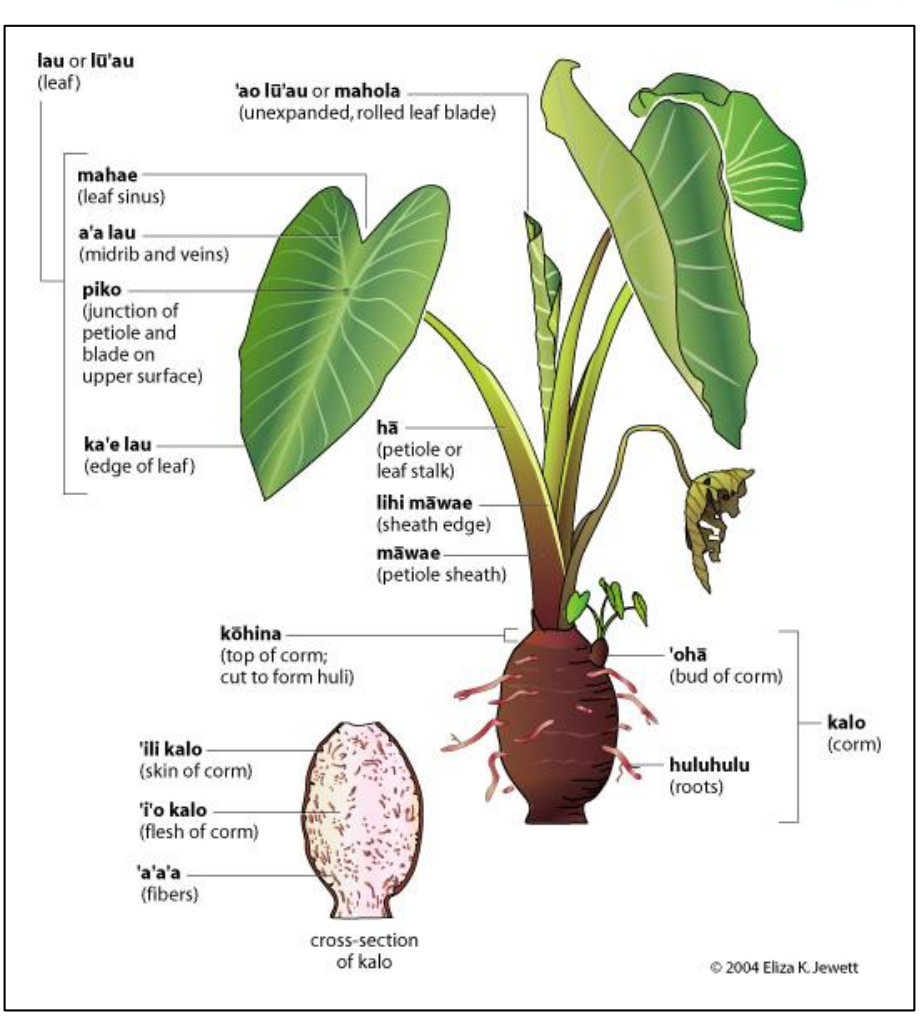
- Growing cycle: estimated twelve (12) to fifteen (15) months from planting to harvest, depending on the cultivar variety.
- Fallowing: may take an additional two (2) months to however long deemed necessary and is based on weather and the farmer’s circumstances.
- Cover cropping:[56] four (4) to twelve (12) months.

The overall time duration has been provided as a means to give context to the overall timeframe and planting cycle; timing is always subject to natural and environmental conditions. The process is highly dependent on natural, environmental conditions (e.g., rain, humidity, sun, season, cloud cover, and temperature), coupled with operational factors (e.g., equipment and labor availability). The following outlines the Hui’s general process of kalo cultivation, the stages of farming, and best management practices.

[56]A cover crop is defined as a close-growing crop that provides soil protection, seeding protection, and soil improvement between periods of normal crop production (Soil Science Society of America, 2008).



Source: Bishop Museum, 2020



Source: Bishop Museum, 2020

Figure 23: Loʻi Kalo Maturity and Dissection

Hui member planting huli – July 2019

Hui member planting huli – April 2017

Hui member removing weeds – October 2020

Hui Work Day - 2018

Hui member maintaining mānowai - 2016

Youth Volunteer Workday – June 2018

Figure 24: Working in the Loʻi Kalo Irrigation System

Source: Hui

Generations of family farmers working together in Waiʻoli – July 2019

Next generation – September 2020

Varieties of Kalo found in Waiʻoli – January 2020

Working in the loʻi – May 2020

Making poi from Waiʻoli Kalo – March 2018

Fresh steamed laulau using Waiʻoli lūʻau (leaf) - February 2016

Figure 25: Kalo Cultivation and Use

Source: Hui

Loʻi Preparation (Part 1):
Once an individual loʻi is harvested, the inflow is closed and the outflow is left open. This allows the loʻi to dry. Once a harvest is complete, the Hui members determine the next step(s) in preparation for a new cultivation cycle:

1. **Immediately Plant Huli**: Typically, if a farmer chooses to immediately plant huli from a recently harvested loʻi within the complex, it could mean: (a) the farmer does not have access to a tiller or tractor; (b) weather conditions may be too wet to prepare the loʻi; and/or (c) the huli need to be planted to ensure there will be a continuous source of planting material and crop for the near future.

2. **Fallow the Loʻi**: As a best management practice, this process is beneficial to the environment as well as the kalo itself. Similar to adding amendments (see Growth Cycle Part 1 below), kalo benefits from being planted in "soil that is allowed to lie fallow, or 'rest,' for a period of time…The longer the fallow, the more chance the soil has to replenish itself" (Evans, 2008, 31) Loʻi kalo research has also found that "[d]iseases of the corm and roots are found chiefly on wetland taro; they can best be controlled by thoroughly plowing and drying the soil and not replanting to kalo for 6 months to 1 year" (Parris, 1941). This process helps to break the cycle of disease causing microbes by allowing microorganisms in the soil to break down host tissues remaining after harvest, helps to lower pest populations (i.e., apple snail), and is a "means to reduc[e] pathogen populations and restoring soil quality and nutrient availability" (Evans, 2008, 33). In addition to intentional fallowing, a field may also be fallow due to weather, flooding, lack of water, drought, disrepair along the Loʻi Kalo Irrigation System, or operational challenges (ie. equipment, funds, labor, etc.).

3. **Plant Intentional Cover Crops**: Planting intentional cover crops is another best management practice utilized by Hui members. It helps to break the cycle of disease causing microbes, lowers the apple snail and pest populations, and enriches the soil to enhance soil composition. Intentional cover crops include: sunn hemp (*Crotolaria* sp) and/or combined with male sterile sorghum sudan. In this stage, the farmer procures cover crop seeds, tills and dries the loʻi, and times the seed planting. Timing is important in this stage because the farmer must ensure the right amount of rainfall to avoid any potential flooding in the loʻi which may result in a subsequent loss of seed. Once the cover crop begins to flower, the farmer will cut and spade, then till in the cover crop, thereby improving the loʻi soil structure. The inflow remains closed and outflow is open so that standing water does not hamper growth.

   As a best management practice, the use of organic green matter and/or cover cropping residues help the soil to hold nutrients and water, improving the efficiency of nutrient use, suppressing weeds, improving the physical condition of the soil, and protecting soil from wind and water erosion/runoff (Grubinger, 2020).

4. **Allow Unintentional Cover Crops**: By allowing unintentional or naturally occurring cover crops to grow (e.g., honohono, buffalo grass/California grass), the farmer helps to break the cycle of disease-causing microbes, lower the apple snail and pest populations, and enrich the soil with beneficial microbes that enhance soil composition that improve overall plant health. This method of cover cropping would require the green matter to be cut or mowed, then tilled

in when the lo‘i needs to be prepared. The inflow is usually closed, and the outflow is usually open, to allow excess rainfall or floodwaters to leave the lo‘i and allow the lo‘i to dry.

5. **Add Organic Green Matter and/or Compost**: As another best management practice, adding composted or raw organic green matter enriches the soil with beneficial microbes that also enhance soil composition to improve overall plant health. The farmers use a range of green matter including: grass cuttings, hau leaves, kukui leaves, and other naturally occurring foliage from the area. This stage can take several months to break down, similar to the green biomass produced from cover crops. During this stage, the inflow is closed and the outflow is open to allow excess water (i.e., rain fall or floodwaters) to leave the lo‘i and to allow the lo‘i to dry.

Lo‘i Preparation and Planting (Part 2):

1. **Dry Tilling**: Tilling involves turning over the soil; usually with a tractor. The farmer must time tilling with drier weather. If the farmer enters the lo‘i with a tractor when it is muddy or wet, the soil structure can be destroyed. During this stage, the lo‘i outflow is open and the inflow is closed so that no water flows into the lo‘i from the ‘auwai.

2. **Applying a Soil Amendment (optional)**: The farmer may opt to apply an amendment such as lime or another calcium source. This usually occurs after the lo‘i is dry-tilled. During this stage, the inflow and outflow are closed, and the amendment is tilled into the dry soil.

3. **Flood the Lo‘i**: With the outflow closed, the inflow is opened to allow water to flow into the lo‘i until the soil is completely covered. This step eliminates unwanted weed growth. The outflow remains closed.

4. **Tilling:** The watered lo‘i is tilled to fill any gaps in the lo‘i floor. This seals the bottom of the lo‘i so that it holds water more efficiently. This process also softens the soil in preparation for leveling the soil. Tilling is done using a tractor and some may use a handheld walk-behind tiller as well. Other methods may include manually treading or stamping with feet. During this stage, the outflow remains closed.

5. **Level the Soil**: The soil in the lo‘i is then leveled. With a tractor, or with a handheld walk-behind tiller, a board is pulled to level the mud. The famer ensures that there are no exposed areas of soil/mud above the water level. This prevents grass seeds from rooting and eliminates unwanted weed growth. The lo‘i outflow remains closed and inflow is slightly open with water trickling in to ensure the standing water height continuously covers the soil.

6. **Plant Huli**: The farmer can commence planting after the soil is leveled. The farmer uses huli from recently harvested kalo (see below). During the harvest stage, the ‘i‘o is removed and the huli is cut and set aside to use for the next planting cycle. Ideally, the huli should be planted one (1) to three (3) days after harvest. During this time, the lo‘i outflow remains closed and the inflow is partially open with water trickling in to maintain the proper water level.

a. **Soil and Water Levels**: Generally, as described in "Taro Mauka to Makai: A Taro Production and Business Guide for Hawaiʻi growers," "there should be at least 10 inches of good soil above the hardpan (a subsoil layer that will act as a barrier to retain water, if not disrupted). Deep soil will allow plenty of room for ʻiʻo growth. If the subsoil is shallow and relatively moist, as in a marshy area, you will typically not be able to excavate the soil from the center of the loʻi to make the banks (kuāna) because all the soil will be needed just to seal the bottom of the loʻi. Therefore, you will need to locate enough additional debris-free soil to build the banks as necessary." (Evans, 2008, 67).

7. **Settling In**: By the time planting the huli is complete, which can range from a few days to a few weeks (dependent on the number of people supporting the work), the sedimentation in the water is settled and the inflow and outflow can be opened and adjusted.

8. **Weeding**: With no leaf canopy on the kalo, the farmers closely observe the natural environment and the kalo in the first few weeks. Farmers monitor water levels to ensure the soil is covered with water which this reduces weeds from taking root and growing. If weeds grow in the loʻi during this stage, weeding is done by hand. During this time, the inflow and outflow can be opened.

Growth Cycle (Part 1) – Adding Amendments:
Amendment use varies by farmer and is highly dependent on natural and environmental conditions (e.g., plant growth stage, plant observation, loʻi size, stage of growth, seasonality). Thus, each farmer and/or each individual loʻi will differ as to if or when amendments are used, what type of amendment is used, and the amount applied.

1. **Types**: Amendments include a variety of sources of food-friendly nutrients that are needed to ensure healthy kalo growth for 12 to15 months. The Hui's amendments typically include naturally occurring lime or calcium, mined sulfate of potash for potassium, and nitrogen sources derived from chicken manure, sea bird guano, or feathermeal.

2. **Timing**: In Waiʻoli, loʻi kalo can receive nutrients from approximately one (1) month to about eight (8) months of kalo age. When amendments are applied, the farmer will close the outflow and inflow. No water leaves the loʻi to ensure that nutrients remain within the loʻi and benefit kalo growth. After application, the farmer will open the inflow to briefly allow water to flow into the loʻi and ensure the soil is covered to prevent unwanted weed growth. The outflow is kept closed. Once the loʻi is sufficently flooded, the inflow is again closed, and the amendment continues to dissolve and percolate into the loʻi soil. This is done until there is no standing water in the loʻi. This practice is repeated three (3) to five (5) times, so that any remaining amendment can dissolve and percolate into the soil.

3. **Quantity**: The quantity of amendment varies and is highly dependent on unique plant growth, loʻi size, stage of growth, and seasonality (i.e., photosynthetic rate) – all key components in the farmer's expert observations and decisionmaking. Balancing these components are important to the farmer's succes. Overusing amendments will attract pests and diseases that can affect the quality of the harvest, affect other loʻi in the communal Loʻi

Kalo Irrigation System and/or serve no additional beneficial purpose if excess is applied. The Hui complies with product recommendations.

Once the amendment has completely percolated into the soil (varying from approximately 1 to 2 weeks), the inflow and outflow are fully opened to allow the throughflow of water again.

Growth Cycle (Part 2) – Harvesting:

1. **Monitoring Water Levels**: As the kalo matures, the farmer must continue to monitor water level in the loʻi. If the water is too high, plants could drown. If the water is too low, the farmer risks soil exposure that may attract feral animals and increase weed growth.

2. **Harvesting**: Loʻi kalo in Waiʻoli are typically harvested around twelve (12) to fifteen (15) months of kalo age and varies based on the kalo variety and the natural and environmental conditions at that time. This stage could take anywhere from a day to a month to complete, depending on loʻi size, quality of kalo, and demand. Harvest of each individual kalo is done by hand with patience; no machinery is used. At this stage, the inflow and outflow can be open or closed.

3. **Distribution**: Huli is harvested and used for the next planting cycle and generation of kalo. The ʻiʻo and leaves are bundled or separately bagged in both large (100 pound) and small (80 pound) bags. These bags are often shared with family, friends, community groups, and/or sent to processors. The bagged kalo is sent to neighboring Waipā Foundation or other nearby mills for processing. The Hui, itself, does not boil or process kalo other than for personal use.

   Distribution is also done through the trading of good and services. For example, the Hui may trade kalo and other kalo products (e.g. kululo, lau, poi, kalo paʻa) with fishers, hunters, vegetable/fruit farmers, or lomilomi practitioners. Kalo for friends and family or through trading is often provided in boxes, buckets, or bags, depending on the quantity needed. **See Section 5.8.3., Economic Characteristics.**

Ongoing Maintenance:

- **Mitigating Invasive Vegetation & Overgrowth**: The Hui's weed management strategy is to suppress, or eliminate weeds. Overgrowth of vegetation and trees threaten ʻauwai integrity and restrict water flow through Waiʻoli Stream and Loʻi Kalo Irrigation System. The Hui pulls weeds by hand and/or utilizes a variety of hand tools.
- **Removing Debris & Unblocking Waterways**: On a regular basis, the Hui monitors and removes debris, silt, ʻiliʻili, etc. from the stream, ʻauwai, and larger Loʻi Kalo Irrigation System in order to ensure healthy stream and water flow.
- **Combatting Pests & Feral Animals**: On a regular basis, farmers walk line by line to pick out apple snail eggmasses and the snails and place them into a bucket. In addition to causing agricultural damage, these pests, and apple snails in particular, are a threat to human health. To combat feral pigs, the Hui uses snare traps or shoot feral pigs on their private property, depending on the circumstances.

3.2.3. Instream Flow Standards

Given competing needs for Hawaiʻi's limited water resources, instream flow standards ("IFSs") and interim instream flow standards ("IIFSs") are the principal mechanisms to ensure that surface water rights and interests, including resource protection, are adequately considered. To facilitate IFSs and IIFSs, the Legislature mandated that the Commission "establish and administer a statewide instream use protection program" when the Water Code was passed in 1987. (HRS § 174C-71). This program was specifically designed "to protect, enhance, and reestablish, where practicable, beneficial instream uses of water." (HRS § 174C-71(4)). To implement the program and establish meaningful IFSs and IIFSs, the Commission must conduct investigations and collect instream flow data including streamflow characteristics, fishing, wildlife, aesthetic, recreational, water quality, and ecological information necessary to determine instream flow requirements.

An IFS assures a minimum amount of stream flow "necessary to protect the public interest in [a] particular stream. Flows shall be expressed in terms of variable flows of water necessary to protect adequately fishery, wildlife, recreational, aesthetic, scenic, or other beneficial instream uses in the stream" and must be established "on a stream-by-stream basis." (HRS §§ 174C-71(1), -71(1)(c)). In Waiʻoli, kalo cultivation, other traditional and customary Native Hawaiian practices, and the conveyance of irrigation supplies to downstream points of diversion, are beneficial instream uses. The Hui's use of water – including the traditional and customary practice of kalo cultivation and the exercise of appurtenant rights – are also public trust purposes, which means they have legal priority over other uses and are considered "the norm or 'default' condition" ("*Waiāhole*").

To establish an IFS, the Commission must "weigh the importance of the present or potential instream values with the importance of the present or potential uses of water from the stream for noninstream purposes, including the economic impact of restriction of such uses." (HRS § 174C-71(1)(E)). It must also consult specific agencies and hold a public hearing before any IFS is established. (HRS. §§ 174C-71(1)(E), (F)). Because an IFS is intended to be permanent, it requires rigorous biological, hydrologic, and cultural data, as well as other information. In establishing an IIFS, the Commission must adhere to the same balancing standard established for an IFS. This process was designed to be expedited and adaptive, however, and the standard is more flexible in terms of how broadly it may be imposed, when compared to a permanent IFS. The administrative rules implementing the Water Code contemplated that by December 31, 1988 – approximately one year from the date of the Code's passage – the Water Commission would establish scientifically-based IIFSs for all 376 perennial streams in Hawaiʻi.

The current IIFSs for Kauaʻi streams including Waiʻoli were established by HAR 13-169-48. These "status quo" IIFSs are not numeric and instead adopted as the IIFS, the amount of water flowing in each stream as of June 15, 1988.

> "Interim Instream flow standard for Kauaʻi. The Interim Instream Flow Standard (IIFS) for all streams on Kauaʻi, as adopted by the commission on water resource management on June 15th, 1988, shall be the amount of water flowing in each stream on the effective date of this standard, and as that flow may naturally vary throughout the year and from year to year without further amounts of water being diverted off stream through new or expanded

> diversions, and under the stream conditions existing on the effective date of the standard…" (HAR 13-169-48).

In January 2021, the Water Commission published a draft Instream Flow Standard Assessment Report ("IFSAR") for Wai‘oli Stream and began consultation with affected community members, including the Hui. In April 2021, the Water Commission received an informational briefing on the IFSAR, including a recommendation to establish the IIFS at a flow of 4 mgd. At that meeting, members of the public testified in support of the proposed IIFS. That value represents 50% of the 90th percentile flow (Q90) at the po‘owai, which was estimated to be 8 mgd. In line with Native Hawaiian custom, Commission staff expect that during drought conditions, only 50% of the water shall be diverted from Wai‘oli Stream to protect other instream values (in addition to the Hui's instream use of kalo cultivation). Commissioners praised the Hui's efforts and uplifted the process as a model for other IIFSs. In May 2021, the Water Commission voted to adopt the staff's recommendation of a numeric IIFS of 4 mgd. In addition to regular monitoring requirements, the Commission also adopted an adaptive management approach. Consistent with the public trust and precautionary principle, the IIFS may be revised by future Commission action as more data is gathered. **See Appendix B, CWRM May 2021 Submittal**.

An IIFS is a legal determination regarding the amount of water required to protect the public interest in a stream, after weighing present and potential instream values and offstream needs. Any flow in a stream in excess of an IIFS is available for use. Given the adoption of a numeric IIFS for Wai‘oli Stream, the Hui may use any amount of water in excess of 4 mgd during low flow conditions. The Hui, however, is requesting up to 13.5 mgd only, which is what the Water Commission verified in the late 1980s as the Hui's historic use.

3.2.3. Required Permits and Approvals

The following permits or approvals will be required prior to approval of a long-term water lease.

Table 1: Required Permits and Approvals.

Permit or Approval	**Approving Agency**	**Legal Reference**
Right of Entry Permit	DLNR, BLNR	Administrative
Non-Exclusive Easement	DLNR, BLNR	HRS section 171-13 and -55
Request for Water Lease	DLNR, BLNR	HRS chapter 171
Watershed Management Plan or Lease Covenant	DLNR, BLNR	HRS section 171-58(f)
DHHL Reservation or Statement of No Reservation	DHHL	HRS section 171-58(g), Hawaiian Homes Commission Act section 221; HRS sections 174C-49(d), 101(a)

Interim Instream Flow Standard	DLNR, CWRM	HRS chapter 171, HRS section 174C-71(2)

4. Proposed Action and Alternatives

4.1. Proposed Action (Long-term Water Lease)

As described in Section 1.1, the **Proposed Action**, a 65-year long-term water lease, seeks legal approval for the Hui's existing, non-consumptive use of water from Waiʻoli Stream to sustain its Loʻi Kalo Irrigation System. It would enable the perpetuation of the traditional and customary Native Hawaiian practice of loʻi kalo cultivation in Waiʻoli, as it has operated for centuries on State Agricultural District land outside the State Conservation District. At the beginning of the Loʻi Kalo Irrigation System, water from Waiʻoli Stream flows into the mānowai, located 1.8 flowpath miles from the muliwai. The water is then channeled into the poʻowai, ʻauwai, and eventually reaches the individual loʻi. The water is then returned to Waiʻoli Stream or Hanalei River through eight (8) hoʻi. The **Proposed Action**'s use of water is a traditional Native Hawaiian use and is instream, almost entirely within the Waiʻoli Watershed, and completely within the Hanalei River Watershed (State DLNR-LD, 2020).

The Proposed Action will secure the legal entitlement for the ongoing use of water from the Waiʻoli Stream for kalo cultivation practiced in a traditional manner. Under the Proposed Action, loʻi kalo cultivation will continue to support community-based cultural and agricultural education, reinforce community identity, and provide vital environmental benefits such as local food security, flood mitigation, ground water recharge, Native habitat preservation, and watershed stewardship. The Proposed Action will also ensure reliable access to the water resources intrinsically tied to traditional and customary cultivation practices that have been documented as an integral part of Waiʻoli's rich history and bountiful ʻāina.

The **Proposed Action**, allows for and supports: the perpetuation of constitutionally-protected Native Hawaiian traditional and customary practices; the continued stewardship of biocultural watershed resources that are closely intertwined with stream flow and the maintenance of waters in their natural state; appurtenant and riparian rights; and local food production. The **Proposed Action** also allows for the continuation of an ancient land management system to survive the transition into Hawaiʻi's modern legal paradigm.

4.2. Alternative A: Shorter Lease Term Alternative (35-Year Lease)

Similar to the Proposed Action, Alternative A, the **Shorter Lease Term Alternative**, would provide the Hui with a long-term water lease for the Hui's non-consumptive use of water from Waiʻoli Stream to sustain its Loʻi Kalo Irrigation System. It would, however, provide a shorter lease term of 35 years. The **Shorter Lease Term Alternative** would still secure the legal entitlement for the ongoing use of water from Waiʻoli Stream for kalo cultivation in a traditional manner, support community-based education, uphold community identity, provide environmental

benefits, and support the constitutionally protected Native Hawaiian traditional and customary practice of kalo cultivation.

Given the shorter lease term, however, this alternative would provide considerably less stability than the **Proposed Action** and may minimize the potential security for kalo cultivation in Wai‘oli. A shorter lease term will make it difficult for the Hui to obtain potential partners to invest in improvements to the Lo‘i Kalo Irrigation System, infastructure, and water lease area. For example, partners (e.g., County of Kaua‘i or the Federal Government) may be less willing to invest in implementing a USGS stream cleaning gauge, piping unlined portions of the ‘auwai to minimize loss, and/or fencing and stream cleaning efforts to improve water quality and the larger watershed. These potential partnerships offer improvements that would make the area more efficient, stable, and long-lasting.

4.3. Alternative B: Status Quo Alternative (Annual Revocable Permit)

Under Alternative B, the **Annual Revocable Permit Alternative**, the Hui would be required to continue to renew and/or obtain annual revocable permits for water. The Hui would need to submit a request each year with no guarantee that a permit will be granted and without the environmental protections afforded by the Chapter 343 process. This alternative not only threatens the continued practice of kalo cultivation in Wai‘oli but may also impede on the State’s ability to fulfill its constitutional duty under Article XII, section 7. Further, reduced maintenance and stewardship of Wai‘oli’s natural resources as a prerequisite to kalo cultivation would also significantly diminish and affect the surrounding North Shore community.

The Hui remains committed to kalo cultivation in Wai‘oli. This **Annual Revocable Permit Alternative**, however, provides no long-term legal commitment by the State to preserve and protect the water needed to continue the practice of kalo cultivation in Wai‘oli. Without a long-term water lease, the Hui has no security or certainty in their rights to access the water necessary to support their lo‘i. Given the many challenges around kalo cultivation (e.g., recovery from severe weather events, changing community, inherent risk in agriculture, etc.) the Hui fears that they may not be able to continue kalo cultivation as they have for generations.

The Hui relies on the **Annual Revocable Permit Alternative** as the current entitlement for water use. On February 28, 2020, BLNR unanimously voted to award the Hui a revocable permit for its water use (State DLNR-LD, 2020). As we await the Hawai‘i State Supreme Court’s decision in *Carmichael v. BLNR* (argued in April 2020), it is unclear whether renewal beyond a single year will continue to be a possibility in Hawai‘i. A forthcoming ruling may also set additional requirements; including, for example, Chapter 343 compliance, which itself takes more than a year to complete.

The **Annual Revocable Permit Alternative** likely impedes on the State’s ability to fulfill its constitutional duty under Article XII, section 7 to preserve and protect traditional and customary practices and to “assur[e] appurtenant rights and existing correlative and riparian uses.” Without a long-term water lease, the Hui’s ability to plan and invest in the future will also be severely impaired. For instance, since many varieties of kalo grown by the Hui typically take well over a year to grow, a year-to-year permit would not even support a single harvest.

From a natural resource management perspective and as it concerns the long-term viability of traditional kalo cultivation, requesting an annual water permit is significantly less desirable than the approval of a long-term water lease. Given the uncertainty of a year-to-year permit, should an annual water permit not be granted, the Hui faces significant challenges and negative impacts on their ability to cultivate kalo and for Waiʻoli to maintain its character and culture that has defined this North Shore community (as further elaborated in Section 4.3).

4.4. Alternative C: No-Action Alternative (No Permit Scenario)

Alternative C, the **No-Action Alternative**, would leave the Hui without a long-term water lease or a revocable permit. The denial of a long-term water lease and/or a revocable permit would cause irreparable damage to the Hui's longstanding, intimate, and unique relationship to this ʻāina and wahi pana.[57] Leaving the Hui with few (if any) legal options to access water necessary for the Loʻi Kalo Irrigation System, a **No-Action Alternative** threatens the Hui's generations-old practice and would likely force kalo cultivation out of operation entirely. Under a **No-Action Alternative**, the State would violate its constitutional duty under Article XI, section 7 to preserve and protect this traditional and customary subsistence practice and to "assur[e] appurtenant rights and existing correlative and riparian uses."

For legal or other reasons, if the Hui lacks access to the water necessary to maintain this Native Hawaiian Loʻi Kalo Irrigation System, throughflow will stop, which will end loʻi kalo cultivation in Waiʻoli all together. Like many cultural practices, the Loʻi Kalo Irrigation System is intrinsically tied to and works in balance with ʻāina. Without the Loʻi Kalo Irrigation System that has been a part of Waiʻoli's natural environment for centuries, there would be significant negative effects to the ʻāina, including the natural, cultural, and historic resources in the area. For instance, without the Loʻi Kalo Irrigation System and the kamaʻāina that steward it, the community would have fewer opportunities for ʻāina-based experiential education, which has the power to reshape perceptions, attitudes, behaviors, and kuleana towards vital environmental and cultural resources such as the watershed, ecosystem, and traditional kalo cultivation.

Without a long-term water lease or revocable permit, the Hui will not be able to manage the Loʻi Kalo Irrigation System as its members have for generations. The lack of regular stewardship and maintenance will have negative impacts on Waiʻoli's unique environment, resources, and community. These damaging impacts include:

- Diminishing or outright eliminating important habitats for endangered and threatened water birds;
- Removing a long-standing and active food source for the people of Kauaʻi and Hawaiʻi;
- Denying constitutionally-protected Native Hawaiian traditional and customary rights and appurtenant rights;
- Significantly altering the natural ecosystem that has relied on and adapted to this Loʻi Kalo Irrigation System for centuries;
- Neglecting the long-term health of the Loʻi Kalo Irrigation System and Waiʻoli Stream;
- Increasing presence of devastating pests and diseases related to diminished quality and quantity of water flow; and

[57] Storied place.

- Increasing external pressures that threaten the culture and environment of the area.

If the Loʻi Kalo Irrigation System is not properly maintained, invasive species will amplify damage to the ecosystem by increasing soil nitrogen levels, outcompeting Native plants, reducing Native habitats, blocking waterways, damaging infrastructure, and stagnating the flow of water (State DLNR – Invasive Species Council, 2020 and WVTH, 2020). Without active and ongoing maintenance, throughflow water, and the continuation of traditional stewardship practices, the Hui will not have the water they need to sustain their loʻi. As a result, Waiʻoli would no longer be able to support kalo cultivation. Instead, lands would likely regress to a swampy state, unusable for the traditional and customary subsistence practices that have thrived in this valley for centuries. If the lands were developed, the development would completely – and irrevocably – change the environment of Waiʻoli and the larger North Shore Kauaʻi altogether.

Without the Loʻi Kalo Irrigation System, a greater volume of water would be channeled through the main branch of Waiʻoli Stream, and the increased volume and intensity of water in the main channel during major rain events will have more severe impacts on Kauaʻi's North Shore community unless mitigated through other strategic stewardship activities. Thus, the Waiʻoli environment and its community are also left vulnerable to severe floods and other major weather events that have the potential to devastate the larger community. In addition, lack of long-term stewardship (that the **Proposed Action** would provide) would result in overgrowth of invasive species; the lack of regular stream cleaning and maintenance will result in clogged waterways; and the potential loss of kalo cultivation threatens community identity and values.

The potential impacts of the Hui not having legal permission to maintain the Loʻi Kalo Irrigation System and surrounding areas are exemplified by surrounding areas in the ahupuaʻa. In areas of Waiʻoli where loʻi are no longer maintained due to lack of water, the natural environment (e.g., grasses, hau, shrubs, etc.) grows over the loʻi and pathway areas. Further ma uka, albizia, extremely fast-growing trees, are prone to sudden failure and collapse, and are located along the ʻauwai and near the mānowai. Recently, the Hui has also observed the trumpet tree, cecropia, or cecropiaceae (*C. peltata*), a newly introduced high risk invasive (PIER, 2021), in the areas from Kūhiō Highway to pasture land and near the start of the Loʻi Kalo Irrigation System. Although the trumpet trees fix nitrogen, their shallow roots cause landslides into the ʻauwai or may completely fall over, creating blockages similar to the problems with albizia. If invasive species like the trumpet tree continue to grow rampantly, unchecked, the Loʻi Kalo Irrigation System will be compromised by irreparable damage to the ʻauwai and loʻi.

A **No-Action Alternative** threatens not only the Hui's lifestyle of kalo cultivation but also the life and integrity of the Loʻi Kalo Irrigation System and loʻi kalo cultivation in Waiʻoli. The detrimental impacts of a **No-Action Alternative** would negatively effect Waiʻoli's natural environment, its culture rooted in kalo cultivation, and the community's resilience against major weather events and severe floods. If, under a **No-Action Alternative**, the Hui is unable to steward their loʻi and the related Loʻi Kalo Irrigation system, the purposes of the **Proposed Action** will be near impossible to meet and would result in the State's abrogation of its constitutional duty to protect Native Hawaiian traditional and customary practices.

5. Environmental Setting, Potential Impacts, and Minimization and Mitigation Measures

This section discusses the environmental conditions and ʻāina, provides an analysis of potential impacts, and proposes minimization and mitigation measures. The terms below are used to describe the scope, scale, and intensity of potential effects.

- *Beneficial* - Resources would be positively affected, with measurable benefits to wildlife or plant communities or other aspects of the human environment. No mitigation measures would be needed to offset favorable effects. This term may be considered atypical in the HRS chapter 343 process; however, the Proposed Action's uniqueness and significance to Hawaiʻi is reflected in the use of this additional analysis.

- *Neutral to Negligible* - Resources would not be affected, or the effects would be at or near the lowest level of detection. Resource conditions would not change or would be so slight there would not be any measurable or perceptible consequence to the natural and human environment (i.e., wildlife or plant communities).

- *Minor* - Effects would be detectable. Mitigation, if needed to offset adverse effects, would be easily implemented and successful based on knowledge and experience.

- *Moderate* - Effects would be readily detectable with measurable consequences to wildlife or plant communities or other aspects of the human environment but not readily detectable or measurable beyond the immediate area of impact. Mitigation measures could be extensive, moderately complicated to implement, and likely successful based on knowledge and experience.

- *Significant to Major Negative* - Region-wide effects would be obvious and would result in substantial consequences to wildlife or plant communities or other aspects of the human environment.

5.1. Climate

5.1.1. Climate

The Proposed Action is located in Waiʻoli, on the north side of the island of Kauaʻi immediately west of Hanalei Valley. Generally, the climatic conditions on Kauaʻi are dominated by northeasterly tradewinds approximately 70% of the year, bringing warm, tropical, moisture-laden air to the island. At sea level, temperatures in the Hanalei Bay Watershed, where Waiʻoli Valley is located, are mild and generally range from a daily mean minimum of 65 to 70°F to maximum of 80 to 85°F, with the warmest temperatures occurring in August and September. Temperatures vary with elevation and generally decrease 3°F per 1,000-foot elevation gain (HWH, 2012).

Over the last 30 years, data from the University of Hawaiʻi shows a rapid rise in air temperature, averaging 0.3°F per decade including the presence of warming at high elevations (above 2,600 feet). Although, the rate of temperature rise at low elevations (below 2,600 feet), 0.16°F per decade, is less

than the global rate (about 0.36°F per decade); yet, the rate of warming at high elevations in Hawaiʻi, 0.48°F per decade, is faster than the global rate (Fletcher, 2010).

5.1.2. Rainfall

From 1845 to 1846, the Waiʻoli-Mission Rain Gauge actively tracked rainfall data in Waiʻoli. Then, from 1892 to 1909, the Hanalei-Deverill Rain Gauge actively tracked rainfall data in the area. Although there is no consistently present rainfall gauge in Waiʻoli Valley, annual rainfall in Waiʻoli is approximated at an average of 118.22 inches/year (3,000 mm) (Giambelluca et al., 2013; State OP-GIS, 2020). Although rainfall varies greatly throughout the year, the uppermost reaches of Waiʻoli Valley at its kumu wai,[58] Nāmolokama Mountain, annual rainfall has been recorded at 236 to 275 inches (Leu Cordy & Merrin, 2020).

For the last 111 years, there has been no active rain gauges within the Waiʻoli Ahupuaʻa. The nearest active rain gauge to Waiʻoli is located in the neighboring Waipā Ahupuaʻa to the west. Established in 2011, Waipā Foundation operates the Waipā Garden Rainfall Gauge. The highest annual rainfall recorded was in 2018 (the same year as the historic floods this EA seeks to address) with 209.77 inches of rainfall. The lowest annual rainfall recorded was in 2013 with 86 inches. The highest monthly rainfall recorded by the Waipā Garden Gauge was in April 2018 at 68.56 inches followed by monthly highs of 63.44 inches in March 2012, and then 28.96 inches in August 2018 (Hurricane Lane); a 34.48 inch difference between the second and third highest recorded rainfall months in the area (Waipā Foundation, 2020). Research estimates that climate change will cause the global hydrological cycle to intensify and result in an increased risk of flooding to Waiʻoli and the surrounding areas (State DOH, 2019).

Although climate change research estimates an increase in intensity, and thereby flooding, there has been a noticeable decrease in regular precipitation in Hawaiʻi generally over the last century, decreasing the amount of ground water recharge that occurs (State DOH, 2019). “This decline in precipitation can also have a negative impact on Native species and sensitive ecosystems that rely on rainwater to survive.” Kalo is particularly vulnerable to any future decrease – and increase – of precipitation, which would pose a threat to this valued and vital traditional food sources for Kānaka Maoli and the greater community. (State DOH, 2019).

5.1.3. Air Quality

The Hawaiʻi Department of Health (“DOH”) collects measurements of ambient level pollutants through a statewide monitoring network to ensure State and Federal air quality standards are met. The island of Kauaʻi’s Niumalu Station measures particulate matter, sulfur dioxide, and nitrogen dioxide. The Station is located south of Līhuʻe Airport, 34 driving miles from Waiʻoli. Thus, there is no data available specifically available for the North Shore of Kauaʻi.

A review of the 2020 Ambient Air Monitoring Network 5-Year Assessment for the island, however, notes that cruise ship emissions are the main air surveillance concern for Kauaʻi and it should continue to be monitored. Although a reduction in SO2 was noted, DOH recommends, “in the future,

[58] Water source.

the station may be moved to the population centers of Līhuʻe or Kapaʻa, depending on the needs of the community" (State DOH, 2020).

5.1.4. Potential Impacts, Minimization and Mitigation Measures

Given the historical use and management of this area, *no significant impacts* are anticipated as a result of the Proposed Action. To the contrary, the Proposed Action will have *beneficial impacts.* The Proposed Action may affect air quality by generating some dust, but given the farmers' practices and distance, it is unlikely to affect anyone other than the farmers working on their respective farms.

In evaluating projects generally, it is important to note that larger environmental settings like climate change cannot be entirely minimized and mitigated. There are, however, opportunities to mitigate the effects of climate change. With this in mind, and in partnership with DLNR, the Hui's Watershed Management Plan articulates mitigation measures with regard to Waiʻoli Valley. Specific to climate, the Draft Hui Watershed Management Plan includes:

- Cleaning and restoring Waiʻoli Stream to decrease hazards of future flood events;
- Removing and control of non-Native hooved animals (i.e., pigs) from important watershed forests; and
- Community outreach and education to facilitate citizen-based watershed protection and ahupuaʻa-level resource management.

The **Proposed Action: Long-Term Water Lease** would ensure the continued and ongoing water flow through the traditional Loʻi Kalo Irrigation System with access to up to 50% of flow during low flow conditions, consistent with the Water Commission's 2021 IIFS of 4 mgd for Waiʻoli Stream. Kalo cultivation in this traditional manner has a *beneficial effect* on climate (including and pertaining to rainfall and air quality) by mitigating flood impacts and improving air quality.

The Hui works in the loʻi daily, cultivating their intimate relationship with the ʻāina; the land and natural environment. It is because of this, that the Hui is the first to experience the impacts of rainfall, because kalo cultivation occurs in the flood prone lowlands. They are thus accustomed to enacting regular flood prevention (stream and ʻauwai cleaning) and mitigation measures. Although severe storms have the ability to damage the traditional Loʻi Kalo Irrigation System and subsequent harvests, the system has *beneficial effects* on community-wide flood mitigation. It distributes water in and across the ʻauwai and Loʻi Kalo Irrigation System, protecting lowland areas from the potential force and impact of floodwaters. In fact, this is the very ingenuity of the system. For example, the mānowai is designed to breakaway in heavy rain as to prevent flooding of the area, but it also distributes excess flow and force of floodwaters through the system minimizing flood damage. The system requires continued maintenance and repair (Townscape, 2018).

The Proposed Action has *beneficial effects* on air quality through the cultivation of kalo and surrounding plants. As living, Native species, these plants contribute to reducing carbon dioxide through photosynthesis. In turn, this creates more stable temperatures over time through transpiration; and, plays an active role in the natural water cycle. As wetlands, the loʻi kalo themselves are also extremely efficient at carbon sequestration. The Proposed Action also ensures ongoing cultivation of native plants and food, as opposed to alternative activities such as residential

development, invasive grass/weeds growth that typically overtake lowland areas, or non-Native, intensive agriculture production. "Another threat to native species is the invasive or non-native species. Some of the non-native species are far better adapted to the warmer, drier climate, and can therefore easily replace the native species" (State DOH, 2019).

Under **Alternative A: Shorter Lease Term Alternative**, **Alternative B: Status Quo Alternative** and **Alternative C: No-Action Alternative** and a reduction or elimination of kalo cultivation would have a *neutral to moderate beneficial impact* on air temperature, water cycle, and air quality within the area. Without long-term entitlements, requisite throughflow may be compromised (i.e., inconsistent or reduced) resulting in a reduction of loʻi and kalo cultivation by the Hui. Some individual loʻi may be taken out of cultivation to support other individual loʻi. The Hui would also need to address an increase in pests, weeds/non-Native species, and kalo rot/disease related to a reduction of throughflow. **See Section 4., Proposed Action and Alternatives**. With regard to climate and air quality, this would significantly reduce the existing *beneficial effects* on carbon dioxide reduction as outlined above.

In addition, a lack of or reduced amount of throughflow would make the Hui's work exponentially harder and increase the overall burden on the Hui's farming operations. For example, an increase in temperature has the ability to increase the presence of disease and pests such as kalo leaf blight disease that spread between plants and loʻi. An increase in pests and disease also requires additional time and resources to mitigate and reduce its presence for farmers in and around Waiʻoli.

5.2. Geology and Soils

5.2.1. Geology

The Hawaiian archipelago was created by volcanic eruptions that formed mountains with heights from 2,000 to over 13,000 feet above sea level. The island of Kauaʻi is the oldest of the eight main Hawaiian Islands and consists of a single shield volcano. Topographically, Kauaʻi is a product of heavy erosion with broad, deep valleys and large alluvial plains.

Hanalei Bay Watershed consists of deep valleys cut by running water that destabilize the slopes by tearing away rock fragments. These localized collapses occur and remain in talus slopes or carried downstream by floods (HWH, 2012). The sides of the stream valleys have near vertical pali[59] with crests and ridgelines that divide the numerous sub-watersheds such as Waiʻoli. Generally, the valleys in the Hanalei Bay Watershed have broad coastal plains with elevations at 0 feet mean sea level ("msl"). The lower portion of the mainstream stems contain floodplains that are part of the coastal plain and provide topography conducive to kalo cultivation (HWH, 2012). The dramatic difference in topography is one of the reasons that makes the area so iconic, but it is also a major factor in the flood-prone conditions. The steep mountain slopes encourage a quick runoff response to rainfall, while the floodplains in the lower stream reaches have such low gradients that floodwaters accumulate during runoff events, taking days to drain away (Waipā Foundation, 2020). **See Figure 26, Topography.**

[59] Cliffs.

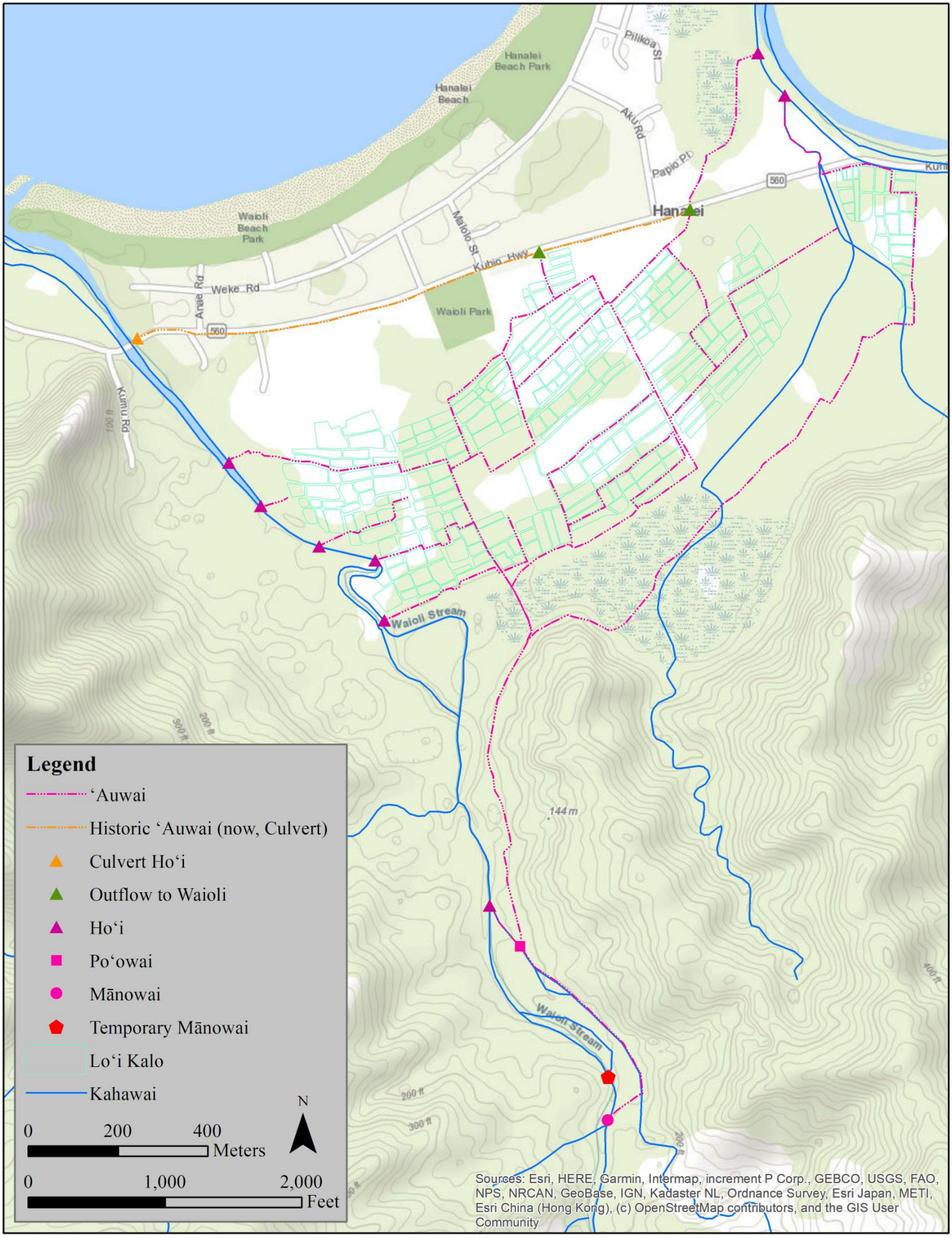


Figure 26: Topography

As a sub-watershed within Hanalei Bay Watershed, Waiʻoli is characterized by steep mountain slopes (45° with an average slope of 26°), steepest near the high ridgelines which then form concave drainage basins that transition into more moderately sloped valley walls (HWH, 2012). The upper portion of Waiʻoli contains three massifs, or mountain groups: Hīhīmanu, Nāmolokama, and Māmalahoa. Hīhīmanu is to the east and encompasses the back valley of Waiʻoli; Māmalahoa is to the west; and Nāmolokama is situated between the two to the south. The lower portion of Waiʻoli is bound to the east by the kalo lands of Kuhimanu, which abut Kamōkoleaka, a ridge that connects to Hīhīmanu. On the western border, dividing the Waiʻoli Ahupuaʻa from the Waipā Ahupuaʻa is a ridge paralleling Waiʻoli River named Makaihuwaʻa.

Demonstrating the interconnectedness of the Hanalei Bay Watershed, or Hanalei Kalana, the Waiʻoli Loʻi Kalo Irrigation System stretches across the coastal plains of Waiʻoli and into the Hanalei Ahupuaʻa, while the Waiʻoli estuary is located in the Waipā Ahupuaʻa. The majority of the Project Area elevation is at sea level to ten (10) feet above mean sea level ("amsl"). The elevation of the poʻowai is equal to or less than 50 feet amsl and the mānowai is between 100 to 125 feet amsl (GDSI data set, Kauaʻi 50-foot contours) (Leu Cordy & Merrin, 2020). The remainder of the ʻauwai, loʻi and hoʻi are situated within zero (0) to ten (10) feet amsl (Leu Cordy & Merrin, 2020).

5.2.2 Soil

Waiʻoli's soil composition consists of alluvial, non-calcareous flatland soils in the lowlands and along valley streams and considered to be most important for agriculture; coral sandy soil, mixed with calcareous marine organism fragments, concentrated in the ocean front (HWH, 2012).

Within the Waiʻoli Stream and breadth of the Loʻi Kalo Irrigation System, the soil series vary depending on the topography or location ma uka to ma kai. Using the United State Department of Agriculture ("USDA") Natural Resources Conservation Service Web Soil Survey, generally, the Waiʻoli Stream and Loʻi Kalo Irrigation System are represented by six (6) soil series. However, roughly half of the Project Area is comprised of Kolokolo extremely stony clay loam (KUL) and Mokuleia clay loam (Mta) (USDA, 2020). **See Figure 27, Soil Map.**

Below is a detailed description of each soil series:
Rough mountainous land (rRT): These occur in mountainous areas. It consists of very steep land broken by numerous intermittent drainage channels. Elevations range from nearly sea level to more than 6,000 feet. Over much of the area, the soil mantle is very thin, ranging from one (1) to ten (10) inches in thickness. The land surface is dominated by deep, V-shaped valleys that have extremely steep side slopes and narrow ridges between the valleys. This land type is used for water supply and wildlife habitat (USDA, 1972).

Kolokolo series (KUL): Across the island, this series is predominantly found in the subject area. The series is on stream bottoms with slop ranges from zero (0) to two (2) percent. Permeability is moderate. Runoff is slow and the erosion hazard is no more than slight. The specific soil type KUL is extremely stony. The soil is subject to damaging overflow with some extreme boulder areas and some areas where the slope is as much as 12 percent (USDA, 1972).

Hīhīmanu series (HMMF): The series consists of deep, well-drained soils that formed in material weathered from basic igneous rock. Hihimanu soils are on very steeply sloping positions in the uplands of Kauaʻi. Slope is 40 to 70 percent. The series is well drained; medium runoff; moderately rapid permeability. These soils are used for watershed, wildlife and grazing (USDA, 2004).

Hanamāʻulu series (HsB, HsC): These soils consist of very deep, well-drained soils and occur on stream terraces and steep terrace breaks and have slopes ranging from three (3) to 40 percent. These soils are developed in alluvium washed from upland soils. The solum is about three (3) feet to over six (6) feet thick over gravel, stones and boulders. A few highly weathered ʻiliʻili and stones are throughout the solum in some pedons. They are nearly level to strongly sloping. Elevations range from 200 to 700 feet. The specific soil type at the site is Hanamāʻulu silty clay, three (3) to eight (8) percent slopes (HsB), and is located on terraces. Permeability is moderately rapid. Runoff is slow, and the erosion hazard is no more than slight. Most areas are under cultivation (USDA, 1972)

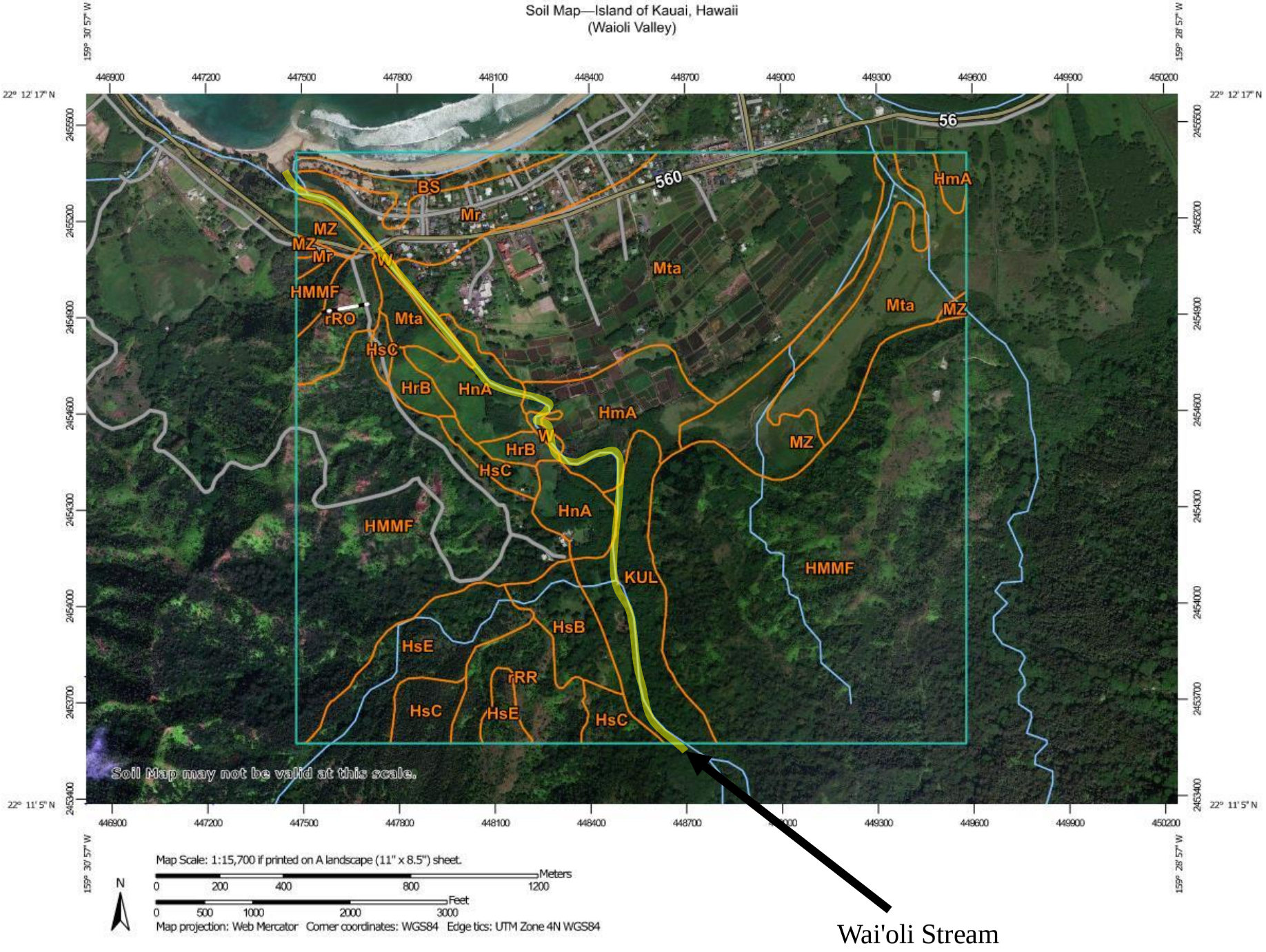
Hanalei series (HmA, HnA, HrB): These soils consist of somewhat poorly drained to poorly drained soils on bottom lands. These soils develop in alluvium derived from basic igneous rock. They are level to gently sloping, located on bottom lands and low terraces along streams. The soil series is somewhat poorly to poorly drained, including slow runoff and moderate permeability. Most soil is used for kalo, pasture, and vegetables (USDA, 2004).

Mokulēʻia series (Mr, Mta): The series consists of well drained soils on coastal plains from near sea level to 100 feet with slopes of zero (0) to two (2) percent. The series is well drained with very slow runoff and moderate permeability. The series is typically used for irrigated crops and pasture (USDA, 2004).

The following is a summary of the soil series and the various areas in which they exist in Waiʻoli Stream and Loʻi Kalo Irrigation System (from ma uka to ma kai):

- Ma uka of Waiʻoli Stream: primarily rough mountainous land (rRT), Kolokolo extremely stony clay loam (KUL), Hīhīmanu silty clay loam (HMMF), and Hanamāʻulu silty clay (HsB).
- Mānowai: primarily Hanamāʻulu silty clay (HsC), Hanalei silty clay, deep water table (HrB) and Hanalei silty clay (HnA).
- ʻAuwai and individual loʻi: Hanalei silty clay loam (HmA) and Mokulēʻia clay loam (Mta).
- Estuary and ma kai areas of Waiʻoli Stream: Mokulēʻia fine sandy loam (Mr), Mokulēʻia clay loam (Mta), and Hanalei silty clay (HnA).

Figure 27: Soil Map



5.2.3. Potential Impacts, Minimization and Mitigation Measures

Given the historical use of the area and existing infastructure and practice of kalo cultivation, *no significant negative impacts* are anticipated as a result of the Proposed Action. To the contrary, the Proposed Action will have some *beneficial impacts* on the geology and soil in the Project Area. Minimal potential impact to soil within the Loʻi Kalo Irrigation System include run-off, dust, and seepage and are mitigated by implementing best management practices.

The **Proposed Action: Long-Term Water Lease** would have a *moderate beneficial impact* on geology and soil since the Proposed Action utilizes and seeks to maintain the naturally occurring topography and soil properties, as a cultural practices done for centuries in Waiʻoli Valley. In addition, as an integral part of the Hui's kalo cultivation efforts and as a part of the Watershed Management Plan required under HRS 171-58, the Hui will undertake regular proactive mitigation efforts through regular farming practices, stream cleaning, and other efforts that actively maintain the geology and soil.

Under **Alternative A: Shorter Lease Term Alternative**, **Alternative B: Status Quo Alternative** and **Alternative C: No-Action Alternative,** the water lease for kalo cultivation would have a *neutral impact* on geology and soils. Under Alternative B: Annual Revocable Permit alternative, the maintenance of the Loʻi Kalo Irrigation System would be similar. However, under Alternative C, a no-action alternative will lead to a decline in kalo cultivation, the frequency and quality of Loʻi Kalo Irrigation System maintenance would likely be diminished, limited, or discontinued resulting in an overwhelming increase of invasive grass and weeds, leading to a higher rate of eroded soil, runoff, and natural debris flowing through the stream.

Minimization and Mitigations Measures

Erosion ma uka of the Proposed Action is natural and not caused by the Proposed Action. The Hui's Watershed Management plan, however, minimizes the effects of such erosion including: arboreal maintenance, removing debris, moving naturally occurring rocks out of the ʻauwai, and in the nearby vicinity, and manually relocating rocks to support the purpose of the mānowai. Although the maintenance to the system may cause a degree of turbidity, the mitigation work to date has relied on manual labor and hand tools, which creates minor disturbances over short periods of time compared to mitigation measures that would require machinery.

The soil series within the loʻi complex and surrounding area does affect the structure of the loʻi itself and any potential seepage within the loʻi. To minimize impacts to soil, the Hui utilizes best management practices and fallows each loʻi (**see Section 3.2**). To minimize run off during loʻi preparation, the individual loʻi water outflow is closed, allowing water and soil disturbance to remain within the loʻi. Any dust produced as a result of dry tilling does not affect the larger public since only the farmers are present during this practice. The Hui also implements standard agricultural methods that mitigate seepage and allows the loʻi to retain water and allow for sufficient throughflow. For example, in Waiʻoli, the soil series within the loʻi complex varies from Hanalei silty clay loam (HmA) and Mokulēʻia clay loam (Mta). For individual loʻi with Hanalei soil series, preparing the loʻi requires slightly less tilling since the soil series is "poorly drained, including slow runoff and moderate permeability" (USDA, 2020) reducing the amount of seepage through the

ground. On the other hand, individual loʻi with Mokulēʻia soil series that are "well drained with very slow runoff and moderate permeability" (USDA, 2020) may require additional tilling during the loʻi preparation to reduce seepage into the ground. With generational knowledge of this specific ʻāina, the farmers' individual practices have adapted to the soil on their respective farms.

Removing and controlling non-Native hooved animals (i.e., pigs) from important watershed forests is also key to maintaining and restoring the biological integrity of the Waiʻoli Watershed by preventing soil erosion and limiting the spread of invasive species. The Hui will continue to control the ingress of ungulates and remove them through a coordination of active hunting and setting of snare traps in the watershed and Loʻi Kalo Irrigation System. The Hui will partner with the community to coordinate active ungulate management within the Waiʻoli Watershed and will notify the Hui's secretary and log each action and location. Ultimately, the continued control and removal of ungulates will help to prevent further watershed degradation caused by ungulate activity.

5.3. Wai: Water Resources

Understanding wai, or water, in a Kānaka Maoli context is best understood through ʻōlelo Hawaiʻi. Waiwai, a reduplication of wai, means wealth, and kānāwai meaning law, may pertain to the earlier pre-contact laws dealing with water (Pukui, 1986, 127). As an island community, "both wealth and the law were and continue to be defined by fresh water" (Sproat, 2009, 3). For Kānaka Maoli, and in this case, the Hui in particular, the use and management of water in Waiʻoli is a "true kuleana: both a privilege and a responsibility" (Sproat, 2009, 3). "For early Hawaiians, water (wai) was a symbol of abundance because it was essential for making taro, the staff of life, flourish. Because water was so important in daily life, a fundamental concept of property was based on water-use rights, rather than land ownership. The Hawaiian traditions related to water encouraged both water conservation and cooperation among farmers" (Evans, 2008, 17).

In Hawaiʻi, water is recognized as a public trust resource, which must be managed for present and future generations. Today, Hawaiʻi's Constitution, Water Code, and case law strongly reaffirms the importance of protecting and carefully administering Hawaiʻi's limited fresh water supply for the public good, with the highest consideration given to specifically enumerated public trust purposes, such as kalo cultivation. Article XI, section 1 of Hawaiʻi's Constitution declares that "all public natural resources are held in trust by the State for the benefit of the people." Article XI, section 7 of Hawaiʻi's Constitution makes specific reference to water, including the directive "to protect, control, and regulate the use of Hawaiʻi's water resources for the benefit of its people." Significantly, "article XI, section 1 and article XI, section 7 adopt the public trust doctrine as a fundamental principle of constitutional law in Hawaiʻi" (*Waiāhole*). The public trust imposes "a dual mandate of 1) protection and 2) maximum reasonable and beneficial use" (*Waiāhole*). This establishes an "affirmative duty to take the public trust into account in the planning and allocation of water resources, and to protect public trust uses whenever feasible" (*Waiāhole).*

The "public trust purposes" identified by the Hawaiʻi Supreme Court, which include environmental protection, traditional and customary Native Hawaiian rights, appurtenant rights, domestic water uses, and reservations for the Department of Hawaiian Home Lands, mandate a high level of

protection and consideration. The public trust also dictates that uses "consistent with trust purposes" such as the Hui's uses are "the norm or 'default' condition" (*Waiāhole*).

The Hui's proposed and ongoing use of water from Waiʻoli Stream is grounded in both traditional and customary Native Hawaiian rights and appurtenant rights. **The Cultural Impact Assessment, Appendix C ("CIA: I Mano ka Waiʻoli"),** expands on the extent of traditional and customary Native Hawaiian practices and appurtenant rights in this area.

Kalo and kalo cultivation contribute to the collective water resources in the Waiʻoli Watershed. The hydrologic cycle is a building block for a healthy watershed: water evaporates off the ocean and land surfaces; it is then carried over the earth in atmospheric circulation as water vapor and returns to the earth as rain. This rainfall is intercepted by plants, runs off over the land surface, infiltrates into soils, recharges ground water, discharges into streams, and ultimately flows to the ocean from which the cycle continues. As a part of this cycle, water collects on kalo leaves, and then evaporates, drips to the ground beneath the canopy, or flows down the stem of a plant. Rainfall falls to the floor of the Loʻi Kalo Irrigation System, and some infiltrates into the soil below. A portion of the infiltrated water percolates beneath the soil layer flowing into aquifers or along subsurface flow paths, emerging down slope as seepage into the estuary and Hanalei Bay and Estuary. A portion of the total rainfall reaching the ground also becomes surface runoff, which occurs when the rainfall rate exceeds a soil's infiltration rate or when the soil is saturated and cannot absorb any additional water. As water percolates beneath the soil, however, a portion ends up floating on heavier sea water which forms an island's freshwater aquifer (s), recharging our ground water supply (Hanalei Watershed Hui, 2012).

5.3.1. Ground water

According to the Watershed Management Plan for Hanalei Bay Watershed, 2012:

> Ground water is water found in underground layers of rock or sediment, referred to as an aquifer. An aquifer is roughly defined as an area in which the spaces (voids) are filled with water. The water table is the upper elevation of the water in an aquifer. Similar to surface water, water in an aquifer flows under the force of gravity. The flow rate of water through an aquifer is a function of the elevation head (or slope) of the water table, the hydraulic conductivity of the substrate it encounters, the cross section of the area it flows through, and the viscosity of the water. In general flow rates through dense material are slower compared to flow through loosely packed materials if all other variables are the same. Water in aquifers can either be fresh, salt, or brackish (24).

The current sustainable yield for the Hanalei Aquifer System is 35 mgd, and the January 2021 12-month average pumpage from the aquifer system is 0.151 mgd. There are two existing wells in the Waiʻoli hydrologic unit and one (2-1130-002) is reporting its use, with a 12-month average pumpage of 0 mgd (CWRM Staff Submittal, April 2021). The 1990 Kauaʻi Water Use and Development Plan indicated that at that time the well capacity for Hanalei was 0.36 mgd and the demand was 0.88 mgd (CWRM, 1990, 9). Despite recent updates to other County Water Use and Development Plans, Kauaʻi Department of Water Supply has not yet revised the thirty-year-old plan.

The aquifers beneath the Hanalei Bay Watershed are in the same Sector (02) and System (02), both named Hanalei (aquifer code: 20201). The aquifers are separated into three types: High Level (2), Unconfined (1), Dike (2) located primarily in the steep sections of the Hanalei Bay Watershed; Basal (1), Unconfined (1), Dike (2) located in the middle elevations; and Basal (1), Unconfined (1), Sedimentary (6) located along the coastal plains (Hanalei Watershed Hui, 2012, 24).

The aquifer located in the steep sections of the watershed is found beneath the land surface from the top of the Hanalei Bay Watershed down to approximately 500 feet (152 m) elevation. High level means the water is fresh and does not contact seawater, unconfined means the top of the water table in the aquifer is the upper surface, and dike means that water is held in dike compartments (e.g., similar to boxes that can only overflow if full, or leaks). This aquifer function as mountain reservoirs and is a significant hydro-geologic feature of the watersheds (Hanalei Watershed Hui, 2012).

The aquifer located in the middle elevations is located beneath the Hanalei Bay Watershed from the contact line with the high level dike aquifers to the land surface elevation at approximately 100 feet (33 m) elevation. Basal water is a fresh water layer that is in contact with seawater, while unconfined means that water is percolating through soils, recharging the aquifer. In this aquifer, water is contained within the dike compartment, and as described above the rate at which it leaks out is variable (Hanalei Watershed Hui, 2012).

The aquifer located along the coastal plains is beneath the Hanalei Bay Watershed, from the land surface at approximately 100 feet (300 m) elevation to the shoreline. The water in this aquifer differs in that the ground water is contained in sediments carried by surface water running over the landscape. The water table in this aquifer varies, however, its depth below the ground surface is generally small. In areas with ground elevations equal to or less than 10 feet (3 m) the ground water table is approximately 3 to 4 feet (1 m) beneath the ground surface (Hanalei Watershed Hui, 2012).

Moreover, research from samples of ground water in temporary wells in the Wai‘oli beach face found that the coastal aquifer is a dynamic zone in which fresh ground water, saline ground water, and seawater mix. A small, but noticeable, salinity depression occurred nearshore in areas not located near a stream, indicating the discharge of fresh ground water. This indicates that ground water could be an important nutrient source to nearshore waters in Hanalei Bay. The sample groups, however, did demonstrate high variability representing a complex mixing zone rather than a uniform end (Field et al., 2007).

The 2007 study by Friedlander et al. found that neither rainfall nor surface water discharge was significantly correlated with bay bottom salinity, suggesting that fresh, turbid water from rainfall, discharged through streams into the bay, becomes horizontally distributed, and remains largely in the upper portion of the water column. This reflects the fact that stream discharge entering the Bay is both colder and fresher than seawater and that more discharge enters during the colder (rainier) part of the year (Friedlander, 2007, 234).

5.3.2. Surface Water

Surface water in Hawai‘i is a valued resource with significant economic, ecologic, cultural, spiritual, economic, and aesthetic importance. In Hawai‘i, there are approximately 376 perennial streams that

flow continuously throughout the year supplying more than 50% of the irrigation water in Hawaiʻi. From the mountains to the sea, these streams give life to the diversity of ecosystems that form unique Hawaiian physical and cultural landscapes, all playing a vital role in the larger watershed and ecosystem (CWRM, 2020).

Since time immemorial, Kānaka Maoli engineered loʻi and related agricultural irrigation in alluvial plains and valleys with sufficient stream resources, enabling them to transform vast areas into farmland to support the production of wetland kalo. They built complex irrigation ditches to direct and redirect water from free-flowing streams, and they closely controlled water flow and circulation within the fields to prevent stagnation, keep water and thus kalo temperatures low, and prevent disease (Kurashima et al., 2019).

The total length of Waiʻoli Stream is 5.4 miles from its mouth to the base of Nāmolokama (State OP-GIS, 2020), and it is fed by at least ten (10) well-formed, intermittently flowing mana wai, originating on Hīhīmanu, Nāmolokama, and Māmalahoa (Kīpuka Kuleana, 2020). The centerline of Waiʻoli Stream is dynamic and is historically documented to have changed course within its basin. Even with these shifts, all historic maps show a clear stream channel (Kīpuka Kuleana, 2020). The four (4) perennial streams that drain into Hanalei Bay Watershed have sections where ground water drains into the stream increasing surface flow volume in the channel, and other sections where the channel loses water through its bed and banks (Field et al., 2007; Hanalei Watershed Hui, 2012).

Water temperature in Waiʻoli was documented by a USGS study and examines four (4) independent Waiʻoli loʻi complexes totaling 45 acres. The average temperature of the Waiʻoli loʻi complex was 23.6 degrees Celsius (Gingerich et al., 2007). These loʻi complexes were studied for a period of two (2) months, from August to September 2005. Water temperatures were taken in loʻi with kalo near the harvesting stage during the dry season, when water requirements for cooling kalo are higher (from June to October) (Gingerich et al., 2007).

Stream temperature can be affected by a combination of many factors such as: water volume of surface flow or ground water discharge, geographic qualities such as topography and lithology, atmospheric conditions such as surface temperature, relative humidity or wind speed, and a stream's physical characteristics (riparian vegetation, channel width, substrate). Within the ʻauwai and Loʻi Kalo Irrigation System, water temperature is also affected by the loʻi structure, evaporation, kalo crop stage, and water flow into the loʻi (Kurashima et al., 2019 and UH-WRRC, 1970).

Surface water in the Project Area is primarily used for throughflow. It is the Hui's primary means of maintaining the necessary cool surface water temperatures, a foundational concept in traditional loʻi kalo cultivation. **See Section 3, Project Description**. Throughflow is defined as water that flows through the loʻi and carries heat away. Throughflow is distinct from water that is "consumed." This "used" water is water that is lost to percolation through the soil, transpiration by the plant, and evaporation. Together, throughflow and used water comprise the total water flowing into the loʻi, or the "inflow." With adequate throughflow, kalo can keep in the field for several months, up to 24 months for some varieties. Farmers who lack adequate throughflow, however, are "forced to choose between harvesting prematurely or incurring losses from rot" (Reppun, 2007, 7).

5.3.3. Watershed and Hanalei Bay

The Hanalei Bay Watershed is comprised of four traditional ahupuaʻa: Hanalei, Waiʻoli, Waipā, and Waikoko. From the mountains of these four (4) ahupuaʻa, four (4) perennial waters flow their lengths and empty into Hanalei Bay (State DLNR, 2008; Tetra Tech-DOH, 2008). As a traditional kalana, Kānaka Maoli have managed the natural and cultural resources within the larger Hanalei Bay Watershed as a single integrated system to maximize the cultivation of traditional crops and aquatic resources. The lifeways and techniques that allocate and distribute water resources have the ability to further mitigate the impacts of flooding. From a watershed-wide perspective, Loʻi Kalo Irrigation Systems "enhance environmental sustainability by maintaining aquatic and riparian habitat, integrity of the hydrologic cycle (especially coastal discharge, stormflow dissipation, and ground water recharge), instream flow for other water uses, and integrity of the cultural landscape" (Penn, 1980, 132). Thus, the health of the Loʻi Kalo Irrigation System is critical for the sustainability and resilience of the watershed as a whole.

The Waiʻoli Watershed is 3,483 acres and as part of Hanalei Kalana, shares stream resources with the ahupuaʻa of Waipā and Hanalei. For instance, the Waiʻoli muliwai (estuary) is located within the Waipā Ahupuaʻa, a portion of the Waiʻoli loʻi and ʻauwai are located within the Hanalei Ahupuaʻa, and two (2) hoʻi from Waiʻoli return water to Hanalei River, all eventually terminating in Hanalei Bay. **See Figure 2, Hanalei Bay Watershed and State Land Use District Map, and Figure 3, Waiʻoli Ahupuaʻa**. It is for these reasons, that Kānaka Maoli managed wai, or water resources, within a kalana.

Table 2: Summary of Subwatersheds within Hanalei Bay Watershed.

Watershed	Total Stream Length (mi)	Watershed Area (ac.)	Watershed Area (sq. mi.)
Hanalei	77	15,125	23.63
Waiʻoli	16	3,483	5.44
Waipā	9	1,592	2.48
Waikoko	1	458	0.72
Total	**103**	**20,658**	**32.27**

Source: Hanalei Watershed Hui, 2012.

Waiʻoli is near the center of the Hanalei Bay Watershed and is the second largest sub-watershed within the Hanalei Bay Watershed comprising approximately 17% of the total area (Tetra Tech-DOH, 2008). The Bay is northwest facing, crescent shaped, framed by two rocky points, Puʻupoa to the northeast and Makahoa to the northwest. "Hanalei River, one of the largest in the State of Hawaiʻi, enters the bay from the east, and is a major source of fresh water, sediment, and organic input. The much smaller streams, Waiʻoli, Waipā, and Waikoko, enter from southwest" (Friedlander, 1997, 14). In general, the water in Hanalei Bay is more saline and cooler farther offshore, as depth increases, which is influenced and explained by the presence of freshwater discharge or ground water effluence, especially near the estuary (Field et al., 2007). **See Figure 28, Hanalei Bay Surface Water Column Properties.**

The four (4) ahupua‘a in Hanalei Bay Watershed share similar environmental landscapes. The inner shore of the Bay is lined with stretches of sandy beach that give way to low dunes. Immediately inland of the dunes are lo‘i that stretch into the upper valleys and into the shallower valleys on the western portion of the Watershed.

Within the Bay, the marine environment is characterized by well-developed fringing reefs bordering an extensive area of unvegetated carbonate sediments (Friedlander et al., 1997, 54), which is historically known to support diverse invertebrate assemblages (158). Study observations “suggest that the soft bottoms function as shelter and/or foraging grounds for many nearshore fishes, including several important resource species” (Friedlander et al., 1997, 54). Immediately extending 500 meters out from Wai‘oli muliwai into the Bay, the substrate consists of soft substrate and shallow reef flat, ranging in water depth of 0 to 12 meters (Friedlander et al., 1997, 18 and 21). The area directly in front of Wai‘oli muliwai was also one of three (3) sites that were found to be a high coral area, which also had greater protection from large surf than other sites in the bay (Friedlander et al., 1997, 28).

From 1993 to 1994, coral cover within Hanalei Bay was generally low due to exposure to high energy waves for long-periods during winter months depressing coral coverage. On average 17.88% of sample transects substrate was scleractinian (hard) corals with *Montipora patula* the most abundant coral species in the bay, accounting for over half of the total coral cover. *Porites lobate and M. capitate* were the next most abundant species of coral commonly encountered and usually appeared in encrusted forms. Encrusting growth forms were also found to maximize surface area for survival in Hanalei Bay, a light limited environment where heavy rainfall and freshwater inputs can greatly increase the sediment load (Friedlander et al., 1997, 26).

Prior to the published 1997 Friedlander et al. study, the biology (fisheries, biological resources, or processes) of Hanalei Bay had been little studied using Western research methods. A few small-scale, short-term, individual studies were done within the Bay irregularly over the prior two decades for limited purposes, in a few locations (Friedlander et al., 1997, 10). For this reason, DLNR-DAR selected Hanalei Bay for a multi-year study examining the marine biological resources, quantifying important fauna and habitat features, and relating habitat characteristics to fish communities and resource species. The study found that seasonal variability was present in most of Hanalei Bay’s environmental variables (e.g., wind speed, surf height, rainfall, Hanalei River discharge, water column temperature and salinity) experiencing large variation from broad seasonal patterns as well as significant year-to-year variability (Friedlander et al., 1997, 235). In particular, large surf events and heavier than average rainfall during the winter and spring seasons appeared to be the major environmental variables affecting the local marine system. Studies of Hanalei Bay found:

> “…a relatively healthy nearshore marine environment ecosystem persisting in a dynamic and relatively harsh environment that at times includes high wave energy, heavy influx of fresh water, and high turbidity. Although the system is not pristine nor highly diverse, the Bay maintains a considerable variety of plants and animals, including a good many harvestable species…In view of the limited size of the bay and the apparent sizes of its resource populations, as well as the nature and level of natural stresses it experiences, it seems unlikely that the system has the capacity to support much increase in exploitation” (Friedlander et al., 1997, 7).

The 1997 Friedlander et al. study found that fine and medium-fine sands make up the majority of the sedimentary habitat of Hanalei Bay. Medium-fine sands are associated with reef edges of the outer Bay and the shoreline area, whereas fine sands are distributed through the more central Bay. The area fronting the Wai‘oli muliwai is reef and immediately to its east is medium-fine sand and to its west is course-medium sand (Friedlander et al., 1997, 61). The most distinctive feature of the soft-bottom habitat of Hanalei Bay, nearly 0.7 miles to the north east of Wai‘oli muliwai, is the presence of a large silt/mud depression associated with the Hanalei River mouth, known locally as “the Black Hole.” Its center or depression appears to be an area for depositing terrigenous material from the Hanalei River and based on the 1997 study, appears to play an important ecological role for many fish species (Friedlander et al., 1997, 60). The research published in 1997 suggests, “an important trophic link between the featureless, unvegetated sand habitat and the structurally complex reef substrate in Hawai‘i” (Friedlander et al., 1997, 28). The number of fishes in Hanalei Bay were found to utilize soft-bottom habitats as foraging grounds, while reef edges in the Bay supported significantly more species and individuals of fish than other reef habitats in the bay (Friedlander et al., 1997, 228). **See Figure 29, Sedimentary Habitat Types of Hanalei Bay.**

5.3.4. Water Quantity

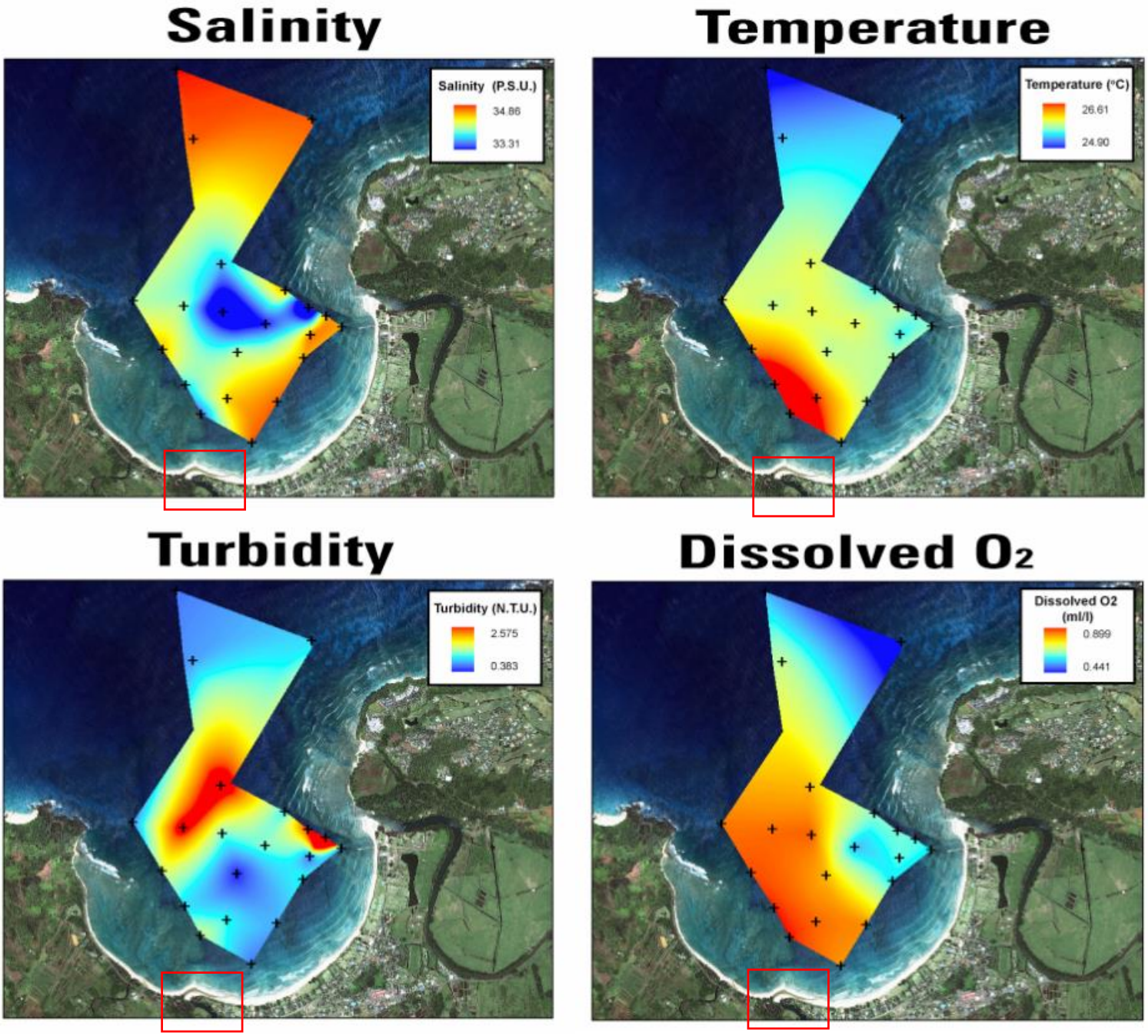
Generally, streamflow consists of five (5) components (Oki, 2003):

- Direct runoff from rainfall in the form of overland flow and subsurface storm flow that rapidly returns infiltrated water to the stream;
- Ground water discharge in the form of base flow, where the stream intersects the water table;
- Water returned from bank storage;
- Rain that falls directly on streams; and
- Any additional water, including excess irrigation water discharged to the stream by humans.

The amount of direct runoff and base flow that contributes to total streamflow depends on factors including rainfall amount and intensity; drainage-basin geology, morphology, and size; soils; and land cover. Streamflow characteristics also can be affected by human-made diversions, channelization, dams, land-use changes, and other factors (Oki, 2003).

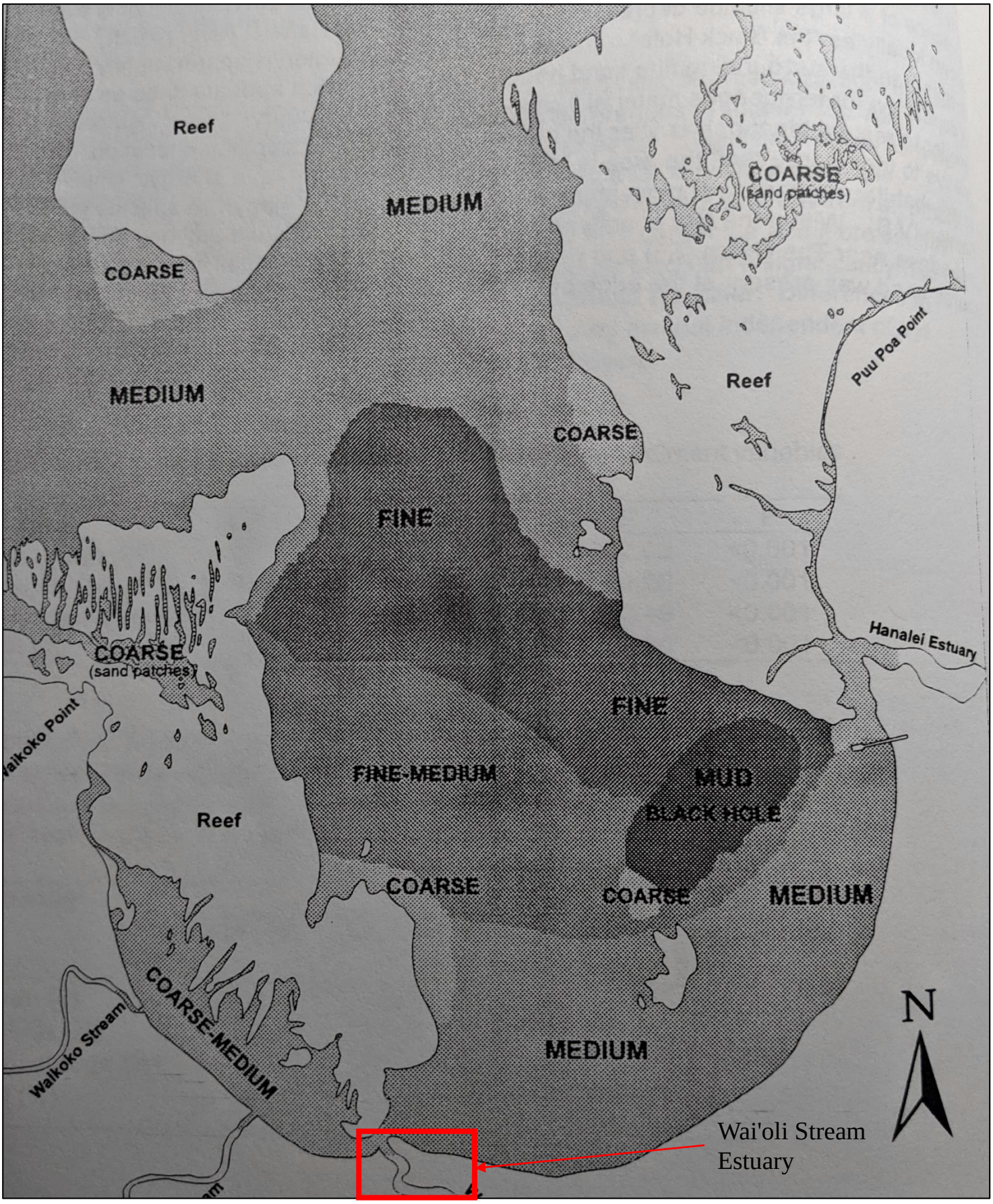
The Hanalei Bay Watershed – of which Wai‘oli is a subwatershed – originates at the summit of 5,240-foot Mount Wai‘ale‘ale, which receives an average of 450 inches of rainfall per year. The Hanalei Bay Watershed has a 32.3 square mile drainage area with the Hanalei River Watershed comprising 73.2% of the entire Hanalei Bay Watershed drainage area (23.6 square miles). The Wai‘oli Watershed is the second largest drainage area comprising approximately 5.5 square miles (Tetra Tech-DOH, 2008).

As part of the long-term water lease process, CWRM established a numeric IIFS of 4 mgd during low flow conditions that balanced beneficial instream needs and off stream uses in Wai‘oli. CWRM is the governing authority to review and make determinations regarding all claimed water rights, instream uses, and off stream needs. Wai‘oli’s kalo cultivation – and the requisite throughflow – is an appurtenant, riparian, and traditional and customary Native Hawaiian use of water for public trust purposes, which have some of the highest levels of protection under the Hawai‘i State Constitution and Water Code, HRS chapter 174C.



Source: Field (Eds.), 2007

Figure 28: Hanalei Bay Surface Water Column Properties



Source: Friedlander, et.al., 1997

Figure 29: Sedimentary Habitat Types of Hanalei Bay

Historically, as a relatively smaller stream, flow data collection on Waiʻoli Stream has been inconsistent and limited. The original Waiʻoli Stream Gauge (USGS 16105000, 22.1676, -159.4952) documented daily discharge between 1914 and 1933. During that period of record, the median flow (Q50) was 20 cubic feet per second ("cfs") or 12.9 mgd (State DLNR – CWRM, 2021). Over the same period, the Q70 – or the flow in the stream about 70% of the time, which also approximates the groundwater contribution to the stream – was 15 cfs or 9.7 mgd, while the Q90 – indicative of low flow conditions – was 11 cfs or 7.1mgd (State DLNR – CWRM, 2021). **See Figure 3, Waiʻoli Ahupuaʻa**.

Over fifty years later, in 1989, during CWRM's registration process, a number of Hui members declared their water uses from the East Waiʻoli ʻauwai (east flow after the poʻowai). Registrations and subsequent verifications in 1993 and 1994 determined that 13.5 mgd was being diverted at the time of registration (State DLNR-CWRM FIR, 2019).

In 2019, in response to the historic April 2018 floods, CWRM staff conducted a site visit to verify and record the present and historic stream diversions that supplied water to the Hui. Staff conducted a stream diversion works verification, measured the amount of water diverted during the site visit, and quantified the amount of water upstream in the main stream channel. CWRM staff measured a total of 21.14 mgd in Waiʻoli Stream's main channel above the mānowai and 10.07 mgd at the historic poʻowai, which mathematically left 11.07 mgd in Waiʻoli Stream on that specific day (State DLNR-CWRM FIR, 2019). CWRM staff had planned to take other miscellaneous measurements in 2021, but two site visits were cancelled due to flooding in Haleleʻa and Waiʻoli in particular. A consultant for the Hui who was on Kauaʻi was able to take additional measurements that were shared with CWRM.

Generally, for kalo cultivation, USGS's 2007 peer-reviewed study documented an average inflow of 260,000 gad for loʻi complexes, acknowledging that the actual volume of water is location specific and dependent on a host of factors. Some of these unique factors include elevation, soil type, percent shade, growth stage of the plant, variety of kalo cultivated, how the kalo will be consumed, whether it is an individual loʻi or part of a loʻi complex, and where along the ʻauwai an individual loʻi is situated. This water duty includes both the amount needed for actual consumption by the kalo plant, and the amount required to flow through the loʻi to keep the kalo cool and prevent crop failure. Both amounts are necessary to farm kalo successfully and to calculate any realistic measure of kalo water duty (Reppun, 2007).

Water use and needs in Waiʻoli vary by season and year, but are likely in the range of the Hui's historic use of roughly 13.5 mgd of throughflow over the Hui's 84-acre loʻi complex. After centuries of living on and with this ʻāina and stream, the Hui is mindful of the balance between the kalo's needs and those of the stream and surrounding community. As part of the water lease process, the Hui will decide on the specific loʻi that are able to be replanted as part of the flood recovery effort.

5.3.5. Water Quality

Water quality is a measure of its suitability for a particular use based on physical, chemical, and biological characteristics. To make this determination, samples are gathered and then analyzed based on various charateristics (e.g., temperature, dissolved mineral content, and number of bacteria). Results are then compared to numeric standards and guidelines to determine if the water is suitable for a particular use (USGS, 2001).

The federal Clean Water Act ("CWA") section 303(d) requires the Hawai‘i Department of Health ("DOH") to report on the State's water quality in April of every even numbered year. To fulfill this requirement, the State of Hawai‘i publishes a biennial Water Quality Monitoring and Assessment Report, known as the Integrated Report ("IR"). This report informs the public about the status of marine and inland waters, including water quality conditions across the archipelago. The IR both identifies areas in need of restoration, and also serves as a baseline to validate the State's efforts to improve water quality and eventually de-list impaired waters that have been rehabilitated. The data included in the 2018 IR was collected between November 1, 2015 to October 31, 2017. Similarly, the data for the 2020 IR data was collected between November 1, 2017 to October 31, 2019. Hawai‘i Administrative Rules Title 11 Chapter 54 (HAR 11-54) also requires monitoring for all State waters.

With approximately 3,326 miles of rivers and streams, Hawai‘i's Water Quality Standards ("WQSs") play a central role in the successful implementation of Hawai‘i's surface water pollution control programs. CWA section 303(d) requires states to submit a list of waters that fail applicable WQSs, plus a priority ranking of impaired waters for Total Maximum Daily Load ("TMDL") development based on the severity of pollution and the designated uses of those waters. Impaired waters – waters that do not meet WQSs – in the IR may be targeted for further monitoring activities to develop TMDLs. The TMDL process is a roadmap for restoration that identifies sources of pollution within a watershed and determines pollutant load reductions required for a water to once again meet water quality standards. One challenge for TMDL development in Hawai‘i is that much of the pollutant "loading" is caused by non-point sources (such as runoff from conservation land or cesspools), as opposed to point sources (such as pipes) that can be more easily regulated or reduced. Relevant water quality standards and norms for Wai‘oil Stream include:

Table 3: HAR § 11-54-5.2(b): Water Quality Standards – Stream Criteria.

Parameter	**Geometric mean not to exceed the given value**	**Not to exceed the given value** more than 10% of the time	**Not to exceed the given value** more than 2% of the time
Total Nitrogen (ug N/L)	250.0* 180.0**	520.0* 380.0**	800.0* 600.0**
Nitrate + Nitrate Nitrogen (ug [NO_3 + NO_2] –N/L)	70.0* 30.0**	180.0* 90.0**	300.0* 170.0**
Total Phosphorus (ug P/L)	50.0* 30.0**	100.0* 60.0**	150.0* 80.0**
Total Suspended Solids (mg/L)	20.0* 10.0**	50.0* 30.0**	80.0* 55.0**

Turbidity (N.T.U.)	5.0* 2.0**	15.0* 5.5**	25.0* 10.0**
*Wet season – November 1 through April 30			
** Dry season – May 1 through October 31			
L = Liter			

Specific criteria for **stream** standards are:

N.T.U. = Nephelometric Turbidity Units. A compariston of the intensity of light scattered by the sample under defined conditions with the intenstiy of light scattered by a standard reference suspension under the same conditions. The higher the intensity of scattered light, the higher the turbidity.
ug = microgram or 0.000001 grams
pH units – shall not deviate more than 0..5 units from ambient conditions and shall not be lower than 5.5 nor higher than 8.0.
Dissolved Oxygen – Not less than eighty per cent saturation, determined as a function of ambient water temperature.
Temperature – shall not vary more than one degree Celsius from ambient conditions.
Specific Conductance – not more than three hundred micromhos/centimeter.

In contemplating minimum flow levels for Waiʻoli Stream in anticipation of a long-term water lease, CWRM noted that "the primary constituents, sediment and temperature, are directly impacted by the amount of water in a stream" (State DLNR – CWRM, 2021). Streams with flow reductions often have higher water temperatures, while streams with healthy flows have lower temperatures and the ability to quickly dilute contamination events (State DLNR – CWRM, 2021). Fortunately, Waiʻoli has continuous ma uka to ma kai flow year round. Water temperature is one of the most important environmental factors because it directly affects all forms of aquatic life. Surface water temperature in Hawaiʻi may fluctuate depending on the season by only a few degrees Celsius because the streams here are relatively short (State DLNR – CWRM, 2021). Temperature fluctuations, however, may be higher in altered streams, including concrete-lined channels due to vertical solar contact (State DLNR – CWRM, 2021). For a healthy and productive wetland kalo crop, cool water must flow over the corm and roots (Gingerich, 2). There must be enough "throughflow" – water flowing through the loʻi – since factors such as evaporation and percolation through the loʻi must also be considered (Gingerich, 2). Throughout the kalo life cycle, water must be cold enough to support healthy and productive crops (Gingerich, 2). Various studies suggest that loʻi temperatures should be kept at about 25 degrees Celsius (77 degrees Fahrenheit), or lower (Gingerich, 2). Water temperature management in loʻi kalo is a priority, and the most critical physical factor in kalo cultivation (Gingerich, 2). In general, higher irrigation rates should curb water heating and provide lower irrigation outflow temperatures (Gingerich, 2). It is important that the Hui receive adequate amounts of water for their loʻi because this will enhance both productivity of kalo crops and lower outflow temperatures when water returns to the stream.

Sources of pollutants and bacteria vary widely and include natural sources such as feces from aquatic and terrestrial wildlife, and anthropogenic sources such as cesspools, septic tanks, illegal sewage disposal from boats along the coastline, trash, and pet waste. Feral and domesticated animals and humans are implicated as sources of microbial pollutants (Tetra Tech - DOH, 2020). **Importantly,**

the Proposed Action does not include cesspool or septic systems, a major contributor to water quality findings in this area (State DLNR – CWRM, 2021). On the contrary, as detailed below, the Hui's loʻi kalo improve water quality in Waiʻoli.

Within the Waiʻoli subwatershed, two (2) monitoring stations are located along the Waiʻoli Stream (upper and lower) and one (1) in the Waiʻoli Estuary.

The 2018 and 2020 IR provides the most recent data on water quality in Waiʻoli. During the wet season, Waiʻoli Stream attained applicable water quality standards. In the 2020 IR, Waiʻoli Stream again attained water quality standards for all criteria except enterococci and turbidity during the dry season (State DOH, 2020). Notably, however, these impairments were considered low priorities for TMDL development in 2018 and 2020. Waiʻoli Stream was first listed on the 2018 IR for exceeding dry season water quality standards for turbidity and enterococci. The 2018 IR noted that "Waiʻoli Stream was previously assessed . . . and met the associated WQS" (State DOH, 2018). In 2008, during the wet season, a TDML was approved for turbidity and total suspended solids ("TSS") in Waiʻoli Estuary (in Hanalei Bay), and enterococcus and nutrients were listed as low priorities for TMDL development.

Due to the COVID-19 global pandemic, access to Kauaʻi in general and Waiʻoli Valley in particular has been limited for consultants and others not located on that island or even in Waiʻoli. In addition to existing water quality data and DOH's determinations in the IRs, a consultant for the Waiʻoli Taro Valley Hui flew to Kauaʻi in January of 2021, and collected water quality samples, after a relatively dry winter. Samples were taken at nine (9) sites in Waiʻoli: in Waiʻoli Stream ma uka of the mānowai; in the ʻauwai moving water from Waiʻoli Stream to the Hui's loʻi; and at seven (7) hoʻi returning water to Waiʻoli Stream or Hanalei River. The first hoʻi was not sampled because it is at the same location as the ʻauwai/poʻowai. Although additional sampling was planned while the consultant was on-island (through March 2021), obtaining those samples proved impossible due to torrential rains, ongoing flooding and related recovery efforts, and even a landslide on the Hanalei hill; the only access to Waiʻoli Valley, which completely cut off access to the area for some time (Voiland; 2021 and HNN, 2021).

Results of this additional water quality sampling confirmed that this area, like many others throughout Hawaiʻi, has some issues with background loading of nutrients unrelated to the Proposed Action. It also established that the Hui's kalo cultivation maintained water quality for some parameters; for example, nitrate levels were the same at the uppermost reach of Waiʻoli Stream sampled and at all the hoʻi returning water to both Waiʻoli Stream and Hanalei River. Importantly, the data also revealed that the Hui's loʻi kalo improved water quality by reducing recorded nutrient levels in phosphate, for example. Finally, the data confirmed that additional maintenance and repairs to the Hui's Loʻi Kalo Irrigation System is necessary to ensure the "throughfow" of water necessary to maintain ideal temperatures for wetland kalo to thrive. The data is provided in Table 4, and also explained in more detail by specific parameter.

Table 4: Waiʻoli Stream Water Samples – January 10, 2021.

Testing Site	**Time**	**Temp** (Celsius)	**D.O** %	**D.O.** mg/L	**Salinity** ppt	**pH**	**Nitrate,** NO_4 mg/L	**Phosphate,** PO_4 mg/L

Waiʻoli Stream (at Mānowai)	10:13am	19.1	95.8	8.90	0.04	7.50	<0.01	0.01
ʻAuwai (at Poʻowai; next to Hoʻi #1)	12:37pm	19.8	99.4	9.07	0.04	7.30	<0.01	0.11
Hoʻi #2	2:20pm	21.7	43.4	3.80	0.07	7.08	<0.01	<0.01
Hoʻi #3	2:57pm	25.6	56.8	4.54	0.09	7.30	<0.01	0.06
Hoʻi #4	3:28pm	24.1	104.0	8.83	0.04	7.47	<0.01	0.11
Hoʻi #5	3:56pm	23.0	93.0	7.90	0.04	7.40	<0.01	0.05
Hoʻi #6	4:05pm	23.6	65.2	5.51	0.19	7.32	<0.01	0.06
Hoʻi #7	4:38pm	25.5	43.9	3.56	0.10	7.26	<0.01	0.23
Hoʻi #8	5:02pm	24.0	63.7	5.35	0.09	7.28	<0.01	0.02

Generally, non-point source pollution in Hawaiʻi primarily consists of cesspools, agricultural land use, urban land use, and feral ungulate activity in conservation lands (IR 2018, 3). In Waiʻoli, 93.2% of the land is designated as conservation, while 4.7% is designated agricultural, alongside the remaining 2.1% designated as urban (State DLNR – CWRM, 2021 and State - Office of Planning, 2015d). Because the Conservation district is located at the upper end of the Waiʻoli hydrologic unit, there is little to no human-influenced pollution that runs into the stream (State DLNR – CWRM, 2021). This raises concerns about background loading of nonpoint source pollution caused by feral ungulate activity and the decay of organic matter, given that 93.2% of the land in Waiʻoli is primarily zoned as Conservation (State DOH, 2018).

In the context of Waiʻoli's loʻi kalo cultivation, two nutrients relevant to water quality are nitrate and phosphate. These nutrients "are essential for plant and animal growth and nourishment, but the overabundance of certain nutrients in water can cause a number of adverse health and ecological effects" (USGS, 2021). Nutrient levels for nitrate in Waiʻoli Stream and Loʻi Kalo Irrigation System were *below* requisite water quality standards. Notably, though phosphorus levels exceeded the relevant standard above the Loʻi Kalo Irrigation System, water quality improves as it travels through the loʻi kalo itself (with the exception of Hoʻi #7 near wastewater disposal systems that are not associated with the Proposed Action).

For Waiʻoli Stream, nitrate levels must be less than .05 mg/L. Data from January 2021 revealed that all samples for Waiʻoli Stream, ʻauwai, and all seven (7) hoʻi were less than .01 mg/L, meeting water quality standards. Phosphate, which is dissolved phosphorus in natural water, can be deposited into streams by the erosion of rocks, sediment, and soil (Mueller, 2). Feral ungulates, mainly wild pigs, disturb soil by uprooting vegetation and cause soil erosion and sediment runoff which contributes to higher levels of nutrient and fecal matter, such as phosphorus and *Enterococci* (State DOH, 2018). Phosphorus is a concerned nutrient in HAR 11-54, but, it is also vital to plant growth, as it is involved in key plant functions, such as photosynthesis and energy transfer (Munee et.al., 2009). Kalo planted in the wetland style constantly absorbs natural phosphorus from stream water, no matter how slight the absorbtion rate is. Research has shown that not only does kalo aid in removing phosphorus from the water, but it also reduced nitrogen and sediment loads (Bremer et.al., 2018). While the research

considers a boost in nitrogen exports in water, increases may also be attributed to fertilizer inputs (Bremer et.al., 2018).

For Waiʻoli Stream, phosphate levels must be less than .04 mg/L. Data from January 2021 revealed that the sample at the mānowai was .01 mg/L, which meets the standard. The sample of the ʻauwai at the poʻowai, however, was 0.11 mg/L, which exceeds the HAR 11-54-5.2(b) standard. This figure reflects background loading of phosphate as it is within the Conservation zone and ma uka of all known human activity, and well above the Hui's kalo cultivation areas. Importantly, water quality for phosphate improves as water flows through the loʻi. For example, the sample at Hoʻi #2 meets the water quality standard in HAR 11-54-5.2(b). While other samples may not meet water quality standards, they are all **below** the background loading level detected at the ʻauwai/poʻowai. This makes sense as water flowing through the loʻi enables the kalo to absorb some of the phosphorus and remove it from the water, improving the water's quality before returning it to the stream. One site, Hoʻi #7, had levels higher than the poʻowai, but it directly abuts the Hanalei Center with wastewater disposal systems not related to the Hui or this Proposed Action. This is also where the urban designated area begins, which likely affects water quality (State DLNR – CWRM, 2021).

5.3.6. Potential Impacts, Minimization and Mitigation Measures

Given the historic use of public trust resources, intergenerational kuleana, and existing infastructure central to kalo cultivation in Waiʻoli, *no significant negative impacts* are anticipated as a result of the Proposed Action. While a few potential impacts are outlined below, the Proposed Action appropriately mitigates these potential effects and will have some *beneficial impacts* on water resources in the area; especially when considered against the No-Action Alternative.

With regard to threats to water quality in Waiʻoli Stream, feral ungulate activity is one of the biggest concerns. Feral pigs pose the greatest threat to wet forests because they reproduce quickly and forage by digging and upturning the soil to access roots and soil fauna (KWA, 2005). Other nonpoint source pollution – such as decomposing plant matter or erosion caused by flooding and invasive albizia – are also likely the majority contributors to decreased water quality and pose an ongoing threat to water quality in Waiʻoli. Ma kai of the Proposed Action, cesspools are a significant threat.

Both loʻi preparation and planting (**see Section 3.2.2**) are known to cause some turbidity. The Hui relies on food-friendly soil amendments such as those listed with the Organic Materials Review Institute (OMRI) to maintain soil structure and health. The Hui is also aware that improper amendment use could have detrimental impacts on not just the water, but the Hui's kalo as well. Therefore, the Hui complies with product recommendations and government regulated uses.

The **Proposed Action: Long-Term Water Lease** is a legal commitment to support and manage public trust resources that would enable kalo cultivation into the future and would have an overall *beneficial impact* on water resources in Waiʻoli. The anticipated *beneficial effects* are based upon the studies outlined above, implementation of the Hui's Watershed Management Plan, and the Hui's ongoing monitoring, maintenance, and stewardship of the Loʻi Kalo Irrigation System .

For generations, the Hui has stewarded the Waiʻoli Watershed and seeks to continue this practice with no expansion or change in use. Using best practices to minimize potential negative impacts and

protect water resources during kalo cultivation, the **Proposed Action** would have numerous *beneficial effects* on water resources including:

- Water quality mitigation and improvement: Kalo – especially in wetland-style cultivation – has a *beneficial effect* on water quality by removing phosphorus and reducing nitrogen and sediment loads. Further, the Hui's active monitoring and maintenance of the stream and surrounding infastructure also contributes to improved water quality, especially in comparision to a reduced and/or absence of kalo cultivation altogether.
- Contribution to the hydrologic cycle: Traditional loʻi kalo cultivation is an active participant in and contributor to the hydrologic cycle. The Proposed Action, by nature, contributes to transpiration, evaporation, and infiltration to support ground water recharge and subsurface water flow. In fact, very little water is lost in loʻi kalo cultivation. CWRM supports this benefit highlighting that "water loss due to evaporation, seepage, and evapotranspiration [in loʻi kalo] can be considered as negligible, due to the relatively small displacement in location and limited time frame" (CWRM, 2019).
- Ground water recharge: Along with directing throughflow water through the loʻi kalo, the system and kalo itself captures rainfall and dew, which slows the flow of water to allow the gradual release of water into the ground. This promotes ground water recharge; and in turn, supports ground and surface water supplies.
- Flood mitigation: As a biocultural watershed resource, the Loʻi Kalo Irrigation System is closely inter-twined with stream flow and the maintenance of surface water in its natural state (State OHA, 2019). The Hui's multi-generational knowledge and maintenance of this extensive Loʻi Kalo Irrigation System tempers and distributes overflow, thereby reducing the severity and impacts of floodwaters on Hanalei Town (Kīpuka Kuleana, 2020; Heʻeia Report, 32).
- Long-term resource management: Consistent and planned resource management of water as a public trust resource will allow more opportunities for natural stream flow adjustments in response to extreme weather events and landslides. The Hui will have opportunity to steward the area into the long-term, as described in the Draft Hui Watershed Management Plan. Long-term management of invasive plant species and the planting and maintenance of Native riparian vegetation will also preserve and support the continuous flow of water, restoring and maintaining functional integrity to the stream and traditional Loʻi Kalo Irrigation System.
- Management of ʻāina and wai: As a Native Hawaiian traditional and customary practice, loʻi kalo cultivation has a mutually beneficial relationship for the stream, loʻi, kalo crops, and natural habitats that have existed in balance for centuries. In addition, the Hui's active management also provides opportunities for additional funding and resource allocation to Waiʻoli Stream and Watershed that could address many of the existing impacts into the future.

The Proposed Action will not impact DHHL homesteads or on future water demand for nearby sites. Due to the physical distance and elevation difference between Waiʻoli and the Hawaiian homestead communities of Anahola and Moloaʻa, DHHL staff recommended and the Hawaiian Homes Commission voted in January 2021 to **not** seek a water reservation in relation to the Proposed Action, fulfilling the beneficiary consultation contemplated in the water lease process.

Alternative A: Shorter Lease Term Alternative, **Alternative B: Annual Revocable Permit Alternative** and **Alternative C: No-Action Alternative,** would have a *negligible to minor impact*

on water resources. Without a long-term lease, the *beneficial effects* described above will be diminished or non-existent. In particular, the Hui would not be required to implement the important measures in the Hui's watershed management plan. Lack of a long-term commitment to protect lo‘i kalo cultivation would make it significantly harder for Hui members to continue farming at the current level, something that might further reduce existing *beneficial effects* to the project area. The resulting impacts may include an increase of invasive grass and weeds that diminish ground water recharge, elimination of the potential for long-term resource management, and the diminishment or gradual elimination of a cultural use that has been documented as pre-contact (prior to 1778 A.D.). Research has proven that the ground water recharge rates of invasive species are significantly lower than that of Native species like kalo due to low throughflow and high evapotranspiration rates (Mair, 2009 and AWUDP, 2019).

Notably, however, a **No-Action Alternative** may have *significant negative effects* on water quality. Under this scenario, and without continued lo‘i kalo cultivation in the project area, existing lo‘i kalo would become overgrown, the Hui would not actively monitor the stream, or undertake ungulate control measures throughout the watershed. Kalo would no longer remove and/or regulate nutrients in the water or contribute to groundwater recharge at high rates if at all. Lack of maintenance in the Lo‘i Kalo Irrigation System and Wai‘oli Stream would increase risks of flooding and related detrimental impacts.

Minimization and Mitigation Measures

With respect to impacts on water resources, the Proposed Action will undertake a number of direct mitigation measures including implementing best practices to minimize runoff, turbidity, control nutrient losses, and improve water quality. Mitigation measures and best management practices are further detailed in the Draft Hui Watershed Management Plan jointly developed with DLNR.

With respect to water quality and given the recent IR and relevant impairments, the farmers' best management practices and small-scale farming methods seek to mitigate and minimize potential turbidity. As small family farmers, the Hui utilize basic farm equipment and machinery such as tillers (small tractor attachment and manual push tillers) and small tractors to maintain the lo‘i prior to planting. The majority of kalo cultivation practices as outlined in **Section 3.2.2** are done by hand which significantly minimizes impacts to water turbidity.

To minimize runoff and turbitity, prevent sediment outflow, and to minimize impacts to water quality, the Hui's best management practices will be used when applying soil amendments. The outflow will be closed, and the amendment will be added to ensure the value of the amendment is maximized without waste or runoff. This also prevents sediment from flowing out of the lo‘i bed itself. As part of the process, and in an effort to allow turbidity to settle and to ensure amendments have absorbed into the soil, the Hui allows the lo‘i to rest for a period of time (one to two weeks). When amendments are applied to actively cultivated lo‘i kalo, Hui farmers will continue to close their outflows to prevent release of nutrient-rich water. Applying amendments in amounts that minimize the loss of nutrients through ground water leaching is key. Resting periods after fertilizer application, flooding lo‘i, and holding water before releasing it back into the system are effective ways to reduce pollution. In "Taro, Mauka to Makai," the U.S. Army Corps of Engineers suggests additional steps to control nutrient losses; all of which the Hui undertakes:

- Place drainpipe intakes far enough above the bottom of the loʻi to minimize the amount of soil leaving the loʻi;
- Keep water in the loʻi (no outflow) temporarily following a fertilizer application (but beware of allowing water temperature to rise);
- Block off inlets and outlets to the loʻi during planting, harvesting, and weeding operations, which disturb the soil and send sediment and nutrients downstream; and
- Vegetate any areas of bare soil in the area surrounding the loʻi system (above or below it) where water travels; grasses are especially good at trapping sediment and nutrients and preventing their entry into waterways." (Evans, 2008, 79).

Considering the impacts of ungulates on water quality in Waiʻoli Watershed, the Kauaʻi Watershed Alliance's (KWA's) Management Plan offers strategies to mitigate feral ungulate activity including removing ungulates, and monitoring for increasing populations (KWA, 2005). The Hui's active monitoring and commitment to regular ungulate control actualizes these strategies – including those outlined in the Hui's Watershed Management Plan – and would have a positive impact on the water quality in Waiʻoli.

The Draft Hui Watershed Management Plan further outlines specific proactive goals to improve surface and ground water quality and the overall watershed health. Continuing best practices for traditional loʻi kalo cultivation, the Draft Hui Watershed Management Plan also implements various recommended management practices outlined in the 2012 Hanalei Bay Watershed Management Plan. Relevant priorities and mitigation measures include:

- Monitoring and collecting data for stream health: Monitoring and collecting baseline data for Waiʻoli Stream and Watershed (e.g., water quality data, flora and fauna, and additional forest threats including fires, predators, and plant diseases). By collecting baseline data (e.g., dissolved O2 study, water turbidity, flow velocity, species population studies, hydrologic assessment(s), LIDAR or topographic stream assessment(s), video/picture documentation, fish surveys, environmental DNA biosampling, etc.) and begining to establish an ongoing monitoring plan for Waiʻoli Stream and the larger watershed. Ultimately, the data will be critical in developing a management regime, which could become a model for other Hawaiʻi streams. Establishment of baseline data will allow the Hui to better evaluate both the overall health of Waiʻoli Stream, as well as the effectiveness of this plan and their actions and refine mitigation measures. In addition to these studies, the Hui farmers have intimate knowledge of this particular stream and watershed that has been passed down over generations, and as a result are acutely aware of the present ecological context.
- Stream cleaning and invasive species removal: Cleaning and restoring Waiʻoli Stream to decrease hazards of future flood events. Actions include cleaning silt and debris after heavy rains/floods, performing arboreal maintenance, clearing invasive plants (e.g., hau, albizia, trumpet tree, guinea grass), and planting native/non-invasive species for erosion control and improved throughflow. This work takes place along segments of Waiʻoli Stream where the ʻauwai, mānowai, poʻowai, and hoʻi are located. The Hui's approach involves strategically clearing instream invasive species on "islands" to improve natural flow, so water is able to flush and "self-clean" during storm events. Specifically, for ʻauwai maintenance, members hand-clear plant debris and roots to clear silt and ʻiliʻili. In total, the Hui actively and collectively manages over 5.5 miles of ʻauwai. Additional tasks include repairing the

mānowai after heavy rains, cleaning pebble traps, adjusting spillway boards, and maintaining the drain system immediately downstream of the loʻi. Performing cleaning in tandem with restoration and in phases allows Hui members to systematically address a section of the stream in a feasible manner and ensures that they are not creating an area more prone to erosion, sedimentation, and downstream turbidity. The Hui also hopes to partner with DOFAW on cooperative weed control projects. Ultimately, the removal of invasive species mitigates flood and fire risks, supports continuous stream flow, prevents debris accumulation, reduces sediment, and opens up the tree canopy to return direct sunlight to the stream bed. Facilitating flood resilience reduces hazardous debris from accumulating, such as downed trees, rocks, and large boulders.

- Community outreach and education: Community outreach and education to facilitate citizen-based watershed protection and ahupuaʻa-level resource management such as water resources. The Hui aims to educate more community members about Waiʻoli Stream and its cultural significance. This will empower others in the community to develop a sense of kuleana to care for these resources in perpetuity. In addition, the HBWMP highlights that "community engagement, education, and volunteer programs . . . are an integral part of a comprehensive solution to reduce NPS pollutants." Educational curriculum will cover a range of topics including wai, watersheds, loʻi kalo, invasive species, cultural context, and practices specific to Waiʻoli. The Hui will continue to collaborate with community organizations including: Waipā Foundation, Kawaikini Public Charter School, Huliauapaʻa Wahi Kūpuna Internship Program, University of Hawaiʻi at Mānoa's Natural Resource Management Program, the William S. Richardson School of Law's Ka Huli Ao Center for Excellence in Native Hawaiian Law, and Mālama Kauaʻi. Ultimately, the outreach education will instill a sense of kuleana in community members and foster long-lasting sustainable management practices grounded in traditional Native Hawaiian biocultural knowledge. The benefits of educational outreach inspire a better understanding and support for water resource management.

The amount of Conservation land in Waiʻoli suggests that to reduce background loading of nutrients and bacteria in Waiʻoli Stream above the Agricultural and Urban land areas, additional resources and funding must be allocated to maintain spaces and practices such as this Loʻi Kalo Irrigation System. Inadequate resources will continue to allow nonpoint source pollution that the Hui cannot combat on their own, and, Waiʻoli Stream may continue to be impaired due to nonpoint source pollution (IR 2018, 3). Since the 2018 flood, however, the Hui has applied for and recieved funding to clean Waiʻoli Stream. That grant totals $399,000 and provides important resources to clear key infastructure in Waiʻoli Loʻi Kalo Irrigation System. Future grants and efforts could collect baseline data (including additional water quality sampling) and develop a plan to clean additional portions of Waiʻoli Stream.

Finally, with regard to water resources, and water quality in particular, restoring loʻi to full cultivation would directly improve water quality. The Waipā Foundation's multi-year study of its neighboring stream confirmed "a marked improvement in the ecological health of the Stream from mountain-to-sea" over a multi-year study period and a substantial decrease in fecal indicator bacteria or enterococcus levels for the Waiʻoli Estuary (Waipā Foundation, 2020). This was attributed to feral ungulate removal, implementing best management practices, and effects of the 2018 flood that opened up the riparian canopy allowing increased sunlight to the stream channel (Waipā Foundation,

2020). To this end, note that during the January 2021 testing, cultivation in Waiʻoli was dramatically reduced due to significant and ongoing damage to the Hui's water supply. More specifically, several years after the 2018 floods, the County of Kauaʻi completed repairs to the mānowai in August 2020, but those efforts were negated when the māno was destroyed again by flooding in November of 2020 and throughout the Spring of 2021. Ultimately, the Hui hopes not only to ensure the long-term health of Waiʻoli Watershed, but also to embrace the community's sense of kuleana as a means of fostering long-lasting sustainable management practices grounded in traditional Native Hawaiian biocultural knowledge.

5.4. Natural Hazards

5.4.1. Climate Change

Rapid anthropogenic global warming is well-established and documented within the scientific community. Studies show that ocean and island ecosystems are particularly vulnerable, experiencing warming air and ocean temperatures, shifting rainfall patterns, changing frequencies and intensities of storms and drought, decreasing base flow in streams, rising sea levels, and changing ocean chemistry (Marra & Kruk, 2017). As a "critical driver of freshwater ecosystems" the water cycle has also been "fundamentally altered" by climate change and will have an impact on Native species (Clilverd, et. al, 2018).

Over the last century, air temperatures in Hawaiʻi have increased between one-half and one one degree Fahrenheit (US-EPA, 2016). Overall, the daily temperature range in Hawaiʻi is increasing, resulting in a warmer environment, especially at higher elevations and at night. Generally, the average ambient temperature (at sea level) is projected to increase by about 4.1°F by 2100 (IPCC, 2007). Historically, temperature has been rising over the last 100 years with the greatest increase after 1975 (Giambelluca et al., 2008). The rate of increase at low elevation (0.16ºF per decade) is below the observed global temperature rise of 0.32ºF per decade (IPCC, 2007). At high elevations however, the rate of increase (0.48ºF per decade) greatly exceeds the global rate.

Precipitation data in Hawaiʻi shows a steady and significant decline of about 15% over the last 15 to 20 years (Diaz et al., 2005; Chu and Chen, 2005). The data is supported by a documented decline in stream flow beginning in the early 1940s (Oki, 2004).

A 2013 study by a UH team of researchers predicted that tropical regions will experience drastically warmer climates by the year 2047. In addition to rising temperatures, sea level rise is a notable concern for coastal communities. Sea level rise has historically driven shoreline changes throughout the Hawaiian Islands. The global annual sea level rise averaged over the last century was roughly two millimeters, with recent studies indicating that this rate is now approaching three millimeters and may accelerate in the coming decades (UH News, 2013).

According to the 2017 Hawaiʻi Sea Level Rise Vulnerability and Adaptation Report, sea level in Hawaiʻi has increased at a rate of 0.6 inches or more each decade over the last century. Although predicting future sea level rise is challenging, research shows that global mean sea level may rise by approximately one (1) foot by mid-century and 2.5 to 3.2 feet by 2100, with some studies showing a possible rise of up to six (6) feet. According to recommendations provided in the report, an

appropriate planning target to use in the design of future projects within the exposure area would be 3.2 feet (Hawai‘i Climate Change, 2017).

Under conditions of higher sea levels in Hawai‘i, other potential impacts may include hurricanes making direct landfall; reduced precipitation adversely affecting freshwater supplies, changing frequency and intensity of storms, and altered distribution of Native species to name a few (Hawai‘i Climate Change, 2017).

The State of Environmental Conditions in Hawai‘i and the U.S. Affiliated Pacific Islands under a Changing Climate report indicated that the individual geography and topography of each island will determine how impacts to water resources are felt and translated across the landscape (Marra & Kruk, 2017). “Hawai‘i is experiencing global warming impacts in unique ways. It will be increasingly important to focus on the localized impacts of global warming and sea level rise to adequately understand and prepare for the changes to come” (UH-Sea Grant, 2014).

According to an analysis by Mair, it will be extremely important to reforest the areas with Native plants that are already adapted to this climate and remove those invasive species that are detrimental to their success. Research has proven that the ground water recharge rates of invasive species are significantly lower than that of Native species due to the invasive low throughfall and high evapotranspiration rates (Mair, 2009). Similarly, kalo and the lo‘i system it relies on enhances environmental sustainability by maintaining watershed, aquatic, and riparian habitat as well as the integrity of the hydrologic cycle (including coastal discharge, stormflow dissipation, and ground water recharge), instream flow for other water uses, and the integrity of Native Hawaiian culture (Penn, 1980).

Due to climate change, weather events are likely to become more frequent and destructive. As demonstrated during the 2018 floods, extreme weather events and flooding are the highest priority threat to the health of Wai‘oli Watershed. These events pose multiple threats, including increased sedimentation, invasive vegetation growth, bank erosion, channel incision, increased debris, blocked stream corridors, landslides, and constriction of the natural waterways, affecting the natural and ongoing flow of water from ma uka to ma kai in innumerable ways. Specific threats to Native flora and fauna, which are vital to reinforce the stream embankment, include total destruction or decimation due to poor water quality caused by severe flooding, and predation by feral ungulates. These changes to the forested upland can negatively affect downstream users such as the kalo farmers.

5.4.2. Floods

The Federal Emergency Management Agency (“FEMA”) creates the Flood Insurance Rate Map (“FIRM”) that delineate flood hazard areas. The FEMA FIRM flood zone designations for the Project Area include:

- Zones X: Areas determined to be outside the 500-year floodplain
- Zone A: Areas of 100-year flood, base flood elevations not determined
- Zone AE: Areas of 100-year flood, base flood elevation determined
- Zone AE Floodway (“AEF”): Floodway area

Wai‘oli Stream channel is designated as Zone AEF, which is the floodway or channel of the stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1%-annual-chance flood can be carried without increasing the Base Flood Elevation.

The land area immediately surrounding the upper portion of Wai‘oli Stream is designated as Zone X. Zone X corresponds to areas of moderate flood hazard.

The land area nearest the Lo‘i Kalo Irrigation System is designated as Zone A and AE. Zone A corresponds to the 1% annual chance floodplains. Zone AE corresponds to the 1% annual chance of flooding with no base flood elevations shown. Zone AE is the base floodplain where base flood elevations are provided. **See Figure 30, Flood Hazard Map.**

The land area ma kai of the lo‘i and ho‘i is designed as Zone VE. Zone VE corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves.

5.4.3. Hurricanes and Tropical Storms

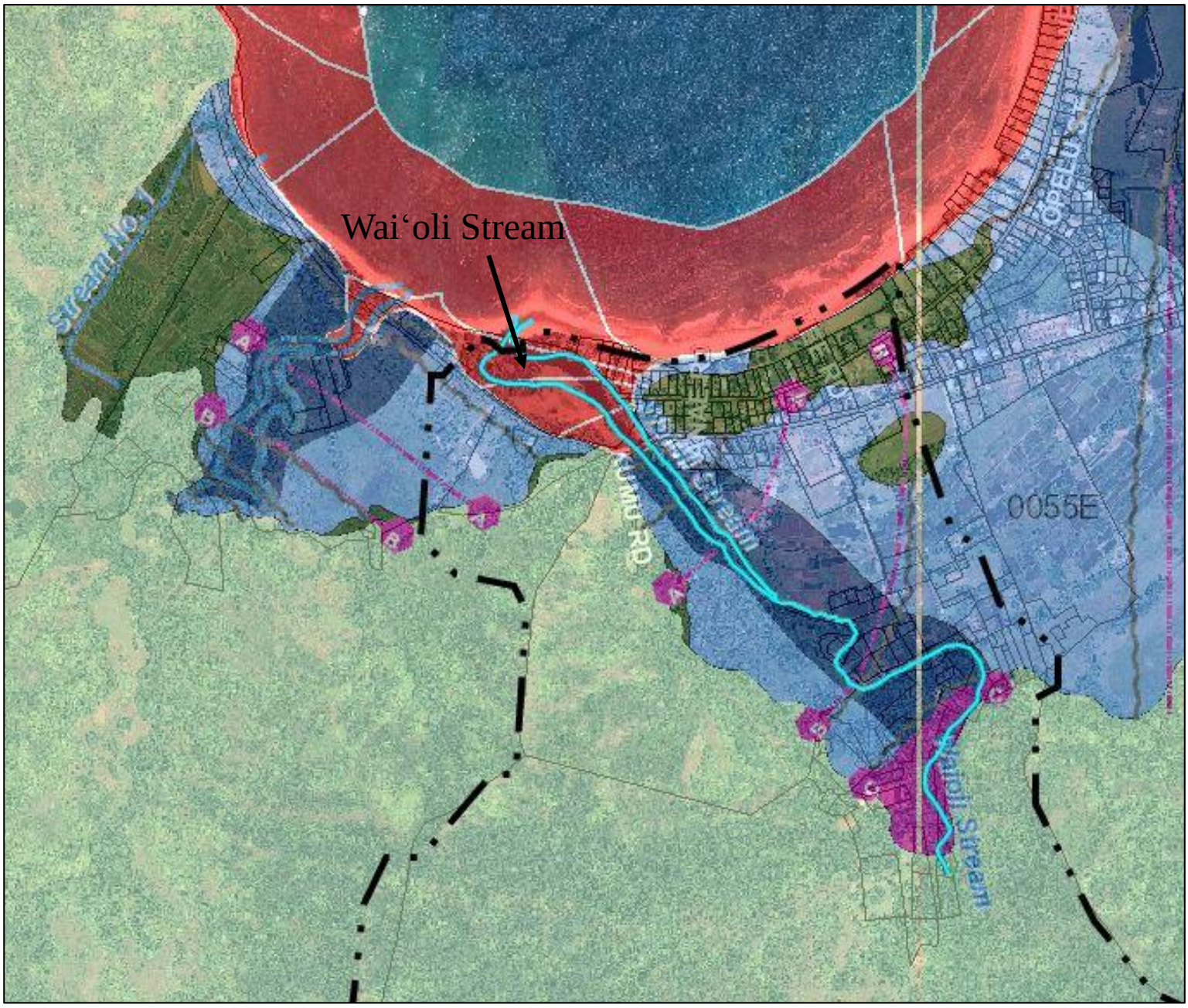
Hurricanes and tropical storms are both categorized as tropical cyclones, which are warm-core storms that originate over tropical waters with well-defined centers of closed surface wind circulation. A hurricane is a tropical cyclone that sustains surface winds of 64 knots (74 mph) or more. Tropical storms are defined as an organized system of strong thunderstorms with defined circulation and maximum sustained winds of 34 to 63 knots (39 to 73 mph). Hurricanes are considered relatively rare events in the Hawaiian Islands and records show that strong windstorms strike all of the Hawaiian Islands.

The first hurricane the National Oceanic and Atmospheric Administration (“NOAA”) documented in Hawaiian waters was Hurricane Hiki in August 1950. Since that time, five hurricanes have caused serious damage in Hawai‘i: Nina (1957), Dot (1959), ‘Iwa (1982), Estelle (1986), and ‘Iniki (1992) (Businger, 1998).

Two main elements have historically protected Hawai‘i from hurricanes: (1) Location: The islands are just south of cold waters too cold for storms and just north is warmer water; and (2) Vertical Wind Shear: The dramatic altitudes essentially stop hurricane wind speed and force as the hurricane approaches the islands, breaking them apart (Honore, 2018). However, climate change brings warmer waters, allowing hurricanes to move farther north toward Hawai‘i. As a result, Hawai‘i and the Project Area may likely experience a higher incidence of tropical storm and hurricane events.

5.4.4 Potential Impacts, Minimization and Mitigation Measures

No significant impacts pertaining to natural hazards are anticipated as a result of the Proposed Action. Natural hazards, however, immediately and directly affect the Proposed Action. Working within the water cycle, lo‘i kalo cultivation works in coordination with the natural environment, and most specifically surface water. Generally, streams in Hawai‘i pose a danger because of their flashy nature; a stream’s stage, or water level, can rise several feet in less than an hour during periods of intense rainfall. Streams in Hawai‘i are flashy because rainfall is intense, drainage basins are small, basins and streams are steep, and channel storage is limited (Oki, 2003).



Map Legend

Effective DFIRM

- Zone XS (X shaded)
- Zone A
- Zone AE
- Zone AEF
- Zone AH
- Zone AO
- Zone D
- Zone VE
- Zone X
- Zone X Protected by Levee

KAUAI
Based on March 2010 USACE report, the **Hanapepe** and **Waimea** levees do not meet levee certification requirements set forth in 44CFR65.10.

MAUI
On November 4, 2015, the **Kaunakakai Levee** will be deaccredited and the FIRM map will be revised to reflect the flood risk.

In August 2015, an **Iao Stream** levee certification has been submitted to FEMA for review.

OAHU
The **Kawainui Marsh** Levee has been certified.

FEMA's Levee Resource Library

Figure 30: Flood Hazard Map

Loʻi kalo cultivation generally, and the Proposed Action in particular, mitigates any negative effects on the environment as a result of natural hazards. Because natural hazards and related major weather events are typically accompanied by heavy rainfall, the Hui and the Loʻi Kalo Irrigation System serve as a severe weather buffer, mitigating floodwaters and providing shelter for some Native species during severe weather events. The Hui, as a community group and with generational knowledge of the specific ʻāina, provides a unified and collective effort to mitigate the issues that intensify flood destruction. Studies show that flooding in the area can be reduced by expanding existing areas of loʻi kalo cultivation and maintaining appropriate flood control measures (Hollyer et al., 1990). Heavy rains can send sediment crashing down the upland hillsides, but the ʻauwai and loʻi, slow it down, so the pollutants can settle and exit the water column. Loʻi kalo is best described as a "reciprocal relationship, not extractive, [and] not exploitative" (Mishan, 2019). In other words, Waiʻoli's Loʻi Kalo Irrigation System, when maintained, tempers and distributes overflow reducing the severity and impacts of floodwaters on Hanalei Town (Kīpuka Kuleana, 2020).

Local leaders, experts, and community members also agree about the imporance of loʻi kalo cultivation and its accompaying practices. After the 2018 flooding, a key finding from local study was the importance of maintaining streams and waterways, as well as clearing them of invasive plants, to prevent future flooding. The team, from UH Mānoa's Department of Natural Resources and Environmental Management and UH Sea Grant, interviewed over seventy (70) community members, government representatives, first responders and non-profit leaders about lessons emerging from the floods. The study highlighted that debris from invasive species created dams in waterways and caused much of the damage in Haleleʻa by re-directing floodwaters to homes, farms, and in Waiʻoli, to Hanalei School and surrounding areas (Huliauapaʻa, 2020). The 2018 floods created a buildup of mud and silt that was deposited within some loʻi with up to a foot of sticky mud and silt comprised of red dirt from ma uka. Although nutrient rich, the mud cannot be used immediately, but must be left to dry before the Hui is able to work with it.

In order to utilize this nutrient rich soil the rain must stop, the intake and outflow need to be closed, and the soil needs to dry out to a point that there is no standing water. In many cases, because the area is so wet, the mud and silt is left to incorporate into the existing soil until it is dry enough to work with. The Hui also uses the mud to manually build up individual loʻi and ʻauwai banks and fill holes in the gravel and dirt access roads. As the mud and silt dry, cover crops may naturally grow or be incorporated into the fallow loʻi, assisting in the process to break down, decompose and nourish the new soil. The loʻi is tilled, using traditional farm equipment to further assist in the decomposition process and improve the soils physical properties to support future kalo growth. **See Section 2.3.2., Loʻi Restoration** and **Section 3.2.2., Kalo Cultivation in Waiʻoli**.

Unfortunately, the frequency and severity of storms may, at some point, require the Hui to determine if changes in the climate, or increased intensity of natural hazards require abandoning or relocating individual loʻi. For example, near the most ma kai hoʻi, the Hui has noticed within the last few years, visible standing water during high tide in some spots of land where water typically would not occur (Hui, 2020). Because the area is in the estuary where brackish water is present, the adjacent plants have not been affected; yet, the presence of standing water is a new observation that is likely attributed to climate change.

The **Proposed Action: Long-Term Water Lease** and **Alternative A: Shorter Lease Term Alternative** would have a *beneficial impact* on the environment as it pertains to natural hazards because the Hui will continue active management and maintenance of the Project Area (e.g., stream cleaning, invasive species removal, ungulate control, etc.) into the future. This maintenance will minimize the effects and impacts of natural hazards; and flooding in particular. Further, the Proposed Action will aid in limiting the spread of invasive species, decreasing debris load, and supporting Native flora and fauna habitats; all of which provide degrees of support to minimize the impacts of climate change.

Alternative B: Annual Revocable Permit Alternative and **Alternative C: No-Action Alternative** would have a *neutral impact* on natural hazards. Without the long-term commitment of a water lease, the beneficial impact of the Hui and the Lo‘i Kalo Irrigation System for flood mitigation and long-term stewardship to clean and restore Wai‘oli Stream in response to natural hazards diminishes.

Minimization and Mitigations Measures

Natural hazards from a project perspective cannot be entirely minimized and mitigated; however, there are opportunities to mitigate its impact as outlined above. Although the future threat of natural hazards cannot be calculated, science has proven that the frequency of threats due to climate change will increase on land and in water. As they have for generations, the Hui has been and is committed to long-term stewardship to clean and restore Wai‘oli Stream that would reduce the impact of natural resources to the immediate area and areas downstream. Actions include cleaning silt and debris after heavy rains/floods, performing arboreal maintenance, clearing invasive plants (e.g., hau, albizia, trumpet tree), and planting Native/non-invasive species for erosion control and improved throughflow. Performing cleaning in tandem with restoration and in phases allows Hui members to systematically address a section of the stream in a feasible manner and ensures that they are not creating an area more prone to erosion, sedimentation, and downstream turbidity. Ultimately, the removal of invasive species mitigates flood and fire risks, supports continuous stream flow, prevents debris accumulation, reduces sediment, and opens up the tree canopy to return direct sunlight to the stream bed. Facilitating flood resilience reduces hazardous debris from accumulating, such as downed trees, rocks, and large boulders due to natural hazards and severe weather conditions.

5.5. Biological Resources

> *“Ahupua‘a residents once accessed the forest for resources such as timber for canoes and homes, medicinal plants, freshwater springs, farmlands, reef areas, and nearshore waters for fishing and gathering seaweed within established palena (boundaries). While these palena sometimes corresponded with the boundaries of an ahupua‘a, they were often smaller or larger, adapted to ecological conditions that shaped the productivity and availability of resources….[whereas modern] new systems of property ownership ignored historical boundaries of land use and the communities formed within them. Though new ownership models were foreign and conflicted with native concepts of relationship to land, Hawaiians adapted by applying these models in ways that perpetuated kuleana”* (Vaughn, 2018, 90).

Based upon existing studies and findings, *no significant negative impacts* are anticipated for biological resources. To the contrary, the Proposed Action has *beneficial effects* and plays a vital role in maintaining biological resources in Wai‘oli. This Proposed Action, the Lo‘i Kalo Irrigation

System, is both culturally and biologically important, playing a vital role in the preservation of Native habitats, many of which are found nowhere else in the world.

5.5.1. Native and Non-Native Flora Species

Kalo: Usage and Relation to Project Area

The Project Area supports, protects, and nurtures kalo. In ancient Hawaiʻi, kalo (taro, *Colocasia esculenta*) and ʻuala (sweet potato, *Convolvulaceae*) were viewed as the most important food crops. They furnished not only the carbohydrate base of the Kānaka Maoli diet, providing high-quality vitamins and minerals. Kalo's cultural importance is found in the large number of varieties that were developed and the even larger number of names that were applied to them. In the 1930s, 342 names for kalo varieties was gathered (Abbott, 1992). Based on reference to previously cited lists of varieties compiled by MacCaughey and Emerson, ancient Hawaiʻi is estimated to have recognized 150 to 175 distinguishable forms of kalo with ample evidence that many varieties have become extinct or at least do not exist in present collections or cultivated areas (Whitney et al., 2007).

Kalo is considered by some to be the world's oldest cultivated crop. It was mentioned in Chinese books as early as 100 B.C., and evidently thriving in Egypt at the beginning of the Christian era (Whitney et al., 2007). Kalo belongs to the genus *Colocasia* as kalo was first known in Egypt under the name *culcas.* Kalo was initially introduced by Polynesians migrating to Hawaiʻi, with many horticultural varieties having been introduced by humans in recent times (Handy et al., 1991). "Lagenfoged, et. al. (2009) estimated that 190 square kilometers (46,950 acres or 19,000 hectares) were cultivated using irrigated agriculture in pre-contact Hawaiʻi. Based on the 19,000 hectares used for kalo production and kalo irrigation's legal requirement, total statewide water demand was approximated at 1.4 billion gallons per day" (AWUDP, 2019, 169).

There are two types of kalo cultures in Hawaiʻi, dryland (unsubmerged) culture, where kalo are grown in māla and wetland (submerged) culture, where kalo are grown in loʻi like those in Waiʻoli. Kalo is a semi-aquatic plant, which in the era of its introduction was presumably planted and grew wild along streams, beside springs, and in semi-marshy areas. Kalo does not flourish in stagnant water. Kalo is a unique plant with distinctive character, that was brought by Kānaka Maoli planters to a higher state of cultivation more than anywhere in the world. Kalo was cultivated so intensively and skillfully in the Hawaiian Islands, that there were hundreds of varieties adapted for different needs (Handy et al., 1991). Some kalo has been grown for lūʻau (leaf), others for kalo paʻa (cooked unmashed taro), whereas varieties were favored for poi, the staple food of Kānaka Maoli. Kānaka Maoli developed kalo classifications based on characteristics such as: the color of the corm, the petiole, the base (kumu), the margin (lihi), the color of the blade (lau), pronounced markings on certain surfaces, differences in lobbing, the veins, and differences in color of ʻiʻowere used to differentiate the varieties of kalo (Abbott, 1992). In Hawaiʻi, cultivation of kalo created a greater number of varieties adaptable to varying conditions of locale, soil, and water - more so than anywhere else in Polynesia and perhaps the world. Today, an estimated 85 to 90 Hawaiian cultivars remain of the hundreds of cultivars selected by Kānaka Maoli (Teves, 2017).

Wetland kalo came to occupy much of the flat, arable land in each valley in Hawaiʻi (Abbott, 1992). The Hanalei Bay Watershed was famous for the Lehua and Lehua Maoli varieties. According to Whitney et al., the Lehua is distinguished by light green, spreading petioles, very smooth, sagittate

leaf blades, and lilac-purple corms. There are four varieties, all of which make red poi of excellent quality. Lehua is known as royal kalo and were formely grown for, and eaten only by the chiefs. Lehua maoli is a Native variety and commonly known as "lehua."

Today, the Hui grows many Native and rare kalo varieties, including:

- ʻEleʻele Mākoko, ʻEleʻele Naioea,
- ʻElepaio Hāuliuli,
- Kāī ʻAla, Kāī Kea, Kāī Uliuli,
- Lauloa ʻEleʻele-ʻōmaʻo, Lauloa Palakea-ʻeleʻele, Lauloa Palakea-papamū,
- Lehua Maoli (Kauaʻi Lehua), Lehua Maui, Lehua Palaʻiʻi,
- Lihilihi mōlina,
- Mana Lauloa, Mana ʻUlu,
- Manini Kea, Maniniʻōwali, Manini Uliuli,
- Moi,
- Nihopuʻu,
- Paʻakai,
- Piko Keʻokeʻo,
- Poni,
- Uahiapele.

Kalo varies in size from two (2) to five (5) feet with size dependent on soil richness or health. A summary provided by Kamehameha Schools compared varieties, explaining that colors and patterns vary greatly by variety. For example, a Lehua variety may have plain green leaves, some may have variegated green and white patterns, or purple and green patterns like the ʻuahi-a-pele. Stem color varies as well; ranging from white, pink, red, green, black or black with green stripes. The leaf shape also varies between cultivars, all have a general heart shape, but some have deeper cleavage than others (piko varieties) and some are cupped shaped (ʻapuwai) (Kamehameha Schools, 2020).

Although the entire plant can be eaten, the most popular source of food is the ʻiʻo, which is the starch-filled base of the stem growing underground, functioning as a root in soil and water. During harvesting time, the corm is pulled and the huli is cut and retained for replanting, creating the next generation of kalo.

Other Native and Non-Native Flora Found or Utilized in Project Area

While this Draft EA is focused on kalo and the Loʻi Kalo Irrigation System that supports its cultivation, other plant species are present around the loʻi.

Native plants found in the vicinity of Waiʻoli Stream and the Loʻi Kalo Irrigation System include:

- Hala (*Pandanus tectorius*, Indigenous)
- Naupaka (*Scaevola gaudichaudiana*, endemic)
- ʻŌhiʻa (*Metrosideros polymorpha*, endemic)

Non-Native and/or Polynesian-introduced flora found around Project Area, Waiʻoli Stream, and Loʻi Kalo Irrigation System include:

- Milo (*Thespesia populnea*)
- Kukui (*Aleurites moluccana*)

- Lāʻī, Kī (ti leaf, *Cordyline fructosa*)
- Maiʻa (banana, *Musa paradisiaca*)
- Noni (*Morinda citrifolia*)
- Hau (*Hibiscus tiliaceus*)

Many of these plants are complementary to kalo processing and consumption, and also support the Hui's medicinal and nutritional needs, some may also be used to fabricate tools or products used in traditional Hawaiian practices.

For example, noni has a wide variety of traditional and contemporary medicinal uses. Some Hui members still gather and use the juice for various ailments. Maiʻa – another staple food with a good source of potassium, vitamin A, and other carotenoids which protect against diseases – complements kalo production and is gathered by the Hui for consumption or to give away.

Many of these Native plants have a legacy in Waiʻoli. The kukui, a tree with an oily nut that provided light and food, and whose wood was once used to carve small canoes for nearshore waters grew in the famous grove of Kālema, an ʻili (smaller section within the ahupuaʻa) of Waiʻoli that was used as a gathering place (Ka Nonanona 15 March 1842). Kukui continues to be collected from this area for medicinal purposes. In the deeper forest ma uka, maile (*Alyxia stellata*, indigenous) and mokihana (*Melicope anisata*, endemic) were found in recent history and has been gathered by some Hui members for lei.

Problematic, invasive flora found around Project Area, Waiʻoli Stream, and Loʻi Kalo Irrigation System include:

- Buffalo grass (California Grass, *Brachiaria mutica*)
- Trumpet Tree (*Cecropia* or *Cecropiaceae*)
- Albizia (*Falcataria moluccana*)
- Lantana (*Lantana camara*)
- Strawberry Guava (*Psidium cattleianum*)
- African Tulip (*Spathodea campanulata*)
- Soap Bush (*Clidemia hirta*)

5.5.2. Native and Non-Native Fauna Species

Loʻi kalo cultivation has been practiced in the Hawaiian Islands since before Western arrival. Not only was it a primary source of food for Kānaka Maoli, the system also provided invaluable habitat for waterbird species for centuries. In modern times, Hawaiian wetlands have severely reduced in size due to extensive draining and filling for commercial agricultural and urban development. Less than 10% of Hawaiʻi's former wetlands are estimated to remain today. This habitat reduction has been a major cause in the decline of several of Hawaiʻi's Native waterbirds to the point of extinction (UH-DURP, 2002).

The Waiʻoli Loʻi Kalo Irrigation System offers a shallow-water habitat that supports threatened and endangered, endemic waterbirds. The specific conditions of the natural environment that appeal to waterbirds and aquatic species vary, but are not limited to, seasonal preferences, water depth, plant growth, and farming operations. Studies have found that loʻi post-harvest, in its wet fallow stage, are

heavily used by threatened and endangered waterbirds, in part because this stage generates substantial invertebrate biomass and the shallow flooded sediments are easily accessed by wildlife with potential predators clearly visible (US-FWS, 2020). **See Figures 31a and 31b, Native Habitats within the Wai‘oli Lo‘i Kalo Irrigation System.**

Less than a mile east of the Project Area is the 917 acre Hanalei National Wildlife Refuge ("NWR"). The NWR was established to conserve five (5) endangered waterbirds that rely on the area for nesting and feeding habitat. These endangered waterbirds also rely on the Wai‘oli Lo‘i Kalo Irrigation System as an informal extension of the habitat and flight range for these endangered waterbirds and the estimated 45 other species of birds that utilize the NWR habitat throughout the year (US-FWS NWR, 2020).

In 2020, the Hui conducted a survey to confirm the observed frequency of the five (5) endangered waterbirds in and around the Wai‘oli Lo‘i Kalo Irrigation System. A brief description of the species is provided below, which can be found on the 2020 U.S. Fish and Wildlife Service ("USFWS") Pacific Islands Birds Webpages (US-FWS Pacific, 2020).

Koloa maoli (Hawaiian duck, *Anas wyvilliana*) – Endangered, Hawai‘i Endemic:
The koloa maoli is a mottled brown duck with a green to blue speculum (the patch of often-iridescent color on the secondary feathers of most duck species). Both sexes have orange legs and feet. Koloa maoli can be found in lowland wetlands, river valleys, and mountain streams. Koloa maoli nest in low-elevation wetland areas as well as near mountain streams, river mouths, and lo‘i (Harrington, 2008). In and around the Wai‘oli Lo‘i Kalo Irrigation System, koloa maoli are abundant and are seen daily by Hui members.

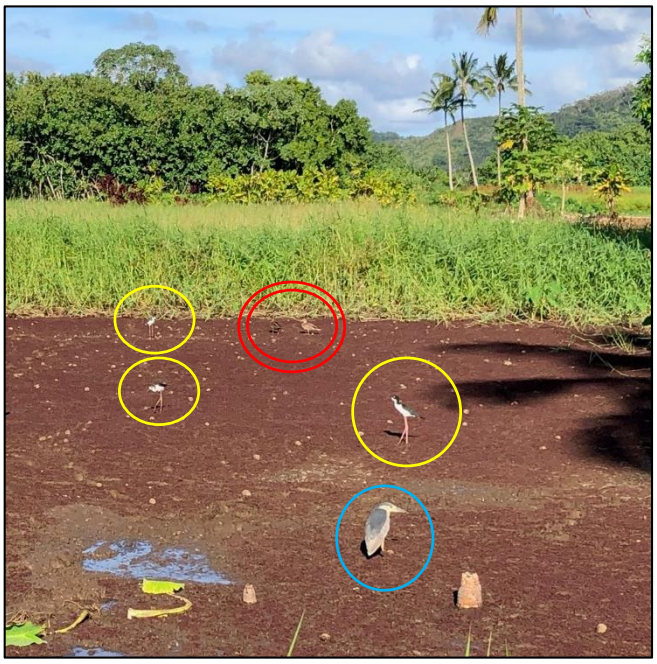
The population size of koloa maoli is roughly 2,200 birds, including 2,000 collectively on Kaua‘i and Ni‘ihau and 200 on Hawai‘i Island. Current population estimates, however, are unreliable because detection rates and montane habitats were not included in calculations. Today, hybridization (mating with feral mallards) and disease (avian botulism) are two of the biggest threats to the species. The largest number of pure koloa remaining are on Kaua‘i.

‘Alae ke‘oke‘o (Hawaiian coot, *Fulica alai*) – Endangered, Hawai‘i Endemic:
The ‘alae ke‘oke‘o is dark slate-gray with a white bill and a large frontal shield (patch on top of head). The frontal shield is usually white but can vary from bluish-white to yellow. They have white under tail feathers that are seen when swimming or during courtship displays. This endemic bird is smaller than its mainland relatives, measuring 15 inches in length. ‘Alae ke‘oke‘o are found in fresh and brackish-water marshes and ponds, building floating nests in aquatic vegetation in which four (4) to ten (10) eggs are laid. They are known to nest in wetlands and lo‘i, using sedges, kalo stems, and other aquatic plants to construct nests that can rise and fall with changing water levels (Harrington, 2018). The statewide population is estimated to range between 2,000 and 4,000 birds. From 2010 to 2015, monthly population monitoring at the NWR counted an average of 254 ‘alae ke‘oke‘o. ‘Alae ke‘oke‘o are frequently seen by the Hui, but are very shy and quick to run away (WVTH, 2020).

Ae‘o nesting in the lo’i. July 2020

Three (3) ae‘o eggs – June 2020

Two (2) baby ae‘o. July 2020



Three (3) ae‘o, one (1) ‘auku‘u, and (2) koloa feeding in a recently drained lo‘i – October 2020

Six (6) ae‘o. November 2019

Source: Wai‘oli Valley Taro Hui

Figure 31a: Native Habitats within the Wai ‘oli Lo ‘i Kalo Irrigation System

Two (2) nēnē fly over the loʻi. October 2020

Nēnē standing next to Wai'oli Stream. October 2020

Nēnē in Loʻi – Late Afternoon. October 2020

Source: Waiʻoli Valley Taro Hui

Nēnē foraging on Kalo. September 2019

Figure 31b: Native Habitats within the Waiʻoli Loʻi Kalo Irrigation System

ʻAlae ʻula (Hawaiian common moorhen, *Gallinula galeata sandvicensis*) – Endangered, Hawaiʻi Endemic:
ʻAlae ʻula are dark gray birds with a black head and neck, and white feathers on their flanks and under tail. They measure about 13 inches in length and have a very distinctive red frontal shield. ʻAlae ʻula are Native waterbirds found in lowland freshwater marshes and streams, kalo complexes, ʻauwai, reservoirs, and wet pastures. They favor dense emergent vegetation near open water, floating or barely emergent mats of vegetation, water depths of less than three (3) feet, and fresh water over saline or brackish water. Alae ʻula are generally shy, inhabitating freshwater marshes such as loi as they are adept to walking across floating vegetation to feed on insects and aquatic plants such as the tops of kalo shoots (Harrington, 2008). They are known to nest in kalo fields.

No historical population estimates are available for the endemic ʻalae ʻula because they are such elusive birds. Today, ʻalae ʻula can be found on Oʻahu and Kauaʻi only with a population believed to be around 2,000 individuals. A sizable population is found at the NWR with over 400 individuals counted in the biannual waterbird survey for the NWR in January 2018. The primary causes of the decline of this Native waterbird are the loss and degradation of wetland habitat and introduced predators. ʻAlae ʻula are seen daily by the Hui in the loʻi kalo enabled by this Proposed Action

Aeʻo (Hawaiian stilt, *Himantopus mexicanus knudseni*) – Endangered, Hawaiʻi Endemic:
The aeʻo is a slender wading bird that grows up to fifteen inches in length. It has a black back and white forehead, and is white below. It has long pink legs and a long black bill. Aeʻo use a variety of aquatic habitats, but water depths of five (5) inches are required for optimal foraging. Nesting sites are adjacent to or on low islands within bodies of fresh, brackish, or salt water. Aeʻo are known to nest in wetlands, loʻi, and ʻauwai, building its nest in a shallow depression in a small mound, often on the banks of loʻi or in low-lying vegetation near water (Harrington, 2008). Aeʻo frequently nest in the Waiʻoli loʻi and are seen daily by the Hui.

The primary threats to this Native waterbird are introduced predators (e.g., rats, dogs, cats, and pigs) and loss and degradation of wetland habitat resulting from altered hydrology, encroachment, alien plants, introduced fish, bullfrogs, disease, and sometimes environmental contaminants.

Nēnē (Hawaiian Goose, *Branta sandvicensis*) - Threatened (effective January 21, 2020) Hawaiʻi Endemic:
The nēnē's face, cap, and hindneck are black with buff-colored cheeks. The front and sides of the neck appear to have black and white stripes. This is caused by diagonal rows of white feathers with black skin showing through. The nēnē ranges in size from approximately 21 to 26 inches in length. In and around the Waiʻoli Loʻi Kalo Irrigation System, nēnē are abundant and are seen daily by the Hui.

In 2017, the USFWS estimated the statewide population of wild nēnē to be 3,252 individuals with 1,482 (46%) on Kauaʻi. From 2010 to 2015, the NWS monthly population monitoring counted an average 115 nēnē. On January 21, 2020, the USFWS reclassified nēnē from

endangered to threatened status because the species' status had improved such that it was not currently in danger of extinction throughout all or a significant portion of its range (84 FR 69918).

Other Native and Non-Native Fauna Found in Project Area

Problematic, invasive fauna found around Project Area, Waiʻoli Stream, and Loʻi Kalo Irrigation System include:

- Apple Snail (*Pomacea canaliculata, Pomacea bridgesi, pomacea paludosa, Pila conica*)
- Wild Pigs
- Feral Cats
- Chameleons
- Wild parakeets
- Rodents
- Wild chickens
- Pheasants

5.5.3. Native Aquatic Species

The Hawaiian Archipelago's isolation in the Pacific Ocean helps to explain the limited number of Native stream animals. There are five (5) Native species of fishes or ʻoʻopu (four (4) endemic and one (1) indigenous); two (2) species of crustaceans or ʻōpae (all endemic); and, three (3) species of mollusks (all endemic) (State DAR, 2020).

All five (5) of the Native ʻoʻopu (freshwater goby) species are found in the Hanalei Bay Watershed (Hanalei Watershed Hui, 2012). ʻOʻopu consist of two (2) closely related families, Gobiidae and Eleotridae, collectively referred to as ʻoʻopu. These fish are small, nearly scale-less bottom dwellers as adults. Fused pelvic fins are adapted to the rocky, steep, flashy-flow nature of Hawaiian streams. These highly muscular fins are used for maintaining position in areas of high flow, but more impressively used for climbing waterfalls (State DAR, 2020).

ʻOʻopu (freshwater goby)

Hawaiʻi's Native ʻoʻopu share a unique life cycle pattern called amphidromy. This is a specialized pattern where the animals live in two different environments (diadromy) during different life stages. Adults live in streams as adults. The gobies lay their eggs in the stream, and upon hatching, the larvae migrate downstream and are swept out to sea. After living in the ocean plankton community for a time, the post larvae, called hinana, return to the adults' habitat by migrating upstream, often climbing numerous waterfalls.

In 1989, Waiʻoli Stream research conducted by the Center for Conservation Research & Training - UH Mānoa and DAR in November 1989 found that Native stream species are adapted to periodic flooding, including intense events. Based on observations of ʻoʻopu nākea and site conditions discussed in this section, the researchers found proof that ʻoʻopu populations will persist in the stream continuum (i.e., from mountain-to-sea) after major flood events. Absent any major biophysical disturbances to the Waiʻoli Watershed or significant plantation-style water diversion from the stream system in the interim, Native

stream animal populations are likely to remain viable in Wai‘oli Stream today (Kido et al., 2019).

Between 2003 and 2019, Waipā Foundation conducted Fish Surveys in Waipā Stream. With close proximity to Wai‘oli Stream, the findings from the Waipā Stream surveys[60] are a good indicator of the presence of similar species in Wai‘oli Stream. To compare pre- and post-2018 flood, researchers compared the 2016 and 2019 fish survey datasets. The comparison found a 76% increase (between the 2016 and 2019 surveys) in the total numbers of fish and macroinvertebrates observed, with increased numbers of Native ‘o‘opu at all study sites. Also, the increase in ‘o‘opu numbers seen at the lower survey site (within the stream restoration area) was almost 400% greater than in 2016 with habitat and biological integrity scores increasing from “Poor” to “Fair” and “Good,” respectively. The findings in the Waipā Stream are likely to be a result of the cleansing effect of floodwaters coupled with a major stream cleaning and maintenance project that began in 2011. In Wai’oli, the 2020 survey of the Hui’s observation of aquatic species also confirmed that currently, the Hui frequently observe ‘o‘opu in the Wai‘oli Stream and Lo‘i Kalo Irrigation System.

The following Native ‘o‘opu species are observed in Wai‘oli Stream or the nearby Waipā Stream, a good indicator of the presence of species likely found in Wai‘oli Stream. The descriptions are partially derived from the DLNR DAR webpage, which was accessed in September 2020 and May 2021 (State DAR, 2020).

‘O‘opu nōpili (*Sicyopterus stimpsoni*) – Hawai‘i Endemic
The physical traits of ‘O‘opu nōpili are highly variable juveniles and females are usually mottled brown or gray, while males are slate gray-blue with striped or variegated markings, or black with white stripes and a pronounced dorsal fin (male in photo). ‘O‘opu nōpili feed on algae growing on rocks, are usually found in the middle stream reaches, preferring fast-flowing water, and can grow up to about seven (7) inches. ‘O‘opu nōpili are found in the lower and middle reaches of Wai‘oli Stream (State DAR, 2008).

‘O‘opu nākea (*Awaous guamensis*) – Indigenous
‘O‘opu nākea appear mottled brown and black with a white underside (nākea means “whitish,” probably referring to the ‘o‘opu’s white underside). Vertical dark and light bands are visible on the dorsal and caudal fins, and there is a dark patch on the caudal peduncle. It grows to about fourteen (14) inches and is usually found in the lower to middle stream reaches. Native Hawaiians favored this goby as a food fish probably because of its large size. ‘O‘opu nākea feed mostly on filamentous green algae, crustaceans, worms, snails, and aquatic insects. ‘O‘opu nākea are found in the middle, lower, and estuary reaches of Wai‘oli Stream (State DAR, 2008).

The 1989 research documented ‘o‘opu nākea spawning in a roughly 75-meter stretch of lower Wai‘oli Stream (Kido et al., 2019). Using underwater visual census (“UVC”), the research team observed 20+ egg masses laid in nests within the basalt substrate. The nests were being guarded by single male or female individuals, indicating that eggs were fertilized and about

[60] Note that Waipā completed major stream cleaning efforts in 2011.

to hatch. The highest nest densities were recorded nearer the stream mouth. The researchers observed an old coral reef underlying the streambed, yet the egg masses were only laid on stream rocks and not the coral. The observation indicates that at that time there was a reproductively viable population of ʻoʻopu nākea in Waiʻoli Stream (Kido et al., 2019). Researchers, however, also observed a tilapia in the study site, which was of concern since this invasive species may prey upon and compete with Native ʻoʻopu for food resources. The researchers also acknowledged that the observation was made following a flood event that closed the Hanalei Bridge. This occurred a few days prior to the spawning observations, providing proof that ʻoʻopu populations will persist in the stream continuum (i.e., from mountain-to-sea) after major flood events. The research is consistent with the oral histories and surveys of Hui members who historically and currently gather Native stream animals as a part of their traditional and customary Native Hawaiian practices (Leu Cordy & Merrin, 2020).

ʻŌpae (crustaceans)

The ʻōpae (endemic crustaceans) are represented by two (2) species: (1) ʻōpae kuahiwi, or mountain ʻōpae, which prefers the higher sections of the streams where there is abundant cool, clear and fast-flowing water; and, (2) ʻōpae ʻoehaʻa, which is most commonly found in the lowest stream section in slow-flowing water. The Hui's 2020 survey confirmed that it has observed ʻōpae in the Waiʻoli Stream and upper portions of the ʻauwai.

The following ʻōpae species are observed in Waiʻoli Stream. The descriptions are derived from the DLNR, DAR webpage, which was accessed in September 2020 and May 2021.

ʻŌpae kalaʻole or ʻōpae kuahiwi (*Atyoida bisulcata*) – Hawaiʻi Endemic

ʻŌpae kalaʻole are golden brown, dark green to black in coloration. ʻŌpae kalaʻole are usually found in the upper stream reaches in fast flowing water and feed on microscopic plant and animal matter. They reach a length of two (2) inches and demonstrate the greatest climbing ability as they are observed above waterfalls over 100 feet in height. ʻŌpae kalaʻole are found in the middle and lower reaches of Waiʻoli Stream (State DAR, 2008).

ʻŌpae ʻoehaʻa (*Macrobrachium grandimanus*) – Hawaiian Endemic

ʻŌpae ʻoehaʻa are light to dark brown with striped pincers. One (1) pincher is noticeably larger than the other. The ʻōpae ʻoehaʻa feeds on both plant and animal matter and are typically found in estuary and lower stream reaches. ʻŌpae ʻoehaʻa are found in the middle and lower reaches of Waiʻoli Stream (State DAR, 2008).

Additional aquatic species are observed in Waiʻoli Stream. The descriptions are partially derived from the DLNR, DAR webpage, which was accessed in September 2020 and May 2021.

Hīhīwai or Wī (*Neritina granosa*) – Hawaiʻi Endemic

The hīhīwai, also known as wī, is a freshwater snail with a black shell that can be rough or smooth. The underside of the shell is orange. Shell shape and texture is variable and dependent on its habitat. Its shell grows up to two (2) inches. Hīhīwai are typically active at night and found in the lower and middle stream reaches, feeding on algae growing on rock

surfaces. Unlike the other species that are frequently observed by the Hui, the Hui reports not seeing hīhīwai in the stream as often as other Native stream animals.

ʻAnae and ʻAmaʻama (Mullet, *Mugil cephalus*) – Endemic
The average size of striped mullet is around 50 cm and is known to penetrate low gradient streams, but is more common in protected habitats, especially in estuaries (muliwai). They reach sexual maturity at 28 cm or three (3) years old and migrate offshore during the winter months to spawn. The pre-juveniles averaging 20 mm appear at intertidal estuaries 30-45 days after hatching at sea. Pre-juveniles averaging 17-35 mm are very common in the shallow intertidal habitats in the spring but disappear by the end of June (Nishimoto, 2007, 143-44).

ʻAnae are full-sized ʻamaʻama, or mullet (Pukui & Elbert). Mullet was one of the most important fish species in traditional Hawaiian culture. Young fish were caught in nets along the shoreline, then raised in the many fishponds throughout the islands. After being fattened in the fishponds they could then be easily caught for consumption (Nishimoto et al., 2007; State DAR, 2014). Farmers frequently see ʻanae in the lower part near the muliwai and they are also prevalent in Halulu fishpond in the neighboring Waipā Ahupuaʻa which is fed by the Waiʻoli Muliwai.

Āholehole (*Kuhlia sp.*) and Zebra-head Flagtail (*Kuhlia sandvicensis*) – Indigenous
Āholehole is common in all Hawaiian waters and can be found both in streams and the ocean, but prefer higher salinity and is, therefore, typically found in the ocean (Bishop Museum, 2010). Āholehole reach about nine (9) inches in length. They range much higher inland in the stream and common in estuary areas, and the lower sections of streams, and can be found well inland to well above the first major riffle area of stream. Āholehole prefer very fast water runs and riffles, but also can be found in pools. Within a stream, āholehole are found in estuarine areas to the upper reaches of the stream, feeding on a wide ranging diet of insects, crustaceans, algae, spiders, annelid and polychaete worms (Bishop Museum, 2010). The Hui's 2020 survey confirmed that āholehole is seen frequently in Waiʻoli Stream near the hoʻi.

The recent long-term fish population survey conducted by Waipā Foundation in nearby Waipā Stream found an increased observation of (Native) āholehole and a sharp drop in the numbers of (non-Native) Swordtails, which are the most common exotic fish found in Waipā Stream above the estuary reach. Based on these findings, its researchers hypothesize that the 2018 flood event probably swept most of the non-Native Swordtails out to the Bay, while the Native ʻoʻopu fared much better due to their higher level of adaptation to the flashy hydrology of Hawaiian stream systems (Rosener, 2020). Based on the proximity to Waiʻoli Stream and similarities as tidal estuaries, it is reasonable to assume similar findings in Waiʻoli Stream.

5.5.4 Potential Impacts, Minimization and Mitigation Measures

Based on the compiled studies and Hui observations, *no significant impacts* are anticipated as a result of the Proposed Action. On the contrary, the action will have *beneficial effects* on biological resources.

Research documents loʻi kalo's instrumental role in conservation efforts to promote, protect, and perpetuate Native species because these species have adapted to these ancient systems and depend on loʻi kalo for food, shelter, and reproduction (USDA, 2009). Loʻi kalo play a vital role in the preserving endemic and Indigenous species, many of which are found nowhere else in the world.

The **Proposed Action: Long-Term Water Lease** and **Alternative A: Shorter Lease Term Alternative** would have a *beneficial impact* on biological resources because the long-term water lease would commit water for instream, in-watershed kalo cultivation and support existing and future flora, fauna, and aquatic species in the area. A long term water lease would also allow the Hui to continue sustainable management practices grounded in place-based Native Hawaiian biocultural knowledge and stewardship.

The long-term lease would support the continuity of the Waiʻoli Loʻi Kalo Irrigation System that provides habitat for endemic waterbird species, offering a more expansive area for food, water, nesting, and shelter. The Hui's mission and implementation of the Draft Hui Watershed Management Plan as required for a long-term water lease seeks in part to protect Native waterbirds through its commitment to maintain the ongoing throughflow water use and loʻi kalo cultivation. A forthcoming study indicates that restoring loʻi "could increase [Aʻ]eo habitat by 171% — even after accounting for losses due to sea level rise" (Star Advertiser, 2021). In addition to highlighting Indigenous relationship to Aeʻo, the study evaluates the impacts of climate change on Native birds like the ʻAlae ʻUla and ʻAlae Keʻokeʻo and underscores the importace of expanding well-mantained wetland kalo much like the Hui's practices.

The Hui also supports the overall concept discussed in the USFWS'2002 Recovery Plan for Hawaiian Waterbirds which acknowledges that the key to the success of the general recovery and protection of waterbirds is the "formation of productive partnerships among Federal, State, and local agencies, private organizations, and individuals…Such partnerships also result in greater community support to ensure long-term wetland and waterbird protection." Establishing and maintaining these relationships creates a greater emphasis on collaborations between community groups, organizations, and kalo farmers who encounter Native species on a daily basis (UH-DURP, 2002).

For native aquatic species, DLNR's Division of Aquatic Resources ("DAR") notes that, "maintaining the natural patterns of water flow in streams is the single most important requirement for protection of native Hawaiian stream animals." Without it, the impacts of "reduced flows on habitat quality pose added stresses to [N]ative species that are already threatened by urbanization, pollutants, changes in land use, and invasive species" (Clilverd, et. al, 2018). For centuries now, Hui members and their ancestors have directed about half of Waiʻoli Stream to their loʻi kalo, which maintains robust flow throughout the stream's reaches and also creates additional habitat for native stream animals in Hui members' ʻauwai and loʻi kalo. Importantly, the amended IIFS and the Hui's maintenance of the larger Waiʻoli Stream and Watershed ensures ma uka to ma kai stream flow, and nearly all of the water used in the system is returned to the stream. As noted by DAR, "These natural flows will provide the gateway for our precious native stream animals to complete their life cycle. Hawaiian native stream life, like the native Hawaiian people who depended on the streams, embody the connection of mauka to makai that defines the Hawaiian ecosystem" (State DAR, 2020). This system also expands available habitat for native stream animals within the Hui's loʻi kalo and ʻauwai, which safeguards those animals as they are not available to be gathered in public reaches of the

stream. The Hui will continue to observe and work with the State if any native species population changes are noted.

Under **Alternative B: Annual Revocable Permit Alternative** and **Alternative C: No-Action Alternative** there would be no commitment to support, protect, or proliferate biological resources in and along the Waiʻoli Loʻi Kalo Irrigation System and would have a *minor or moderate impact* on biological resources. A No-Action Alternative, however, may likely have *significant negative impact* on biological resources in Waiʻoli. Without a long-term commitment from the State, undertaking proactive efforts to protect biological resources would be a significant challenge for the Hui. The Hui may not be able to committ to the efforts currently outlined in the Draft Hui Watershed Management Plan. This may diminish the quality of Native habitats, waterbirds, Native flora, and overall stream health that affects Native aquatic species in the area. The 2020 NWR report stated that without maintenance, the Loʻi Kalo Irrigation System, specifically the ʻauwai, became overgrown within months, limiting the value of the habitat and ability to manage wetlands, especially to properly drain and aerate units [loʻi] (US-FWS Pacific, 2020). The report found that ongoing maintenance of ʻauwai would facilitate water level management within kalo farms and provide minor to intermediate habitat benefits (US-FWS Pacific, 2020).

Minimization and Mitigation Measures

Given the *beneficial effects* of loʻi kalo cultivation on biological resources in Waiʻoli, minimization and mitigation measures are not necessarily required. As a part of their regular work, however, the Hui's efforts contribute to proactive measures and best management practices that prevent the overall degradation of the biological resources in the area.

As an ideal habitat for many biological resources, the farmers inevitably encounter nesting cycles within the loʻi itself. In order to protect and minimize any potential impact, farmers make visual observation of any nests and/or eggs during the growing cycle and make necessary adjustments if/when it is time to harvest. If the farmer determines that it is close to hatching, they wait to harvest kalo. If, however, the farmer determines that the nest and/or eggs are new, they harvet kalo around the area and leave a buffer area to allow continued and safe growth.

The Hui's work effectively maintains this ʻāina as a resource for Native flora, fauna, and aquatic species that already exist in the area. These efforts are articulated in the Draft Hui Watershed Management Plan and support the stewardship of the biocultural watershed resources that are intertwined with stream flow. This pilina enables a successful ancient system that has been vital to Waiʻoli for centuries. The Hui's work, and the Hui's Watershed Management Plan include:

- Cleaning and restoring Waiʻoli Stream – the removal of invasive species mitigates flood and fire risks, supports continuous stream flow, prevents debris accumulation, reduces sediment, and opens up the tree canopy to return direct sunlight to the stream bed. Facilitating flood resilience reduces hazardous debris from accumulating and can better protect and mitigate damage to Native species habitats.
- Removal and control of non-Native hooved animals – the Hui will continue to control the ingress of ungulates and remove them through coordinated hunting and setting traps in the watershed and existing Loʻi Kalo Irrigation System. This maintains and helps restore the biological integrity of the Waiʻoli Watershed by preventing soil erosion, limiting the spread

of invasive species, and protecting Native species by removing non-Native predators (Tep & Gaines, 2003).

- Community outreach and education – The Hui aims to educate more community members about the Waiʻoli Stream to facilitate citizen-based watershed protection and ahupuaʻa-level resource management. This will empower volunteers within the community to develop a sense of kuleana to care for these resources in perpetuity. Ultimately, the outreach education will instill a sense of kuleana in community members and foster long-lasting sustainable management practices grounded in traditional Native Hawaiian biocultural knowledge.
- Continuing best practices – for traditional loʻi kalo farming. The Hui will implement the HBWMP's "recommended management practices" in their loʻi to maintain and improve surface and ground water quality, which supports Native species health. Ultimately, the proposed actions discussed in the Draft Hui Watershed Management Plan aim to reduce sediment, bacteria, and nutrient loads from surface and ground waters to receiving waters (i.e., Hanalei Bay). This should decrease the generation and transport of any non-point source pollutants that may reach the ocean and affect Native species habitats. The Hui will collectively undertake these efforts year-around.
- Passive and active maintenance – Each farmer in the Hui spends about seventeen hours per month on passive and active maintenance (including invasive species removal) within the Loʻi Kalo Irrigation System. Community work days include individual volunteers from the community. The activities range from cleaning the ʻauwai system of overgrowth and debris, clearing and maintaining the intake by cutting back vegetation, removing debris, shoring up ditch banks, shoveling dirt and ʻiliʻili, manually moving rocks out of intake and ditch, and placing rocks to support the breakaway rock dam.

5.6. Cultural Resources

Article XII, section 7 of Hawaiʻi's State Constitution mandates the preservation and protection of all Native Hawaiian traditional and customary practices. The Hui commissioned a Cultural Impact Assessment ("CIA") to record and assess the practices perpetuated within Waiʻoli. The CIA, *I Mano ka Waiʻoli*, includes a complete literature review of cultural and historic resources, a review of previous archaeological work at and near the project area, as well as community consultation, and interviews. The CIA can be found in **Appendix C, CIA: I Mano ka Waiʻoli**.

5.6.1. Cultural Practices, Worldviews, and Traditional Uses

> "*From a Hawaiian worldview, the environment is not merely an entity to be prioritized because of the ecosystem services it provides for man, but it articulates instead a familial and genealogical relationship between ʻāina (land), akua (gods), and kānaka (people).*" (Beamer et al., 2021, 4).

Given the extensive cultural resources, worldviews, and traditional uses encapsulated in loʻi kalo cultivation generally, and in Waiʻoli specifically, the 2020 CIA of the Waiʻoli Loʻi Kalo Irrigation System, *I Mano ka Waiʻoli*, comprehensively surveys cultural beliefs, practices, and resources in the Project Area. **See Appendix C, CIA: I Mano ka Waiʻoli**. It also evaluates potential impacts on these resources and provides historical context for the Waiʻoli Loʻi Kalo Irrigation System. The Hui's traditional use of water and kalo farming is a cultural practice informed by Kānaka Maoli

worldviews. The Proposed Action supports this traditional and customary cultrual practice of kalo farming in a traditional manner.

Kānaka Maoli not only stewarded natural resources as a means for survival, but Kānaka Maoli life was governed by its pono usage. "Given the critical role that water played in Hawaiian society, traditional Hawaiian law, or kānāwai, developed around the management and use of fresh water. In fact, the word 'kānāwai' can be literally translated as 'relating to water.'" (Native Hawaiian Law Treatise, 2015). Wai also denotes wealth, as exemplified in the duplication of the word: waiwai.[61] (Sproat, 2009).

For Kānaka Maoli, the practice of aloha ʻāina is embodied in the traditional and customary cultural practice of kalo cultivation. Aloha ʻāina is love for the land, but this value goes beyond mere feelings; it articulates humans' genealogical relationship to land and embodies ideals of patriotism or nationalism. In each of these views, ʻāina is at the center. Aloha ʻāina as a practice not only operationalizes humans' kuleana to care for ʻāina as a means for survival, but importantly, actualizes one's familial relationship and kuleana to Kānaka Maoli's elder sibling, kalo. In Hawaiian cosmology, kalo is revered as the elder brother of Kānaka Maoli and establishes humans' familial relationship with ʻāina. The first kalo plant sprouted from the grave of Hāloanaka, the first child of Wākea[62] and Hoʻohōkūkalani.[63] As a fundamental cultural practice, the Hui engages in and shoulders the kuleana of kalo cultivation.

In addition to kalo itself, wai that flows through and feeds the loʻi kalo is held in highest esteem. For Hawaiʻi's people, culture, and resources, ola i ka wai. Spiritually, water is revered as a kinolau of Kāne, one of the principal akua in the Kānaka Maoli pantheon (Sproat, 2009). Kāne was the "embodiment of male procreative energy in freshwater, flowing on or under the earth in springs, in streams and rivers, and falling as rain (and also as sunshine), which gives life to plants" (Handy et al., 1991, 64).

Kānaka Maoli also articulate the importance of one's pilina with ʻāina, the interdependence, and the lessons that come with it: "I am certain that the intricacies within….loʻi….ground us in who we are as servants to this land and will manifest as the answers we need to thrive if indeed we look to these sources" (Oliveira & Wright, 2016, 143). Recognizing these practices as "an integral part of the ancient Hawaiian civilization," and deserving protection into present-day, the Hawaiʻi State Constitution, Article XII, section 7 imposes a constitutional mandate to preserve and protect traditional kalo cultivation, a Native Hawaiian traditional and customary practice (Forman & Serrano, 2012, 10). The Hui's continued use of water from Waiʻoli Stream is grounded in both traditional and customary Native Hawaiian, riparian, and appurtenant rights, which have the highest protection under that law, as well as historic and contemporary instream and in-watershed use (Leu Cordy & Merrin, 2020)

The vast extent and interconnectedness of the Waiʻoli Loʻi Kalo Irrigation System throughout history is well documented. Kalo cultivation in Waiʻoli Valley is captured during the 1848 Māhele and the

[61] Wealth.
[62] Sky father.
[63] Daughter of Papa, earth mother.

Waiʻoli Loʻi Kalo Irrigation System is dated back to the 1500s. Maps and written testimony indicate that the Waiʻoli Loʻi Kalo Irrigation System has been in ongoing use, in kalo – including requiste throughflow – for at least the last 170 years. Present-day research found at minimum, 34.57 acres of the Waiʻoli Loʻi Kalo Irrigation System was in loʻi between 1830 to 1860 with all the rights and access to water necessary to irrigate those fields. The documentation provided in the CIA is contemporaneous with the use of loʻi on these various parcels today. Historic maps establish that the ʻauwai system was partly surveyed and depicted 147 years ago, then in greater detail 20 years later. Using ESRI ArcGIS software to georeference old maps to their real world geospatial locations, the CIA clearly established that the ʻauwai system has changed little over the last 127 years. The early depictions confirm the existence of the mānowai and poʻowai per the extent of the ʻauwai system. When coupled with Māhele claims, the attempt to quantify appurtenant rights to a sample acreage, the CIA indicates that (the system and Project Area) is a reasonable estimate based on its near-exhaustive survey of Māhele and other data.

Participants also "detail[ed] important resources and cultural (e.g., subsistence) practices reliant upon them in the Project Area. The most prevalent subsistence practices in Waiʻoli mentioned during the interviews include 1) fishing, 2) hunting, and 3) gathering. Note that while religious or spiritual practices were not a focus of [that] study, they persevere. For example, some gather fresh water for hoʻokupu (offering) and others mentioned the importance of pule (prayer). Apart from established traditional and customary Native Hawaiian practices, because many endemic and endangered manu (birds) are also dependent on the Waiʻoli Loʻi Kalo Irrigation System, participants also shared their manu interactions" (Leu Cordy & Merrin, 2020).

5.6.2. Archaeological and Historical Resources

The Loʻi Kalo Irrigation System is not only a modern-day operating traditional system, but an archaeological and historical resource itself. In a 2019 report, "The Indigenous Origin of the Native Hawaiian Irrigation System that Feeds the Loʻi Kalo in Waiʻoli, Kauaʻi," OHA Land, Culture, and History Research Analyst, Natashja Tong, confirmed that this Loʻi Kalo Irrigation System existed prior to western contact. The report details Māhele records pertaining to the Project Area and the ʻauwai in particular.[64] By referencing the Native Register of Kuleana[65] Claimants and its respective documentation, Tong established a timeframe in which the Loʻi Kalo Irrigation System was in place. (OHA Testimony, 2021).

OHA's research and historical documentation demonstrates that the Waiʻoli Loʻi Kalo Irrigation System existed since time immemorial, to support an agricultural complex of no less than 41 separate kuleana ʻapana containing loʻi kalo at the time of the Māhele. Of those ʻapana, no less than 12

[64] The Māhele occurred between the years 1848-1860 and transitioned Hawaiʻi into a hybridized system of private land ownership. OHA Testimony, 2021.

[65] Kuleana are a type of Land Commission Award (LCA) given to native tenants during the Māhele. Native tenants who were seeking a Kuleana award would submit a Native Register (NR) – a statement that explained the extent of their land claim – to the Land Commission, the Board tasked with confirming title during this process. Typically, the Native Register included information on how many ʻapana (land parcels) the applicant was claiming and what was being cultivated at the time. The Native Register also detailed from whom the applicant derived their interest (i.e., who gave the claimant the right to cultivate those lands), which was usually a konohiki or aliʻi, and/or the year or time period that aliʻi was in power typically in the form of "I ke au iā" or "during the time of" followed by the name of the aliʻi. OHA Testimony, 2021.

referred to this particular ʻauwai as part of their metes and bounds description. (OHA Testimony, 2021). The Loʻi Kalo Irrigation System, as a whole, has been preserved, utilized, and maintained as a archaeological resource since time immemorial.

Within the irrigated fields of the Waiʻoli Loʻi Kalo Irrigation System itself, no archaeological studies have been conducted. This is likely because of the ongoing and historical use of the area for cultivation as loʻi kalo. Archaeological work has, however, been conducted along Kūhiō Highway, in the coastal sand areas ma kai of the Waiʻoli Loʻi Kalo Irrigation System. The archaeological reports in the coastal sand areas have recorded iwi kūpuna (ancestral remains) along the coastal dunes, which is consistent with where people would have lived and buried their ʻohana (family members). This corresponds with the pā hale, per Māhele claims, which were the dominant land use in the sand dunes seaward of the Project Area and Kūhiō Highway (Leu Cordy & Merrin, 2020). Along the same lines, it is unlikely that there are iwi kūpuna or other archaeological resources within the Waiʻoli Loʻi Kalo Irrigation System itself given the documented historical use of the land.

Because of the lack of archaeological studies specific to Waiʻoli, the CIA surveyed manuscripts and reports beyond Waiʻoli Valley, in neighboring Hanalei as well as other traditional irrigation systems similar in scale, production, and geographic setting to Waiʻoli in order to estimate when irrigated loʻi kalo cultivation developed in Waiʻoli. Though the cultural landscape in Waiʻoli and greater Haleleʻa would have taken time to establish after early settlement, it is fair to assume that the Waiʻoli area would have been an optimal early settlement area and that most of the coastal wetlands of Waiʻoli were in loʻi with water coming from canals by AD 1200s-1400s (if not earlier) (Leu Cordy & Merrin, 2020).

Below is a summary of the researched and documented relevant archaeological and historical resources and context from *I Mano ka Waiʻoli* unless otherwise cited:

- An ideal environment for early settlement: Hanalei Bay is likely to have been an early settlement area on Kauaʻi based on the following description, “As with windward Oʻahu, the windward coast of Kauaʻi would have been a favorable environment to early settling parties, and future work in this region will likely turn up additional indications of lengthy occupation” (Kirch, 1985). Early Kānaka Maoli arriving at Hanalei Bay would have found an optimal environment - high rainfall for rain-dependent crops, wetlands for kalo, and sandy beaches and calm seas for easy access to marine resources. After landing on shore, arriving peoples would have most likely started to establish their “transported landscapes,” (Kirch, 1989) immediately tending to the animals and plants they had brought with them on the canoe. Kalo would have been one of these important early plants, but would not have been planted in large, irrigated field systems at that time, which would come later.
- Kalo Cultivation: In early settlements, housing along with tree crops and likely rainfall-dependent crops would have been placed along the Bay, with kalo in the adjacent wetlands of Hanalei and Waiʻoli, or nearer to the base of the mountains if the seaward-most part of the coastal plain was too wet (Gay, 1873).
- Crop Cultivation (mid-1800): One of the first articles pertaining to Waiʻoli was in Ke Kumu Hawaiʻi entitled, No ke Emi Ana o Na Kanaka, in which a Kauaʻi Island census taken in 1835 showed the decline in population. This article was submitted by the mission to address possible mitigating action to deal with the decline. This article was written by W. P. Alexander, a

missionary who founded the Waiʻoli Mission in 1834, fourteen (14) years after the arrival of missionaries in the islands in 1820. From the founding of the mission in 1834, letters, reports, and nūpepa articles continued to document the agricultural wonders of the Waiʻoli community. In the early years of the mission, Alexander connected his property to the main stream through an ʻauwai system to water the crops on his homestead. Moreover, crops were so abundant, that they were sold commercially and shared with other missions.

- Rice Cultivation (mid- to late-1800): Following western contact, "the rice era followed various failed agricultural attempts, including crops of mulberry for silkworms, [cotton,] coffee, tobacco and sugarcane, as well as attempts to raise cattle. [Much of the sugarcane rotted in the lower fields (pp.75)]. By 1870 rice had become a significant product throughout the Islands (Mokulēʻia and Waikīkī on Oʻahu were the largest rice-producing areas) and would soon dominate the Hanalei landscape….by 1882 sugarcane had all but disappeared in Hanalei's lower valley in favor of rice…Other nearby valleys, and virtually all suitable land along Hanalei's coastal plain, had also been planted with the crop….In 1895 Eric Knudsend wrote: "Rice field and taro patches covered the flat bottom land as far as the eye could see" (Harrington, 2008, 94). Rice eventually faded away as California rice producers began to dominate the industry. After the decline of the rice industry in the early 1900s, after nearly three (3) decades, significant kalo farming began again in earnest (Harrington, 2008). By 1997, fifty acres of kalo in Waiʻoli Valley was documented (Harrington, 2008, 136).

5.6.3. Potential Impacts, Minimization and Mitigation Measures

Unlike typical projects evaluated for environmental impacts, this Proposed Action directly supports cultural resources and has *significant beneficial impacts* on Native Hawaiian traditional and customary practices and existing archaeological resources in the Loʻi Kalo Irrigation System. Extensive documentation and subsequent research reveals that these continued practices have enabled and preserved the archaeological and historical resources in the area.

Central to wetland kalo cultivation, continuous flowing water is integral to the Waiʻoli Loʻi Kalo Irrigation System and its cultural resources. According to the CIA, participants shared that "…this system is an intimately interconnected one, and because of this, has changed very little over the last several centuries. The Hui consistently restores the mānowai, clears the stream of debris, and fixes the ʻauwai. This monitoring and maintenance is a vital part of their cultural practice; it is when families gather and share time, food, and fellowship" (Leu Cordy & Merrin, 2020, 71).

Interview participants, however, expressed concerns about "sufficient water availability in the future, including the potential effects of not having any or enough water and of others tampering with the current water system. Because kalo farming is a communal system, tampering or removing water has the potential to harm everyone farming within the [loʻi kalo] system, leaving folks without enough water, losing crops, and leaving the entire community without a food source. They also worried about their ability to continue kalo farming in Waiʻoli without the water lease. Last, many participants shared concerns about the rapidly changing landscape in Hanalei, including stresses due to tourism and overdevelopment" (Leu Cordy & Merrin, 2020, 72).

The **Proposed Action: Long-Term Water Lease and Alternative A: Shorter Lease Term Alternative** would have *significant beneficial impacts* on cultural and archaeological resources in

the area. The long-term commitment to support water for loʻi kalo cultivation will continue to perpetuate the Hui's legacy and cultural connections to place. The Propsed Action not only maintains the Loʻi Kalo Irrigation System as an archaeological resource itself, but it also creates living opportunities for ʻāina-based youth and community engagement, education, and action to preserve the cultural heritage of Hawaiʻi and a cultural practice that has been occurring since Kānaka Maoli arrival, pre-Western contact. The Proposed Action protects the connection to and knowledge of place; restores community identity and resilience; perpetuates cultural practices; and sustains Native species that depend on the Loʻi Kalo Irrigation System.

The long-term lease would affirm the cultural, historic, and future value of traditional kalo cultivation by committing cool, fresh water flowing through the loʻi from Waiʻoli Stream for the purpose of instream, in-watershed, kalo cultivation. The IFS is the "quantity or flow of water or depth of water which is required to be present at a specific location in a stream system at certain specified times of year to protect fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses" (HAR 174C-3). Therefore, compliance with the IFS would have beneficial impacts to the streams and cultural resources compared to current conditions, supporting ʻāina-based education, protecting the connection to and knowledge of place, and perpetuating cultural practices that care for Native flora, waterbirds, and aquatic species.

Further, the water lease would enable Hui members to continue providing for the larger community through kalo farming, ʻai pono, would restore the health of the stream and watershed, and perpetuate vital cultural practices, passing them on to future generations. The Proposed Action will enable connection to ʻāina and directly benefit future generations through the perpetuation of active kalo cultivation and other cultural practices – a lifeway for the Waiʻoli community. For the Hui, "Kuleana extends to caring for the natural resources that sustain you" (Vaughan, 2018).

Under **Alternative B: Annual Revocable Permit Alternative** and **Alternative C: No-Action Alternative**, there would be no long-term commitment to support, protect, or proliferate the traditional cultural practice of kalo cultivation and *moderate to neutral impacts* are anticipated.

The CIA found that there is *no* viable alternative to Waiʻoli Stream water, and the continuous flow of fresh water is necessary for the cultivation of kalo. The No-Action Alternative likely violates the State's duties under Article XI, section 7 to "assur[e] appurtenant rights and existing correlative and riparian uses" as well as under Article XII, section 7 to "protect all rights, customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by ahupuaʻa tenants who are descendants of Native Hawaiians who inhabited the Hawaiian Islands prior to 1778" (HAW. CONST. ART. XII, § 7).

Participants interviewed in the CIA are concerned that any reduction in water for kalo cultivation would significantly diminish – and perhaps wholly prevent – the constitutionally protected practice of kalo cultivation. Other concerns that may be detrimental to cultural resources and practices include:

Minimization and Mitigation Measures

Given the *beneficial effects* of loʻi kalo cultivation on cultural resources in Waiʻoli, minimization and mitigation measures are not required. Mitigation measures and best management practices to

minimize potential impacts to cultural resources include Nohopapa Hawaiʻi's recommendation that, "a long-term water lease would enable Hui members to continue providing for the larger community through kalo farming, restoring the health of the stream and watershed, and perpetuating vital cultural practices, passing them on to future generations" (Leu Cordy & Merrin, 2020, 74).

While the CIA confirms that it is unlikely that archaeological remains will be found within the Waiʻoli Loʻi Kalo Irrigation System since no new construction will occur, if iwi kūpuna, burials, or other artifacts are identified, all activities in the area will stop, the area will be closed off, and the State of Hawaiʻi Historic Preservation Division ("SHPD") and local law enforcement will be notified pursuant to HAR section 13-300-40.

5.7. Agricultural Resources

> *"It is only a little more than 150 years since the first American missionaries visited the Hanalei [district, whereas] Hawaiians had been using its land and water resources for a thousand years; in the evolution of Hawaiian culture from the time of the island's discovery and settlement, the valleys have become productive agricultural areas. Throughout the Islands, native Hawaiians cultivated kalo and produced other nutritious crops. Their irrigation systems, which transformed valley marsh lands, are among some of the largest recorded anywhere in Polynesian, and the well-watered loʻi of the Hanalei and Waiʻoli ahupuaʻa were among the most extensive in the Hawaiʻi…Long before Captain James Cook arrived on Kauaʻi, the valley loʻi formed a distinctive cultural landscape"* (Riznik, 1987, 1).

Kānaka Maoli have developed, refined, and mastered loʻi kalo cultivation throughout Hawaiʻi. Waiʻoli Ahupuaʻa is a shining example of this success and is one of but a few remaining historic sites of, and for the prolific production of agriculture. On Kauaʻi, the Hawaiʻi Baseline Agricultural Study reported that only 21,494 acres of land on the island are being used for agriculture (out of approximately 136,908 acres within the State Land Use agricultural district). Less than 1,000 acres of the lands in production are used to grow food crops, not including coffee.

In 2011, the Hawaiʻi Department of Agriculture found that the State's staple starches are at highest risk of food insecurity. However, as one of Hawaiʻi's highest yielding staple starch food crops, kalo produces between 10,000 to 30,000 pounds per acre, per annum, under current wetland cultivation practices (State Senate, 2015). "Numerous scientific investigations have indicated the superiority of [kalo] over other starchy crops (particularly polished rice) which are stable foods in the Pacific regions" (Whitney et al., 2007, 5). Hawaiʻi consumes approximately 6.5 million pounds of kalo annually, 180% more than it produces (Mishan, 2019). Thus, imported kalo contributes to the State's 88.4% reliance on total available food sourced through importing (Loke, 2013). A forthcoming study also found that "[I]ndigenous agriculture has the potential to play a major role in feeding Hawai[ʻ]i in the years to come. . . .research found that traditional agriculture is resilient and capable of remaining viable even under the most severe future climate scenarios." (Star Advertiser, 2021)

For Hawaiʻi, kalo continues to be the most culturally significant food plant, playing a critical role in food security for the State. The North Shore of Kauaʻi is the center of kalo production for Hawaiʻi. Although production is primarily in Hanalei Ahupuaʻa, the statistics provide a perspective on kalo as the primary agricultural resource in the district. According to the National Agricultural Statistics

Service, the 2017 Census of Agriculture reported that 495 acres of kalo were harvested statewide, producing 3.6 million pounds of fresh and processed kalo (NASS, 2017). Of the statewide harvest, Kauaʻi County accounted for 32 to 56% of the State's kalo acreage and produced between 43 and 75% of the State's total production (NASS, 2017a). Yet, from 2000 to 2017, kalo production in Hawaiʻi decreased from 7 million pounds to 3.6 million pounds, and average yields per acre fell from about 15,000 pounds per acre to 10,530 pounds per acre (NASS, 2017).

Today, the Hui consists of 14 farms and 16 kalo farmers in Waiʻoli Valley. These families operate small-scale farms that range from half (1/2) an acre to eight (8) acres in size with a majority on the smaller size. At most, the Hui identifies approximately 84 acres of loʻi kalo within its collective complex with an additional 45 acres of both leased and privately-owned lands include loʻi banks, access roads, and pathways. In addition, these lands host a variety of other plants gathered and utilized by the Hui (e.g., hala, kukui, kī, maiʻa, hau, etc.).

Scholarly research advocates for the restoration of these Indigenous agricultural systems because they support high levels of biodiversity, increase local food production, and play a role in the conservation of increasingly threatened Native species. However, the restoration of Indigenous food systems goes far beyond food security, providing opportunities for strengthening identity, social ties, knowledge transmission, and well-being, which are all inseparable from Indigenous food (Kurashima et al., 2019).

The 2010 and 2014 Taro Task Force Report to the Legislature recommended greater protections for loʻi, including their structural elements, such as terraces, kuāuna or paepae pōhaku (stone walls), and ʻauwai within the boundaries of the State's public conservation districts to help increase food security and support community and cultural resilience in the face of the rising costs of imported food for local families. More kalo grown means more kalo paʻa (unmashed cooked taro), poi, and other kalo products to feed the local community. The Task Force, established under Act 211 Session Laws of Hawaiʻi 2008, directed kalo farmers, agencies, and University of Hawaiʻi representatives to seek solutions to challenges facing kalo, kalo farmers and kalo markets. Access to water and the long-term water lease in particular in one such challenge.

5.7.1. Potential Impacts, Minimization and Mitigation Measures

The Proposed Action would have *significant beneficial impacts* to agricultrual resources in the project area. In ancient Hawaiʻi, kalo was the primary and preferred source of starchy foods; it is rich in fiber and nutrients contributing to individual nutritional health and well-being. Today, kalo plays a critical role in its food security; prior to the 2018 flood, Hanalei and Waiʻoli farmers produced 85% of the taro in the State of Hawaiʻi (Nakamura, 2020). As a crop that once covered an estimated 35,000 acres in Hawaiʻi, today, only 495 acres are cultivated and harvested, which is about 1.4% of the potential historic production levels.

Environmentally, cultivating kalo in Hawaiʻi significantly reduces the threat of new pests and disease introductions that occur through raw kalo imports. Kalo demand is also expected to grow as the State moves towards greater local food self-sufficiency (Senate, 2015). This highlights the urgent and critical need to support kalo cultivation, fulfill thoughflow water needs, and inspire the next

generation of kalo farmers through ʻāina-based education and hands-on learning experiences, precisely as the Waiʻoli Valley Taro Hui does.

Unfortunately, the devastating 2018 flood destroyed crops and equipment, damaged loʻi, interrupted water flow, and diminished throughflow within the Loʻi Kalo Irrigation System. The cost and time to start anew has been enormous, and is something that the Hui, and generations of farmers before them, have not seen in recent history. The Proposed Action provides an important assurance and some semblance of hope that the Hui will be able to persevere into the future and maintain the legacy of kalo cultivation, its land and water, for their children and future generations. As Hui member Chris Kobayashi explained: "our Hui is part of this tradition, this kalo growing lineage that has been going on in Waiʻoli for hundreds of years. We carry on this tradition, this legacy, and we want this traditional culture to continue for generations to come" (Kobayashi, 2021).

The **Proposed Action: Long-Term Water Lease** and **Alternative A: Shorter Lease Term Alternative** would have a *substantial beneficial impact* on agricultural resources. By cultivating kalo in Waiʻoli, the Hui creates greater diversity in Hawaiʻi's agricultural and food systems, contributing to an increase in local food security and community resilience. Increased food security is a necessary step for improving biosecurity control measures and reducing the high costs associated with these control efforts (Senate, 2015). Particularly for Kauaʻi, the high (and increasing) operational and transportation cost increases the demand for community grown food, countering the State's dependence on import foods and reducing reliance on fossil fuels to transport and distribute food. More kalo grown means more poi and kalo based food projects that sustain the local community.

Alternative B: Annual Revocable Permit Alternative and **Alternative C: No-Action Alternative** would have *a significant beneficial impact* on agricultural resources. Without a long-term lease, the future of throughflow water that kalo cultivation depends on would be unknown and could cease. Any reduction or alteration of throughflow water would diminish or destroy the existing and future potential of meaningful kalo cultivation. The diminished quality and quantity of kalo would require the Hui to determine useable loʻi that includes altering the ongoing traditional practices and methods of kalo cultivation to adjust to reduced or removed throughflow that could possibly end with the demise of the Hui's kalo cultivation activities. The Hanalei area is well known for both its kalo, producing 71% of Hawaiʻi's kalo (HWH, 2012; County of Kauaʻi, 2000). The reduction or termination of the Hui's kalo production would affect the State's supply of local kalo and diminish the State's efforts to improve food security.

<u>Minimization and Mitigations Measures</u>
Under the long-term water lease, the Hui is committed to conducting ongoing maintenance of the Waiʻoli Loʻi Kalo Irrigation System to sustain kalo as an agricultural resource. Given the *beneficial effects* of loʻi kalo cultivation in Waiʻoli, minimization and mitigation measures are not necessarily required. Best management practices seek to maintain agricultural resources are articulated in the Draft Hui Watershed Management Plan and include:

- <u>Removing and control of non-Native hooved animals (i.e., pigs)</u> – The Hui will continue to control the ingress of ungulates and remove them through coordinated hunting and setting traps in the watershed and existing Waiʻoli Loʻi Kalo Irrigation System. Continued control

and removal of ungulates maintains and helps to limit the spread of invasive species, and prevents unnecessary destruction to kalo and surrounding agriculture.

- Community outreach and education to facilitate ahupuaʻa-level resource management – The Hui aims to educate more community members about the Waiʻoli Stream and its agricultural significance including traditional kalo cultivation. This will empower volunteers within the community to develop a sense of kuleana to care for these resources in perpetuity. Educational curriculum will cover a range of topics including wai, watersheds, loʻi kalo, invasive species, cultural context, and practices specific to Waiʻoli.
- Continuing best practices for traditional loʻi kalo farming – The Hui will implement the HBWMP's "recommended management practices" in their loʻi to maintain and improve surface and ground water quality, which in turn supports agricultural resources. Ultimately, the proposed actions discussed in the Draft Hui Watershed Management Plan aim to reduce sediment, bacteria, and nutrient loads from surface and ground waters to receiving waters (i.e., Hanalei Bay). This should decrease the generation and transport of non-point source pollutants that may reach the ocean and further support the health of the Loʻi Kalo Irrigation System and Waiʻoli Watershed.
- Data collection and monitoring –This information will help to ensure the health of Waiʻoli Watershed and agricultural resource. The Hui will track and monitor progress, using both qualitative (comparing water quality to baseline tests, developing a sense of kuleana, etc.) and quantitative data (number of volunteers, individuals served through outreach, flora and fauna counts, etc.).

5.8. Socio-Economic Characteristics

5.8.1. Population and Demographics

According to Harrington, from 1835 to 1860, the population of the Hanalei district decreased by half even as the non-Native population increased. Harrington's research found that less than forty thousand Native Hawaiians remained in the Hawaiian Islands by 1890, down from a Native population at the time of Western contact estimated to have been more than a quarter million, and possibly more than three times that number. "Each new epidemic, each new wave of foreign influences, furthered the unraveling of an ancient cultural fabric, the rich and complex culture of a self-sufficient people living on the planet's most isolated archipelago for more than one thousand years before Western contact" (Harrington, 2008).

The Waiʻoli Loʻi Kalo Irrigation System is located in the Hanalei Census Designated Place ("CDP") that extends from Hanalei River to Waipā Stream. In 2010 the total permanent resident population of Hanalei CDP was 450 people, which is nearly 6% less than it was in 2000. The total population of Kauaʻi was 67,091, which is an increase of 14.8% over the 2000 census.

The Hanalei Census County Division ("CCD") 90540 is a subdivision of Kauaʻi County that includes the Hanalei CDP and more broadly, Moloaʻa to the east and the Nā Pali Coast State Wilderness Park to the west. Within this larger Census area, the estimated population is 6,232 with a median household income of $73,438, poverty rate of 12.3%, and median age of 45.6 years. The population of the CCD is 8.6% of Kauaʻi's total population (72,293) (U.S. Census Bureau, 2019).

With the exception of Hanalei Town, the environment surrounding the Waiʻoli Stream and Waiʻoli Loʻi Kalo Irrigation System is rural, undeveloped, and open agricultural land;nearly 90% of the Hanalei Bay Watershed covered in shrubs and evergreen forest (Tetra Tech-DOH, 2011).

The visitor population contributes to the area resource demands. For example, in 2019, 30 to 50% of all visitors to Kauaʻi visited its North Shore. Islandwide, Hanalei Bay is also one of Hawaiʻi's most productive fisheries, a gathering place for canoe racing, and location of many cultural events throughout the year.

5.8.2. Social Characteristics

> "*Relationships with the coast of North Kauaʻi lead to close connections and familial identities shaped not by islands, moku (districts), or even entire ahupuaʻa, but by specific places and their characteristics. These connections grow by eating from and sustaining one's family from a particular place over time*." (Vaughan, 2018, 22).

The Waiʻoli community identity is grounded in a subsistence lifestyle supported by kalo cultivation and a connection to ʻāina. For many of the Hui members, their ʻohana have shaped and been shaped by Waiʻoli Valley for generations. This leadership and involvement is central to and reflects the identity of the larger North Shore community. The loʻi are a kīpuka, a variation or change in form in the landscape. These kīpuka provide a safe and nurturing environment, where individuals can express kuleana through teaching, learning, working, maintaining ancestral ties, and building new pilina with ʻāina and one another. As kīpuka, these loʻi provide a "place to build community and enact kuleana by regularly gathering to care for their home together" and maintain the essential "character of surrounding areas" (Vaughan, 2018, 120-123).

In addition to the practice of kalo cultivation, the Waiʻoli community's identity is deeply intertwined with various cultural practices dependent on the surrounding resources. It is an avenue through which the kuleana to mālama ʻāina and to elder brother is expressed. "Relationships to land are inseparable from the exercise of kuleana" (Vaughan, 2018,124). Mehana Vaughan, kamaʻāina of Haleleʻa moku and Associate Professor at UH Mānoa, articulates the importance of community identity and pilina:

> "*Together, ancestral language and contemporary actions illuminate kuleana that come with sustained connection to land: continuing genealogical ties, maintain presence, perpetuating in-depth knowledge, caretaking, eating, and feeding. While community actions do not negate ongoing loss and injustice, these stories do offer possibilities: to restore lost connections, grow new ones, and build models that emphasize responsibility and caretaking of lands and resources, rather than ownership*" (88).

Interviews from the CIA participants reflected similar perspectives and all participants highlighted that they take pride in feeding the larger community and supporting ʻai pono, either through sharing kalo with other ʻohana or providing kalo to small community-based non-profit organizations" (Leu Cordy & Merrin, 2020).

The Proposed Action reflects aloha ʻāina; as explained by Trask (1993), Goodyear-Kaʻōpua (2013b), and Oliveira (2014), "aloha ʻāina not only as a feeling of aloha, or love, for the land but also the

relationship in aloha ʻāina is familial and practice based, extending back to time immemorial." (Oliveira & Wright, 2016, 101).

> "*This epistemological belief and understanding comes with a great kuleana (responsibility) to make a contribution to the larger good, to the broader community of Kanaka Maoli and to our islands, and the Earth…As Kanaka [Maoli] we have a shared [I]ndigenous connection to the Hawaiian archipelago. For some we follow in the footsteps of our ancestors or devote our lives to specific practices such as activism, education,…taro cultivation,...and in the multitude of ways that we thrive in these modern times. Within these practices and beyond, guidance happens both physically and metaphysically*" (Wilson-Hokowhitu, 2019, 121).

The social characteristics of Hanalei and Waiʻoli have steadily and significantly shifted over the last century. "While many rural areas in Hawaiʻi continue to lose its history as competing demands on agricultural and conservation lands have intensified, Hanalei [district] still encompasses the resources of taro farming, ranching, and Native Hawaiian, Western, Chinese, Japanese and Filipino life" (Riznik, 1987, 82). Wilson-Hokowhitu describes, "Between April 2010 and July 1, 2016, Kauaʻi experienced a net in-migration of nearly three thousand people, an average annual growth of half of 1 percent, bringing the island population to just over 72,000. On average, one new person moves to Kauaʻi every day." (Vaughan, 2018, 78).

Subsistence and rural lifestyles in Waiʻoli continue despite changing population and demographics. Eleanor Akiona Chun, Reverend Akiona's daughter and her cousin Ezra Kanoho, fondly recall rural life in Waiʻoli and its traditional culture where people continued to live close to the natural world and ʻāina – from taro and rice farming, fishing, gardening and all the associated activities; "we all shared more than we had" (Riznik, 1987, 80). This was the ethics of the community in and around Waiʻoli, during the early 1900s, when Hawaiʻi's land ownership and demographics were going through immense changes.

The cost of land and subsequent property tax has forced families to relocate, resulting in a demographic shift of residents and lifestyle changes. The social character has shifted from the largely subsistence and trade of skills and resources, to individual wealth focused on the idyllic lifestyle that now includes well developed residential properties, gates, and walls, altering the social characteristics of the rural community. Some members of the Hui no longer live in Waiʻoli. Rather, they live in DHHL Homesteads in Anahola or in areas east of Princeville that are more affortable. Through the Hui's committment to kalo cultivation and through their unwavering perserverance, the Hui has maintained a deep connection to the ʻāina they have worked on for generations and continue to sustain the very core identity of the small Waiʻoli community:

> "*The immaculate loʻi, neatly mowed and weed-whacked, with its flourishing kalo, provides tangible visible evidence of the community's ability to work hard, work together, and effectively take care, thus positively influence other collaborations that devolve management authority from the state."* (Vaughan, 2018, 120).

5.8.3. Economic Characteristics

> "*A highly complex and sophisticated society emerged in Hawaiʻi that centered around an abundant agricultural economy, without a market and the need for surplus production… [the] economy of traditional Hawaiʻi was dependent on the balanced use of products from land and sea, accounting for an ingenious land division system… Mary Kawena Pukui identifies ʻohana, or extended families, as the core economic unit in Hawaiian society. ʻIt was the ʻohana that constituted the community within which the economic life moved*.'" (Beamer et al., 2021).

In Hawaiian cosmology, as the elder brother of Kānaka Maoli, the distribution of kalo in old Hawaiʻi was appropriately situated around the values of ʻohana and ʻāina. In Haleleʻa, Kauaʻi, communities measured their wealth in hoʻolako – having enough to share with others. Historically, "economic industries in Hawai[ʻ]i grounded in aloha ʻāina led to generations of productivity, abundance, and growth" (Beamer et al., 2021). Today, the Hui continues to promote these important values while also adapting to create a sustainable practice in modern Hawaiʻi. As a traditional practice, in order to survive, necessitates a certain degree of commercial aspect(s).

As an agricultural staple, the distribution of kalo across the islands has undoubtedly shifted over centuries broadly related to transitions in government and new economic systems. Factors such as colonization, rapid dwindling of the Native Hawaiian population, changes in modes of living, and an increase in immigrant populations all contributed to the necessary shift to western economic systems. "In the latter part of the last century, profound change took place in the growing and processing of taro. Soon after the heavy influx of immigrants, poi was soon commercialized and, not long thereafter, many immigrants took up the growing of kalo to a large extent…" There remain, however, small taro patches tended by the old Hawaiians" (Whitney et al., 2007, 7).

For small family famers across Hawaiʻi, kalo cultivation represents the connection of people and ʻāina and focuses on sharing food with a grower's larger community. This is especially true for the Hui members, all of whom are pillars in the small town community of North Shore Kauaʻi. Socioeconomic changes and community dynamics across the pae ʻāina have impacted how kalo not only is harvested, but distributed throughout this island community. Kalo farming has gone from being cultivated in over 20,000 acres across the islands, to less than one thousand acres. (Jung, *CivilBeat*, 2021). Further, "[b]ecause large-scale commercialization of taro production is somewhat unrealistic [financially]. . . family labor continues to be an important aspect of taro production in Hawaiʻi" (Evans, 2008, 139). This is certainly the case for the Hui. Yet, over time, the value of hoʻolako and the Hui's commitment to kalo cultivation as a connection to ʻāina remains unchanged.

Economically, the Hui members participate in small-scale, partially-subsistence or non-monetary kalo cultivation; most members are either retired or have other full-time employment, which for some farmers, has been impacted by the COVID-19 pandemic. Generally, the Hui utilizes funds generated from kalo sales to cover operating expenses, including property taxes, farming equipment (e.g., gas, tabis, buckets, etc.), and supply costs. With the exception of some growers who maintain their farms as a cultural practice or family tradition, Hui members on average historically sell between fifteen (15) to thirty (30) large bags of kalo a month to various poi mills either locally or on Maui and Oʻahu.

In addition, the Hui commonly trades with and/or gifts kalo to members within their community. The Hui also distributes kalo at cost or at a discounted rate. A large portion of the kalo grown in Waiʻoli goes directly to Waipā Foundation for below cost. Waipā Foundation processes the kalo into poi in its certified kitchen with volunteer labor, and provides the poi to the local community, below cost and often free to kūpuna. Waipā hosts many community events such as: poi day every Thursday, when volunteers clean kalo and hand mill it into poi; farmers market; celebrations; and community meetings. Community members that exchange with the Hui share goods and/or services, and the Hui distribute their harvest to various organizations and community members as gifts or at discounted prices. **See Section 3.2.2.**

The Hui's total production – including its commercial yield – is based on environmental and economic factors that vary by farmer and by year. It is difficult to estimate the specific yield of any loʻi until the kalo is harvested. For example, in addition to the 2018 floods, the recent February and March 2021 rain events completely submerged loʻi with kalo at various growth stages. This exacerbates rot, loliloli,[66] and other complications that affect kalo yield. Sometimes, after waiting for a year or more, a farmer may begin to harvest only to realize that the entire crop must be plowed under (WVTH, 2021). Flooding over the last five (5) years has become so persistent that it is unlikely that the Hui can return to historic levels of cultivation, and Hui members estimate that farming in Waiʻoli's new climate change reality will be less than what was grown when the farmers declared their water uses with the Water Commission in the 1980s.

5.8.4. Project Cost

The existing Waiʻoli Loʻi Kalo Irrigation System does not require new infrastructure, facilities, or a generated power source to operate. Rather, the Proposed Action seeks a long-term water lease to continue the practice of kalo cultivation and maintain the Loʻi Kalo Irrigation System that was built centuries ago. Intrinsically tied to the life and cultural identity of Waiʻoli and Hawaiʻi, the Proposed Action is atypical for HRS chapter 343 process as it does not propose physical improvements that could potentially adversely impact existing environments. Rather, the Proposed Action is a traditional, ongoing use, cultivating the most culturally significant food plant in Hawaiian culture that has also become vital to the naturally occurring environment. Permitting is now occurring because the disaster recovery efforts after the 2018 floods revealed that portions of the Waiʻoli Loʻi Kalo Irrigation System is on State Conservation District land and a water lease is vital to secure long-term access to the life-giving water necessary for kalo cultivation.

The project cost includes the ongoing cost to maintain the Loʻi Kalo Irrigation System and watershed including the specific projects listed in detail within the Draft Hui Watershed Management Plan. The Hui continues to pursue State and County funding and approvals to further support maintenance projects and complete baseline studies to better understand the watershed and related resources and infrastructure. The Draft Hui Watershed Management Plan outlines the estimated expenditures and in-kind services for (1) ʻauwai and loʻi maintenance; (2) animal control; (3) data collection and monitoring; and (4) community outreach and administrative expenses.

[66] Soft, water soaked.

5.8.5. Potential Impacts, Minimization and Mitigation Measures

Project Action would have *neutral impacts* on socioeconomic conditions and a *beneficial impact* on social and environmental characteristics in particular. The most pressing concern for the community is the shift in the socio-economic characteristics over the last century. "Recently, many local residents have grown concerned about the rapidly increasing development of North Shore lands and the consequent loss of public access to beaches and mountain areas. The large increase in the number of vacation rentals on the North Shore of Kauaʻi has led to a severe shortage of affordable housing and long-term rentals for local residents" while local homeowners continue to see dramatic increases in property taxes, driving long-term residents out of the community to more affordable areas on island (Harrington, 2008). The Proposed Action does not contribute to the modern-day pressures; rather, the Proposed Action is a stronghold of Native Hawaiian culture and practices.

The **Proposed Action: Long-Term Water Lease** is anticipated to have a *neutral impact* on population and economic characteristics, and a *beneficial impact* on social and environmental characteristics. Maintaining the distinctive characteristics of Waiʻoli and the Hanalei Bay Watershed, the Proposed Action itself defines the socio-economic characteristics of this community. The Hui's commitment to mālama ʻāina through kalo cultivation, sharing Native food, and perpetuating traditional practices through daily actions and the long-term Draft Hui Watershed Management Plan is the lifeblood of Native Hawaiian culture and identity.

In addition, the Proposed Action increases diversified economic opportunities for area residents and perpetuates Hawaiʻi's agrarian economy, grounded in values and history that represent Hawaiʻi, and is a model for other communities struggling to maintain the distinct rural character of their homelands. Although small-scale, the presence of kalo cultivation in Waiʻoli creates long-term economic benefits that contribute to local agriculture and the heritage of the community that is the fundamentally driver of Kauaʻi's economic attraction and a distinctive way of life.

The **Alternative A: Shorter Lease Term Alternative** would also have a *neutral impact* and economic characteristics, and a *beneficial impact* on social and environmental characteristics, but would not secure the long-term benefits outlined above.

Alternative B: Annual Revocable Permit Alternative and **Alternative C: No-Action Alternative** have *a significant negative impact* on the socio-economic characteristics of Waiʻoli and the surrounding area. Without a long-term lease, the future of throughflow water that the kalo depend on to grow, mature, and thrive would be unknown, diminished or possibly, permanently destroyed. Thus, the decline of Waiʻoli kalo cultivation would result in the permanent loss of cultural connection to place, and the social and community vibrancy that surrounds kalo cultivation and consumption. The loss also includes both formal and informal opportunities for ʻāina-based experiential learning that has the power to reshape perceptions, attitudes, and behaviors towards vital environmental and cultural resources such as watershed, ecosystem, and traditional practices.

<u>Minimization and Mitigation Measures</u>
Under the Proposed Action, the Hui is committed to continue the perpetuation of Native Hawaiian traditional and customary practices, supporting the stewardship of biocultural watershed resources and the local food supply. Loʻi kalo cultivation will continue to create opportunities for community-

based cultural and agricultural education while providing vital environmental benefits, such as flood mitigation, ground water recharge, and preserving Native habitats. Specifically, the Draft Hui Watershed Management Plan identifies community outreach and education as a means to enhance the socio-economic characteristics:

- The Hui aims to educate more community members about the Waiʻoli Stream and its cultural significance. This will empower volunteers within the community to develop a sense of kuleana to care for these resources in perpetuity. In addition, the HBWMP highlights that "community engagement, education, and volunteer programs . . . are an integral part of a comprehensive solution to reduce NPS pollutants." Educational curriculum will cover a range of topics including wai, watersheds, loʻi kalo, invasive species, and cultural resources and practices specific to Waiʻoli. The Hui will continue to collaborate with community organizations including: Waipā Foundation, Kawaikini Public Charter School, Huliauapaʻa Wahi Kūpuna Internship Program, University of Hawaiʻi at Mānoa's Natural Resource Management Program, the William S. Richardson School of Law's Ka Huli Ao Center for Excellence in Native Hawaiian Law, and Mālama Kauaʻi. Ultimately, the outreach education will instill a sense of kuleana in community members and foster long-lasting sustainable management practices grounded in traditional Native Hawaiian biocultural knowledge.

5.9. Visual Resources

The iconic panoramic views from the lookouts leading into Hanalei are famed and are often representive of the larger Hawaiʻi. The expansive view of loʻi kalo provide stunning views of the valley floor with broad sweeping views from the mountain to the sea. In the distance is Waiʻoli Valley and its steep mountain cliffs. The Waiʻoli Loʻi Kalo Irrigation System has been a part of the visual and aesthetic resources that make this area so notable since the earliest documentation of this resource.

Figure 32: Visual Resources – Hanalei Valley Lookout

Kauaʻi Belt Road (North Shore section) is a ten-mile stretch of the Highway between Princeville and Hāʻena. It is registered with the National Register of Historic Places, contributing thirteen (13) historic bridges and culverts, including the Waiʻoli Stream Bridge, a concrete, cast-in-place, multi-span structure with pointed cap railings (Harrington, 2008). The North Shore Section retains "the greatest historic integrity and character" among all sections of the Kauaʻi Belt Road (NPS, 2003).

The visual resource in Waiʻoli Valley are also central to the North Shore of Kauaʻi's characteristic and is also famed throughout Hawaiʻi pae ʻāina and the world.

Figure 33: Visual Resources – Wai‘oli Valley

5.9.1. Potential Impacts, Minimization and Mitigation Measures

The **Proposed Action: Long-Term Water Lease** is anticipated to have a *neutral beneficial impact* on the visual resources of the area. The Proposed Action supports the ongoing practice of traditional kalo cultivation, thereby preserving a major component and focal point of the scenic vistas and view planes within this district and island.

The **Alternative A: Shorter Lease Term Alternative** would also have a *neutral beneficial impact* on the visual resources of the area, but would not provide long-term stability and protection of visual resources that the Proposed Action secures.

Alternative B: Annual Revocable Permit Alternative and **Alternative C: No-Action Alternative** would have a *negative impact* on the visual resources of the area. Without a long-term committment to water, kalo cultivation in Wai‘oli Valley would be significantly reduced and/or may not continue. Without a long-term lease, consistent throughflow for kalo cultivation is uncertain. Any reduction or alteration of throughflow water would diminish or destroy the existing and future potential of kalo cultivation as described, diminishing the iconic scenic vista of expansive lo‘i kalo. This potential outcome would thereby affect the totality of the visual resource.

Minimization and Mitigation Measures

The Proposed Action directly supports visual resources. Given the *beneficial effects* of loʻi kalo cultivation on the visual resources in and around Waiʻoli, minimization and mitigation measures are not necessarily required. Active kalo cultivation is its own minimization and mitigation measure to protect and preserve visual resources of the expansive Loʻi Kalo Irrigation System.

5.10. Hazardous Materials

No National Priority Superfund sites or hazardous waste treatment, storage, or disposal facilities exist within the vicinity of the Project Area (Accessed September 1, 2020).

5.10.1. Potential Impacts, Minimization and Mitigation Measures

The **Proposed Action: Long-Term Water Lease** will have *no (neutral) Impact* on hazardous materials.

Alternative A: Shorter Lease Term Alternative, **Alternative B: Annual Revocable Permit Alternative** and **Alternative C: No-Action Alternative** will have *no (neutral) impact* on hazardous materials.

Minimization and Mitigations Measures

No minimization and mitigation measures are proposed or anticipated.

5.11. Traffic Conditions

The County General Plan (2010) describes Kūhiō Highway as the only arterial road connecting the North Shore with the rest of Kauaʻi, providing circulation between Hāʻena State Park and Līhuʻe. Throughout the North Shore, Kūhiō Highway is an east-west, two-way, two-lane, undivided arterial roadway.

The Project Area is generally inaccessible to vehicular traffic. The Hui utilizes private paved, gravel, and dirt roads to access the loʻi and transport people, tools, and kalo. The stream is mainly accessed by private road, and areas within the State Conservation Land Use District are not accessible to the general public. Hui members, however, have access because of their adjoining properties, and the approval of the DLNR easement to maintain the Waiʻoli Loʻi Kalo Irrigation System. The Proposed Action does not require changes or expansion in traffic use.

5.11.1. Potential Impacts, Minimization and Mitigation Measures

The **Proposed Action: Long-Term Water Lease** and the **Alternative A: Shorter Lease Term Alternative** will have *no (neutral) impact* on traffic conditions, as ongoing access to water in Waiʻoli Stream does not require alterations or expansion in traffic use.

Alternative C: No-Action Alternative has an *unknown imapcts* on traffic conditions since a potential decline in kalo cultivation may introduce other non-traditional activities. As is, the **Alternative B: Annual Revocable Permit Alternative** will have *no (neutral) effect* on noise

conditions, but may have an *unknown impact* on noise since a potential decline in kalo cultivation may introduce other non-traditional activities.

Minimization and Mitigation Measures
No minimization and mitigation measures are proposed or anticipated.

5.12. Noise

Noise is defined as unwanted sound and is one of the most common environmental issues of concern to the public. Since the human ear does not perceive all pitches or frequencies equally, noise levels are adjusted, or weighted to correspond to human hearing. In a rural area with no major roads nearby, noise levels would average around 50 decibels, whereas an urban area near a major arterial roadway would average around 70 decibels.

There are no adjacent noise producers to the Project Area, which promotes a very quiet environment. Noise in the area is limited to the sound of the river, wind blowing through the trees, Native waterbirds, and other fauna. Noise from the current kalo cultivation operations is minimal and limited to farm equipment, people working, and children playing. The majority of kalo cultivation relies on manual techniques to cultivate and harvest kalo rather than noise-generating equipment. The Proposed Action does not include any construction.

5.12.1. Potential Impacts, Minimization and Mitigation Measures

The **Proposed Action: Long-Term Water Lease** and the **Alternative A: Shorter Lease Term Alternative** will have *no (neutral) impact* on noise as it seeks to maintain ongoing kalo cultivation, and does not involve new construction or expansion.

Alternative C: No-Action Alternative has an *unknown impact* on noise since a potential decline in kalo cultivation may introduce other non-traditional activities. As is, the **Alternative B: Annual Revocable Permit Alternative** will have *no (neutral) effect* on noise conditions, but may have an *unknown impact* on noise since a potential decline in kalo cultivation may introduce other non-traditional activities.

Minimization and Mitigation Measures
Any noise generated by farm equipment is minimized by only conducting work during daylight hours.

5.13. Cumulative and Secondary Impacts

Cumulative impacts are the result of incremental effects of an activity when combined with other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Minor but collectively significant actions over a period of time can result in cumulative impacts to a place. Secondary impacts are associated with an activity but do not result directly from the activity.

Cumulative Impacts

The Proposed Action offers an extraordinary opportunity for the support of a critical traditional and customary practice that has grounded the Waiʻoli community since time immemorial. The Proposed Action would have significant long-term benefits to Hawaiian biocultural resources and the public as a whole. The long-term cumulative benefits to coastal ecosystems and the State's responsibility to manage its natural resources, as set forth in Article XI of the Hawaiʻi State Constitution, far outweigh any possible short-term negligible impacts.

The Hui is uniquely positioned to lead the stewardship of this ʻāina; formalizing its commitment to care for the Waiʻoli Loʻi Kalo Irrigation System and the throughflow waters within this legal framework. As a collective, the Hui undertakes the kuleana to care for the ʻāina throughout Waiʻoli; including State Conservation District lands. The Action ensures important traditional and customary rights are protected and perpetuated. The Action is not focused on just the survival of these customary rights but is focused on a way that legally allows them and the kalo to thrive and subsequently, the environments and habitats that are connected to loʻi kalo. Active watershed management specific to Waiʻoli will benefit Native habitats; assist with replenishing ground water resources; and reduce erosion by maintaining the stream and Loʻi Kalo Irrigation System. The kalo harvested will be a continued source of food for the community, contributing to food security, community nutrition, and the cultural legacy of the area.

In partnership with DLNR, the Hui will seek approval for its draft Watershed Management Plan. Because the Waiʻoli Watershed faces many of the same threats that endanger the larger Hanalei Bay Watershed, the plan has been informed by the two-volume HBWMP. Successful implementation of the Hui's Watershed Management Plan will establish baseline conditions to better assess threats and vulnerabilities into the future; further identify best management practices to enhance watershed health; facilitate and monitor restorative work in the forested uplands; and maintain and improve surface and ground water quality. Ultimately, the Hui hopes not only to ensure the long-term health of Waiʻoli Watershed but also embrace the community's sense of kuleana as a means to foster long-lasting sustainable management practices grounded in traditional Native Hawaiian biocultural knowledge.

Secondary Impacts

The secondary impacts of the Proposed Action include flood mitigation by tempering and distributing overflow impacts across the Waiʻoli Loʻi Kalo Irrigation System. The legal effort unifies the Hui, community organizations, and government agencies creating greater opportunities for partnerships and co-management of natural and cultural terrestrial resources. From a community perspective, the long-term right to use water for kalo cultivation celebrates and perpetuates Waiʻoli's history and cultural and Indigenous traditions, while discouraging unlawful activity, helping to promote pono[67] practices that align with the Hui's overall vision, demonstrating that Waiʻoli is special and cared for.

[67] Just, moral, correct or proper.

The Hui’s mission to engage “the larger Kaua‘i communities through educational outreach programs and initiatives related to kalo farming and community-based stewardship of water resources” supports the continuity of cultural knowledge, traditional agricultural practices, and improves long-term watershed management through a community-based approach that perpetuates an Indigenous lifeway that is fundamentally representative of Hawai‘i.

Native Hawaiians have a long history of scientific and mathematical exploration in connection with environmental sustainability (Kanahele, 1986). As an ongoing Indigenous practice, kalo cultivation continues to contribute to modern-day scientific understanding of ancient, traditional knowledge and practices, and has the ability to contribute to place-based science education, functioning as a living classroom. When academic knowledge and skills are framed within a cultural context relevant to students, learning is more meaningful, students maintain higher interest levels and show improved academic achievement (Gay, 2010).

Review of the place-based science education literature reveals that when the teaching and learning of science are imbedded in the students’ place, this results in increased student engagement, sense of empowerment and improved academic achievement particularly for students from Indigenous and historically marginalized communities (Polynesian Voyaging Society, 2016). Specific to Wai‘oli and described by former Hanalei School Principal Beck, “Being outdoors enhances the learning that goes on inside. The world beyond walls is real and alive….some of the students live on operating taro farms…stalking [kalo] knee deep through a kalo patch together has helped our students learn as much about each other as about the wildlife they may observe” (Hanalei School, 1982).

5.14. Irretrievable and Irreversible Commitment of Resources

The **Proposed Action: Long-Term Water Lease** is a long-term water lease utilizing throughflow to operationalize appurtenant and riparian rights, support Native food production, and enable an ancient system that works in conjunction with the natural environment. The Proposed Action does not require irretrievable and irreversible commitments of resources including unavoidable impact or use of non-renewable resources. In fact, the success of kalo cultivation in Wai‘oli depends upon and promotes the health of Wai‘oli’s natural and cultural resources.

Given the ongoing nature of this traditional use and the significant benefits from an environmental, cultural, and social perspective, the Proposed Action complements natural and cultural resources with no irretrievable and irreversible commitment of the water resource.

6. Relationship to State and County Land Use Plans and Policies

6.1. Hawai‘i State Plan

The Hawai‘i State Plan (1986) establishes a statewide planning system that outlines State goals, objectives, and policies. The Plan also details the State’s priority directions and concerns, which are discussed as they relate to the project.

Under the Hawai‘i State Planning Act (HRS chapter 226), the State’s goals include achieving:

- A strong, viable economy, characterized by stability, diversity, and growth, that enables the fulfillment of the needs and expectations of Hawai‘i present and future generations.

- A desired physical environment, characterized by beauty, cleanliness, quiet, stable natural systems, and uniqueness, that enhances the mental and physical well-being of the people.
- Physical, social, and economic well-being, for individuals and families in Hawaiʻi, that nourishes a sense of community responsibility, of caring, and of participation in community life (HRS section 226-4).

Specific objectives and policies of the State Plan that pertain to the Proposed Action include:

- Section 226-6(b)(10) Encourage the formation of cooperatives and other favorable marketing arrangements at the local or regional level to assist Hawaiʻi's small scale producers, manufacturers, and distributors.
- Section 226-7(b)(10) Assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs.
- Section 226-7(b)(11) Increase the attractiveness and opportunities for an agricultural education and livelihood.
- Section 226-7(b)(17) Perpetuate, promote, and increase use of traditional Hawaiian farming systems, such as the use of loko iʻa, māla, and irrigated loʻi, and growth of traditional Hawaiian crops, such as kalo, ʻuala, and ʻulu.
- Section 226-11(a)(1) Prudent use of Hawaiʻi's land-based, shoreline, and marine resources.
- Section 226-11(a)(2) Effective protection of Hawaiʻi's unique and fragile environmental resources.
- Section 226-11(b)(1) Exercise an overall conservation ethic in the use of Hawaiʻi's natural resources.
- Section 226(11)(b)(2) Ensure compatibility between land-based and water-based activities and natural resources and ecological systems.
- Section 226(11)(b)(4) Manage natural resources and environs to encourage their beneficial and multiple use without generating costly or irreparable environmental damage.
- Section 226(11)(b)(6) Encourage the protection of rare or endangered plant and animal species and habitats Native to Hawaiʻi.
- Section 226-12(b)(1) Promote the preservation and restoration of significant natural and historic resources.
- Section 226-12(b)(4) Protect those special areas, structures, and elements that are an integral and functional part of Hawaiʻi's ethnic and cultural heritage.
- Section 226-13(a)(1) Maintenance and pursuit of improved quality in Hawaiʻi's land, air, and water resources.
- Section 226-13(b)(1) Foster educational activities that promote a better understanding of Hawaiʻi's limited environmental resources.
- Section 226-13(b)(2) Promote the proper management of Hawaiʻi's land and water resources.
- Section 226-13(b)(3) Promote effective measures to achieve desired quality in Hawaiʻi's surface, ground, and coastal waters.
- Section 226-21(b)(1) Support educational programs and activities that enhance personal development, physical fitness, recreation, and cultural pursuits of all groups.
- Section 226-21(b)(4) Promote educational programs which enhance understanding of Hawaiʻi's cultural heritage.
- Section 226-25(b)(1) Foster increased knowledge and understanding of Hawaiʻi's ethnic and cultural heritages and the history of Hawaiʻi.

- Section 226-25(b)(2) Support activities and conditions that promote cultural values, customs, and arts that enrich the lifestyles of Hawaiʻi's people and which are sensitive and responsive to family and community needs.

Discussion: The Proposed Action embodies the mission of the Hawaiʻi State Plan and furthers many goals of the Plan. The Hui consists of small-scale family farmers using traditional Hawaiian farming practices and systems, also while engaging future generations through education. The Proposed Action seeks to maintain an ongoing and historic use of water to support kalo cultivation as has been done for centuries. The Waiʻoli Loʻi Kalo Irrigation System supports agricultural, socio-economic, and visual resources, Native habitats, ground water recharge, and agricultural, socio-economic, and visual resources—all while perpetuating Waiʻoli's rich history and cultural heritage.

6.2. State of Hawaiʻi's Environmental Policy (HRS § 344-3)

The State prioritizes projects that have positive environmental and community impacts. The State's environmental policy is to (1) conserve the natural resources, so that land, water, mineral, visual, air and other natural resources are protected by controlling pollution, by preserving or augmenting natural resources, and by safeguarding the State's unique natural environmental characteristics in a manner which will foster and promote the general welfare, create and maintain conditions under which humanity and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of the people of Hawaiʻi. Section (2)(c) and (d) implores the State to enhance the quality of life by establishing communities which provide a sense of identity, wise use of land, efficient transportation, and aesthetic and social satisfaction in harmony with the natural environment which is uniquely Hawaiian; and establishing a commitment on the part of each person to protect and enhance Hawaiʻi's environment and reduce the drain on nonrenewable resources.

Discussion: Granting a long-term water lease to the Hui would align with the State's environmental policy. In addition to being a traditional and customary practice, the Hui views kalo farming as a way of life that intentionally cultivates community through its practice and perpetuation. Many members of the Hui trace their genealogy back to Waiʻoli Valley. Members have decades of experience farming within Waiʻoli and are turning their farming into a multigenerational practice. The Proposed Action incorporates both traditional Hawaiian customs and modern adaptation to kalo cultivation. Kalo farming not only perpetuates a natural, sustainable environment for the Waiʻoli community, but prioritizes integral components of Native Hawaiian culture, and the Hui recognizes both the environmental and cultural impact that their practice provides for their local community. Additionally, harvesting kalo and sharing it with the community allows the Hui to contribute to the social and aesthetic fabric of Waiʻoli and other northern Kauaʻi communities. The Hui has and will continue to work in collaboration with the broader community to coordinate work days, clean up days, and educational experiences for the community. Above all, these traditional kalo practices represent a commitment by the Hui to continue to protect and enhance Hawaiʻi's environment and prevent the drain of nonrenewable resources.

6.3. Hawaiʻi 2050 Sustainability Plan

The Hawaiʻi 2050 Sustainability Plan's main objectives include: respect for culture, character, beauty, and history of the State's island communities; balance among economic, community, and environmental priorities; and meet the needs of the present while ensuring the ability to meet the needs of future generations as well.

The 2050 Plan outlines five overarching goals that "reflect a deeply held sense of where Hawaiʻi should be headed[:]"

- Goal One. A Way of Life - Living sustainably is part of our daily practice in Hawaiʻi.
- Goal Two. The Economy - Our diversified and globally competitive economy enables us to meaningfully live, work and play in Hawaiʻi.
- Goal Three. Environment and Natural Resources - Our natural resources are responsibly and respectfully used, replenished and preserved for future generations.
- Goal Four. Community and Social Well-Being - Our community is strong, healthy, vibrant and nurturing, providing safety nets for those in need.
- Goal Five. Kānaka Maoli and Island Values - Our Kanaka Maoli and island cultures and values are thriving and perpetuated.

The Plan also includes strategic actions for the implementation of these goals and indicators to measure success.

In accordance with the plan, priority actions (intermediate steps) for the year 2020 pertinent to the Hui and this Project include:

- Strengthen public education
- Reduce reliance on fossil (carbon-based) fuels
- Develop a more diverse and resilient economy
- Create a sustainability ethic
- Increase production and consumption of local foods and products, particularly agriculture; and
- Preserve and perpetuate our Kānaka Maoli and island cultural values.

Discussion: The Proposed Action promotes the goals of the Hawaiʻi 2050 Sustainability Plan and aligns with the identified strategic actions identified above. The Hui's kalo cultivation, coupled with the goals and objectives described in the Draft Hui Watershed Management Plan, will foster understanding and awareness of cultural traditions and practices, local food sources, watershed management, and Hawaiʻi's rich history. The Loʻi Kalo Irrigation System perpetuates a cultural subsistence practice and way of life that has traditionally fed Hawaiʻi's people. The production of kalo creates greater diversity in Hawaiʻi's agricultural and food systems, countering the State's dependence on import foods and reducing reliance on fossil fuels. The continuation of kalo cultivation, the maintenance of the Loʻi Kalo Irrigation System, and the development of a Waiʻoli-specific Watershed Management Plan all work toward long-term, sustainable resource management.

6.4. Hawaiʻi State and County Land Use Laws

The State Land Use Commission, pursuant to its authority granted in HRS chapter 205, regulates land use through classification of State lands into four districts: Urban, Agriculture, Conservation,

and Rural. The intent of the land classification is to accommodate growth and development while retaining the natural and agricultural resources of the State.

Within the Waiʻoli Watershed, 1,450 acres (92%) are in Conservation, 218 acres (6%) are in Agriculture, and 74 acres (2%) are in Urban Land Districts. Waiʻoli Stream and the Loʻi Kalo Irrigation System are located in the Conservation and Agricultural Districts. The mānowai, poʻowai, and first hoʻi are located in the Conservation District, while the remaining stream and Loʻi Kalo Irrigation System in the lower area are located in the Agricultural District. The mouth of the stream makai of Kūhiō Highway returns to the Conservation District. **See Figure 34, State Land Use District Map**.

Lands in the Conservation District are administered by DLNR's Office of Conservation and Coastal Lands. The Conservation District has five subzones: Protective, Limited, Resource, General and Special. The first four subzones are arranged in a hierarchy of environmental sensitivity, ranging from the most environmentally sensitive (Protective) to least sensitive (General). Both portions of the stream located in the Conservation District are within the Resource subzone.

The regulations governing the Conservation District are set forth in HAR chapter 13. The overarching purpose of the chapter is "to regulate land-use in the conservation district for the purpose of conserving, protecting, and preserving the important natural and cultural resources of the State through appropriate management and use to promote their long-term sustainability and the public health, safety, and welfare." The objective of the Resource Subzone, as set forth in HAR section 13-5-13, is to "ensure, with proper management, the sustainable use of the natural resources of those areas."

Under Kauaʻi County's Zoning Ordinance, the Conservation District lands fall within the Open District. The Open District was established to maintain an adequate and functional amount of open land for recreational and aesthetic needs of the community, and for effective functioning of land, air, water, plant and animal systems or communities. Within Open District lands, the County seeks "to preserve, maintain or improve the essential characteristics of land and water areas that are . . . of significant value to the public as scenic or recreational resources;" "to preserve, maintain or improve the essential functions of physical and ecological ecoystems, forms or forces which significantly affect the general health, safety and welfare[;]" and "[t]o provide for other areas which . . . are determined to be of significant value to the public."

Discussion: The Proposed Action aligns with the purposes of the State and County land use districts. The Proposed Action, a long-term water for throughflow water used for traditional kalo cultivation in Waiʻoli Valley is aligned with the State's commitment to conserve, protect, and preserve Native Hawaiian traditions and customs through appropriate land management and use. The Proposed Action is also in line with the purpose of Kauaʻi's Open District zoning as it preserves, maintains, and improves the essential characteristic of Waiʻoli's ʻāina and people. The beneficial impacts, as described in Section 5, include the support of ʻāina-based education, protection of the connection to and knowledge of ʻāina, and perpetuation of cultural practices that steward Native habitats.

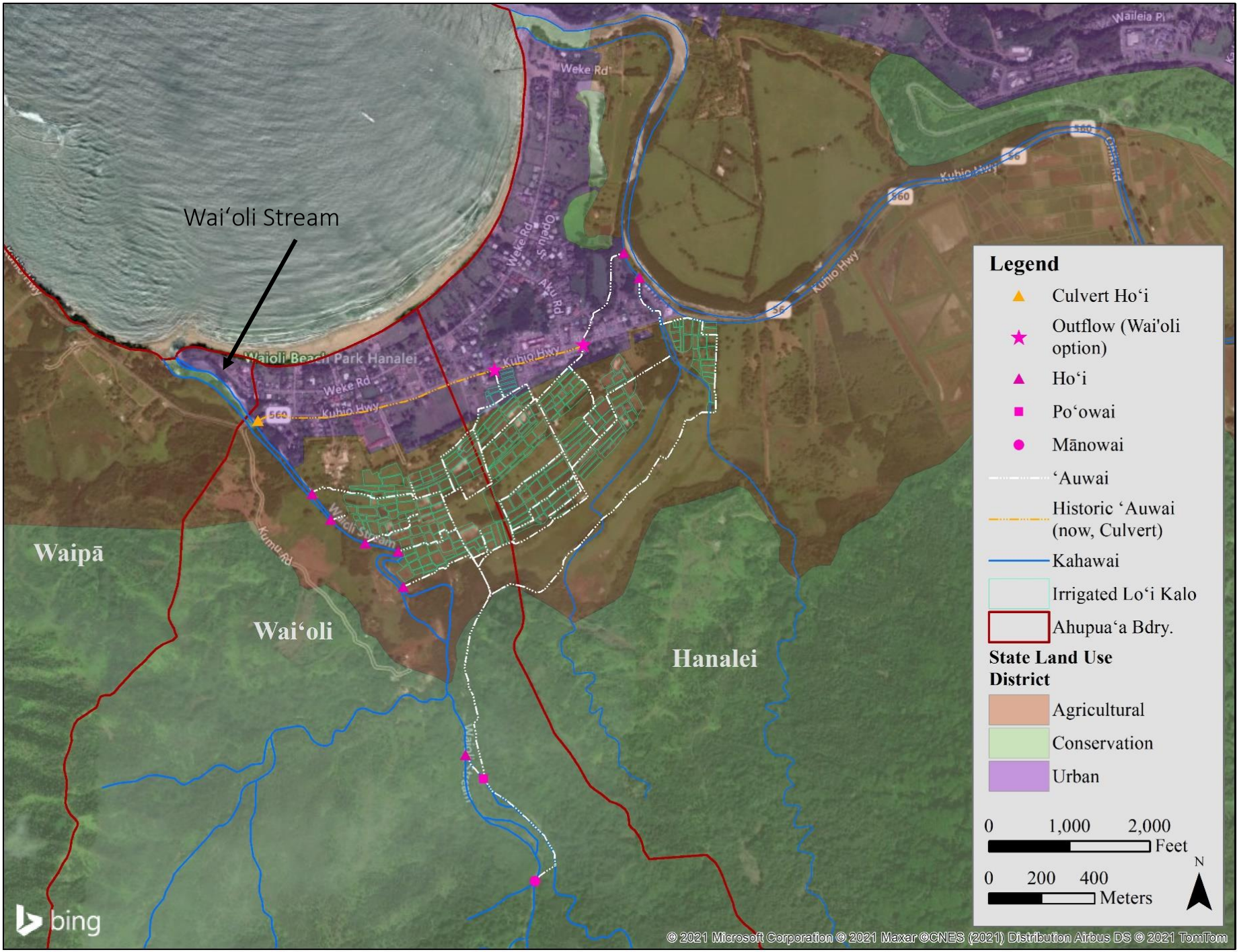


Figure 34: State Land Use District Map

6.5. Hawaiʻi Water Plan

The State Water Code, HRS chapter 174C, recognizes the need for a program of comprehensive water resources planning to address the supply and conservation of water. The Water Code establishes the Hawaiʻi Water Plan as the guide for implementing this policy.

The Hawaiʻi Water Plan consists of five constituent parts: (1) Water Resources Protection Plan ("WRPP") (prepared by the CWRM), (2) Water Quality Plan ("WQP") (prepared by DOH), (3) State Water Projects Plan ("SWPP") (prepared by DLNR, Engineering Division), (4) Agricultural Water Use and Development Plan ("AWUDP") (prepared by the State Department of Agriculture ("DOA"), and (5) Water Use and Development Plans ("WUDP") (prepared by each separate county).

The WRPP and WQP provide the overall legal and policy framework that guide the development, conservation, and use of water resources. The AWUDP provides information on State and agricultural water needs and development plans, and the SWPP provides a framework for planning and implementation of water development programs for State projects. All four plans are integrated into the County WUDP, which sets forth the broad allocation of water use within each County. The table below, found in the SWPP (1-2), outlines the key objectives and elements of each plan.

Table 5: Key Objectives and Elements of Hawaiʻi's Water Plan Documents.

Hawaiʻi Water Plan Document		Objectives	Elements	Status
Water Resource Protection Plan		To protect and sustain statewide ground/surface water resources, watersheds and natural stream environments.	• Designation of hydrologic units • Characterization & inventory of groundwater and surface water resources • In-stream uses • Programs to conserve, augment and protect such resources	1st Update completed in 2008 Revised in 2019
Water Quality Plan		To protect the public health and sensitive ecological systems by preserving, protecting, restoring and enhancing the quality of ground and surface water throughout the State of Hawaiʻi.	• Water quality criteria and standards • Groundwater protection • Water quality problems • Existing water quality management programs and recommended policies and strategies	1st Update completed in 2019
State Water Projects Plan		Refer to Sections 1.2 and 1.3		
Agricultural Water Use and Development Plan		To assess State and private agricultural water use, supply and irrigation water systems through a long-range management plan.	• Master inventory of existing water systems • Existing statewide agricultural land uses, assessment of current and future water irrigation needs • Rehabilitation costs, prioritization and program for system repairs	Completed in 2003 Revised in 2004 2nd Update in Progress
Water Use and Development Plan	Maui	To ensure that the future water needs of the County are met and to provide guidance to the CWRM for decision- making on water uses and water reservation requests.	• Set forth the allocation of water to land use consistent with zoning and land use policies • Current and future water demand forecasts • Water system inventory and profiles • Resource and facility options, including supply sources, transmission, storage and conservation	1st Update in progress
	Kauaʻi			1st Update in progress
	Hawaiʻi			1st Update completed in 2011 2nd Partial Update in Progress
	Oʻahu			Update in progress

Source: Statewide Framework for Updating the Hawai'i Water Plan, February 2000

Discussion: The WRPP was updated in 2019 to "develop a succinct, action-orientated plan to guide CWRM over the next five (5) years[.]" The WRPP provides water resource and management

information and a near-term project list. Kalo is broadly included under the "Agriculture" use category, and kalo cultivation is discussed under the legal and practical framework of traditional and customary Native Hawaiian, riparian, and appurtenant rights. The Proposed Action is consistent with the updates to the WRPP.

The WQP, updated in 2019 to complement the WRPP, is a "living" plan that can be adjusted and adapted to provide information on water resources, reflecting the evolving regulations, standards, and management policies that affect water quality in Hawaiʻi. The WQP acknowledges the need to collaborate with other agencies and partners to achieve beneficial results for the State's water quality, detailing ongoing work and future plans to "provide a means to identify links that will allow for better coordination with work at other agencies" (State DOH, 2019). The Proposed Action includes the Draft Hui Watershed Management Plan, which works in conjunction with the existing HBWMP to implement best management practices in coordination and compliance with the policies discussed in the WQP.

The SWPP was updated in June 2020. The objective of the SWPP is to review current and future State water projects to ensure orderly authorization and development of the State's water resources. The SWPP water development strategy includes existing and/or new State water sources/systems, existing master plans, existing County and private water agreements, and existing County water systems. DHHL's SWPP is also addressed within the SWPP. All of these strategy options were prioritized and assigned to individual SWPP projects, providing potential options and recommended actions that are intended to meet forecasted water demands from State projects on an individual project basis. The Proposed Action would not be included in these plans. Generally, kalo cultivation is broadly included under the category "Other-Stream diversion; Other – Spring Sources" with only two (2) anticipated loʻi kalo cultivation projects within DHHL areas.

The AWUPD does not specifically include traditional Loʻi Kalo Irrigation Systems in its plans; rather, it is a review of sugar cane era irrigation systems. The nearest system discussed in the AWUPD is the Porter-Kalihiwai Irrigation system, approximately eight (8) miles east of the Project Area. The Plan does note that water demand for "aquaculture, taro, and other wet crops" is "dependent on crop and location[,]" acknowledging that a one-size-fits all approach should not be applied for agricultural endeavors (State DOA, 2019).

The Kauaʻi WUDP was approved in 1990 and primarily addresses water use related to the Board of Water Supply, irrigation of sugarcane fields, and private and industrial uses, since irrigated sugarcane utilized ninety-nine percent (99%) of all surface water on Kauaʻi in 1988. As a result, the 1990 plan does not specifically address traditional kalo cultivation uses but broadly discusses kalo under the category of "other diversified agricultural pursuits[,]" which also includes macadamia, fruits, vegetables, coffee, and melons (R.M. Towill Corporation, 1990).

6.6. Coastal Zone Management

The Coastal Zone Management Act of 1972 established a comprehensive nationwide program to guide the protection, development, and restoration of the nation's coastal resources. In response to the federal coastal zone program, the State of Hawaiʻi implemented the Hawaiʻi Coastal Zone

Management ("CZM") Program, HRS chapter 205A. The objectives and policies of the CZM Program are to provide recreational resources; protect historic, scenic and open space resources, coastal ecosystems, and beaches; reduce coastal hazards; and manage the development of coastal resources.

Under the CZM Program, the Counties designate and administer Special Management Areas ("SMAs"). Any "development," as defined by HRS chapter 205A-22, within an SMA requires a SMA Use Permit.

Discussion: As Waiʻoli Stream reaches the estuary and enters Hanalei Bay, a portion of the Proposed Action is located within the CZM area and SMA. The Proposed Action, however, does not require an SMA permit because the Action is not a "development," as defined by HRS section 205A-22, and is exempt from the SMA permitting process as it qualifies as a "[u]se of any land for the purpose of cultivating, planting, growing, and harvesting plants, crops, trees, and other agricultural, horticultural, or forestry products or animal husbandry, or aquaculture or mariculture of plants or animals, or other agricultural purposes." The Proposed Action is nevertheless an integral part of the protection and management of Hawaiʻi's coastal resources consistent with the objectives and policies of the CZM Program.

6.7. Department of Hawaiian Home Lands Planning Documents

DHHL's mission is to manage the Hawaiian Home Lands trust and to develop and deliver lands to native Hawaiians (defined as having 50% or more Hawaiian blood). The Hawaiian Home Lands Program was established in 1921 with the passage of the Hawaiian Homes Commission Act.

Today, award recipients work with DHHL to make arrangements to finance home construction and renovations as well as agricultural/ranching activity on their awarded land. DHHL also manages land not currently used for homesteading and negotiates leases that generate income and license agreements for public uses such as utilities or for homestead organizations. On Kauaʻi, DHHL oversees 20,565 acres of land across seven (7) homesteads. As of 2003, DHHL received 1,479 applications for a residential award, 1,774 applications for an agriculture award, and 220 applications for a pastoral award on the island of Kauaʻi. (State DHHL, 2004)

The DHHL Statewide General Plan (2002) provides guiding principles for the development of DHHL lands statewide. With respect to the Kauaʻi, DHHL's Kauaʻi Island Plan ("KIP"), published in 2004, outlines objectives for the next 20 years, including:

- Designate all Hawaiian home lands with one of the land use categories under the General Plan;
- Deliver at least 840 Residential homesteads, on an average of 42 per year;
- Provide space for and designate a mixture of appropriate land uses, economic opportunities and community services in a native Hawaiian-friendly environment;
- Direct urban growth to priority development areas based on infrastructure availability, feasible site conditions, beneficiary preference and job opportunities;
- Provide agriculture and pastoral homestead lots for subsistence and supplemental purposes;

- Provide general lease agriculture and pastoral lots of adequate size for commercial farming or ranching business purposes by native Hawaiians.

The DHHL homestead lands nearest the Proposed Action are Moloaʻa (316 acres) and Anahola (4,228 acres), which are approximately 13 and 18 miles from the Proposed Action, respectively. Moloaʻa is an agricultural community located north of Anahola. The KIP designates Moloaʻa for agriculture homesteads (200 acres), general agriculture (86 acres), and special district (30 acres). The nearby Anahola homestead is designated for residential (565 acres), subsistence agriculture (533 acres), pastoral (148 acres), general agriculture (1,018 acres), special district (1,419 acres), community use (127 acres), conservation (350 acres), and commercial (68 acres). **See Figure 35, DHHL's Kauaʻi Lands.**

The Moloaʻa homestead lands remain undeveloped and are currently used for grazing (permit for pasture). According to the KIP, Moloaʻa will be developed as a small-lot agricultural community consistent with the surrounding agricultural uses. With wet conditions and intermittent stream flow, the 30-acres of special district designation would allow community groups to come together for kalo cultivation. The estimated development cost for Moloaʻa is $8.3M to support agriculture infrastructure. Whereas Anahola, which is south of Moloaʻa and further from the proposed area, is DHHL's third priority area on Kauaʻi targeting 1,218 residential homesteads and 54 acres of community use, the KIP recommends that Moloaʻa is not a priority development for DHHL lands on Kauaʻi.

The Proposed Action is also subject to the DHHL's rights to reserve water sufficient to support current and future homestead needs, as provided by section 221 of the Hawaiian Homes Commission Act, which is also considered a public trust purpose. For all proposed State water leases, HRS section 171-58(g) provides:

> The DLNR shall notify the department of DHHL of its intent to execute any new lease, or to renew any existing lease of water rights. After consultation with affected beneficiaries, these departments shall jointly develop a reservation of water rights sufficient to support current and future homestead needs. Any lease of water rights or renewal shall be subject to the rights of the department of Hawaiian home lands as provided by section 221 of the Hawaiian Homes Commission Act.

As of September 2018, of the two homesteads, Anahola has a current water reservation of 1.470 mgd (State DLNR & DHHL, 2020). The Anahola Regional Plan (2010) reports that Anahola residents receive their water from ground water sources originating from Makaleha and Kalalea Mountains, completely distinct from Waiʻoli Valley's water sources. In contrast, Waiʻoli Stream originates from the Nāmolokama Mountains, which are independent of any mountain ranges that feed any Hawaiian homestead lands on Kauaʻi. In addition, the elevation between Hanalei and Anahola is an approximate 150 to 550 foot difference and is significant enough to make any transfer of any water infeasible for the DOW. The County of Kauaʻi Department of Water ("DOW") provides some water service to the Kawaihau service area, which includes Anahola, Moloaʻa and Kapaʻa-Wailua. (State DHHL, 2010).

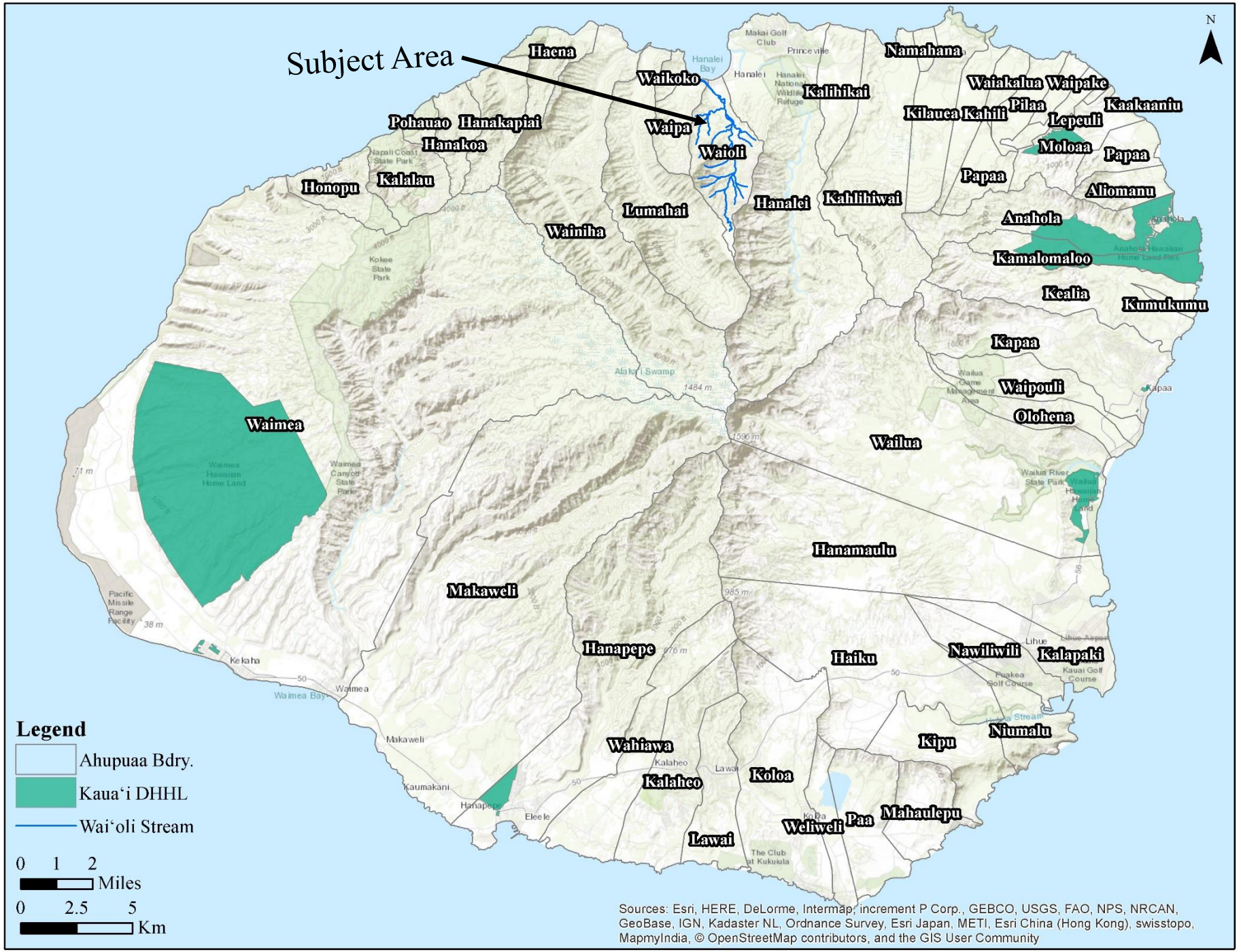


Figure 35: DHHL’s Kaua‘i Lands

Discussion: Because the Proposed Action will have no impact on the homestead sites or on future water demand for those sites, the Proposed Plan is consistent with DHHL's General Plan, the Kauaʻi Island Plan, and the Anahola Regional Plan.

In accordance with DHHL policies, staff held a Beneficiary Consultation on the Proposed Action in November 2020. The purpose of the Beneficiary Consultation was to: (1) share information on the request for the issuance of a water lease; (2) explain the BLNR's water lease process; and (3) discuss the DHHL's water needs in the relevant area. Because there are no DHHL lands in the vicinity of the Proposed Action and there will be no loss of access or availability of water to DHHL, staff indicated in October 2020 that they will not be seeking a water reservation in relation to the Proposed Action (State DHHL, 2020). The matter is expected to go back before the Hawaiian Homes Commission for approval after completion of the HRS chapter 343 review process. In January 2021, the Hawaiian Homes Commission unanimously approved the November 2020 beneficiary consultation report outlining the unanimous support by beneficiaries pertaining to the Hui's long-term water lease.

6.8. Kauaʻi General Plan

First adopted in 1971, the Kauaʻi General Plan establishes the long range priorities for growth management and community development on Kauaʻi with the vision of ensuring Kauaʻi remains a "sustainable island, a unique and beautiful place, a healthy and resilient people, and an equitable place with opportunity for all." The Plan was updated in 1984 and 2000, and in 2018 with the Kauaʻi County Council adopting the latest revised General Plan. "Kauaʻi Kākou," the theme of the County's General Plan, attests to Kauaʻi's strength that comes from its diverse community and its ability to work together to create a better future. (County of Kauaʻi, 2018).
The General Plan provides specific objectives and policies for community planning in each region of the County. A primary goal for the North Shore community is to "retain and restore the historic character of Hanalei." This objective is to be achieved through "protect[ing] Hanalei's unique heritage resources" and "preserv[ing] the character and protect[ing] the kalo loʻi of Hanalei." Thus, the Proposed Action is perfectly aligned and consistent with the Plan's North Shore objectives.

The Plan's framework represents Kauaʻi's approach to managing future growth. In addition, the Plan provides objectives and policies intended to guide and coordinate its land and resource management for present and future generations. This Proposed Action is consistent with the applicable objectives and policies of the current City and County of Kauaʻi General Plan as detailed below.

The Watershed, Critical Infrastructure, and Future Land Use.

Objective 1: To conserve the upper watershed and restore Native habitat and forested areas.
Objective 2: 1) To protect, restore, and enhance freshwater resources to support aquatic, environmental, and cultural resources; and, 2) to recognize and mitigate impacts from the built environment to the mid-watershed area.

- WA 2.D.1 Collaborate with community groups and stakeholders to better manage water resources in a cooperative fashion, avoiding adversarial fights that can divide the community.

Objective 4: To protect the flora and fauna unique to Kauaʻi and Hawaiʻi and to mitigate the impact of invasive species.
Objective 19: To ensure water for Kauaʻi's water needs under the Public Trust Doctrine and integrate traditional ahupuaʻa methods of preserving water for future generations -not taking more than is needed and leaving enough for everyone.

- CI 1.C.2(C)(2) Collaborate with community groups on cooperative approaches to water management.

Agriculture & Economy.

Objective 28: To ensure the long-term viability and productivity of agricultural lands.

Heritage Resources.

Objective 31: To recognize and protect the resources and places important to Kauaʻi's history and people.

- HR 2.A.1 Preserve, restore, and maintain customary access to important archaeological and cultural sites.
- HR 2.A.5 Promote, encourage, and require the correct use of traditional place names.
- HR 2.A.8 Encourage the restoration, management, and use of Kauaʻi's fishponds and loʻi kalo.
- HR 2.B.1 Inventory and acknowledge the importance of archaeological sites and wahi pana during community planning processes.
- HR 2.C.4 Achieve permanent preservation of highly significant cultural landscapes where multiple heritage and ecological values are located.
- HR 2.D.2 Promote County and community partnerships to preserve and raise awareness about traditional cultural places.
- HR 2.D.3 Increase community awareness and stewardship of Kauaʻi's historic and cultural resources.
- HR 2.D.4 Enhance the Hawaiian sense of place by promoting understanding of moku and ahupuaʻa land divisions. Recognize and preserve the unique natural and cultural characteristics of each moku and ahupuaʻa.
- HR 2.D.5 Seek to create community managed subsistence areas, also known as kīpuka, in every ahupuaʻa, in the tradition of kīpuka at Kēʻē and Waipā.

Sustainability, Climate Change Mitigation, Public Safety, and Hazards Resiliency

Objective 33: To increase sustainability and maintain a resilient and cost-efficient energy system.
Objective 36: To ensure that Kauaʻi is resilient to natural disasters and other emergencies.
Objective 37: To prepare for and adapt to the impacts of climate change on the natural and built environments.

Opportunity & Health for All

Objective 38: To recognize and address inequities in health and well-being among Kauaʻi's diverse ethnic, racial, and income groups.

- OH 1.A.4. Mitigate impact to Native Hawaiian traditional and customary practices and the resources they rely on through district boundary amendments and zoning amendments.

Objective 39: To support educational programs that foster cultural knowledge, employability, and civic participation of local residents.

- OH 2.C.8 Support both public and private educational programs that emphasize the Hawaiian language and Native Hawaiian culture, science, and practices.

Objective 41: To actively protect, restore, and increase access to the places where recreational and subsistence activity occurs.

- OH 4.A.2 Protect and preserve mauka and makai access for traditional Hawaiian cultural practices.
- OH 4.A.3 Require identification and mitigation of potential impacts of subsistence activities and resources when reviewing development permits.
- OH 4.D.6 Increase opportunities for access to subsistence hunting, fishing, and gathering.
- OH 4.D.10 Promote access with kuleana through stewardship agreements, work days, jobs, and other means, to engage community members in caretaking.

Discussion: The Proposed Action, a long-term water lease for loʻi kalo embodies the General Plan as the Hui is focused on perpetuating traditional kalo cultivation for present and future generations. Uniquely positioned, the Hui represents the Waiʻoli kalo community, using a legal framework to formalize its commitment to steward the Loʻi Kalo Irrigation System and the throughflow waters from Waiʻoli Stream.

Related to the specific sections of the General Plan:

The Watershed, Critical Infrastructure, and Future Land Use: The Proposed Action seeks to ensure that kalo and the biota connected to the Loʻi Kalo Irrigation System are given the opportunity to thrive. Active watershed maintenance described in the Draft Hui Watershed Management Plan will benefit Native habitats, assist with maintaining water resources, and reduce erosion. Similarly, the Hui will continue to eradicate invasive species and nurture Native plants.

Agriculture and Economy: The North Shore of Kauaʻi is the center of kalo production for Hawaiʻi. More kalo grown provides more poi and other value-added kalo products to sustain the local community. The long-term commitment to support water for kalo cultivation will contribute to food security needs and enable community and cultural resilience in the face of the rising costs of imported food for local families.

Heritage Resources: The Heritage Resource map designates the area surrounding Waiʻoli Stream for traditional cultivation. Today, the Hui continues to demonstrate its commitment and dedication to long-term activities that are beneficial to Waiʻoli Watershed, kalo cultivation, food security, the Hanalei Bay community, and the island as a whole. **See Figure 36, County of Kauaʻi, North Shore Heritage Resource Map.**

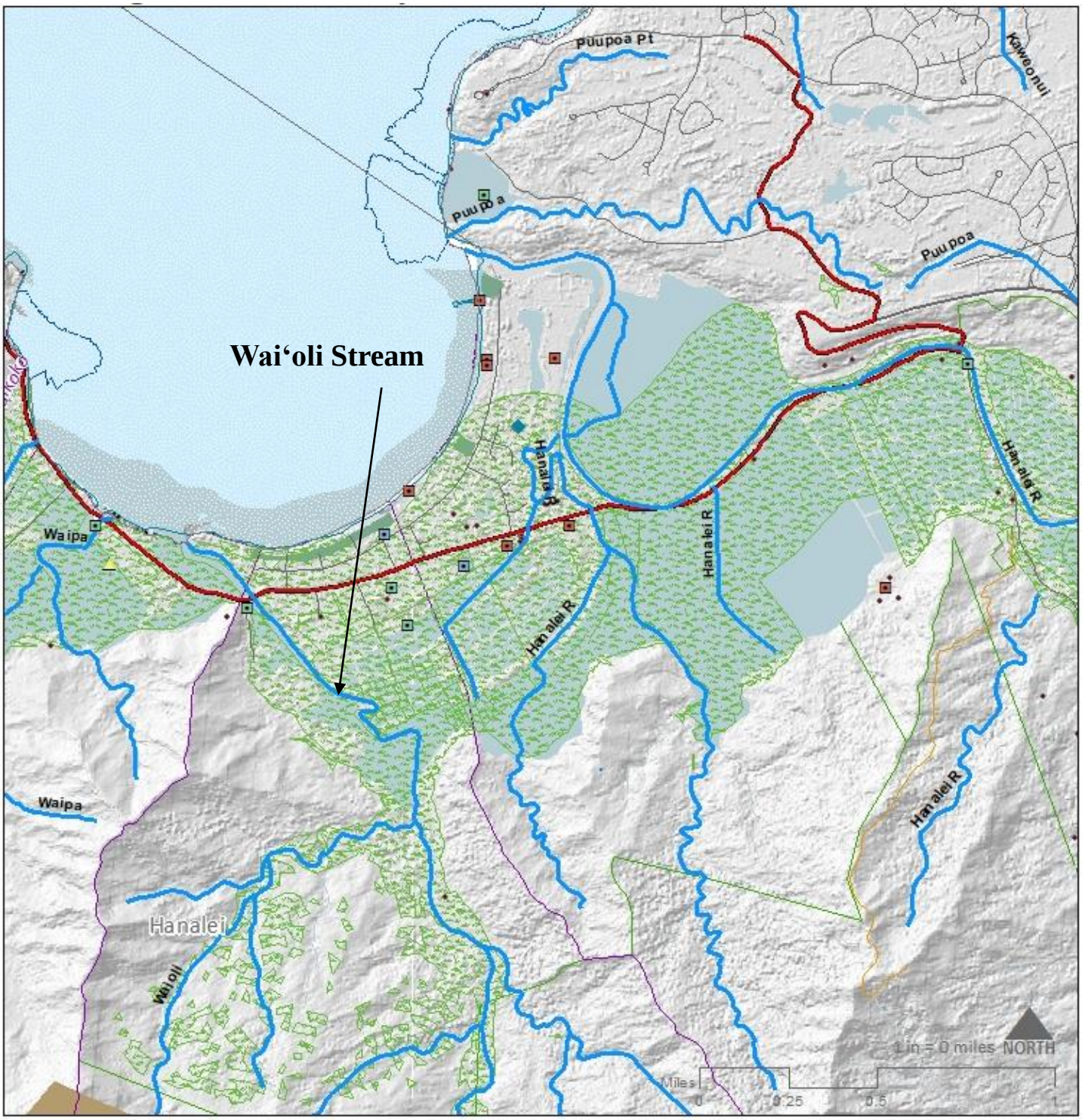


Figure 36: County of Kaua‘i, North Shore Heritage Resource Map

Sustainability, Climate Change Mitigation, Public Safety, and Hazards Resiliency: The General Plan discusses the wide-ranging impacts of global warming on Kauaʻi's environment, economy, and way of life. The Plan also acknowledges that understanding and incorporating the best available information on global warming is critical to planning effectively and taking proactive measures to adapt to climate-related changes. The Proposed Action supports the County's policies and objectives, complementing its overarching and long-term goals of resilience and sustainability through the Draft Hui Watershed Management Plan.

Opportunity and Health for All: The Proposed Action perpetuates cultural connection to place, and the social and community vibrancy that surrounds kalo cultivation and consumption. The Proposed Action also provides formal and informal opportunities for ʻāina-based learning that has the power to reshape perceptions, attitudes, and behaviors towards vital environmental and cultural resources such as the watershed, ecosystem, and traditional practices.

6.9. Halele'a Forest Reserve Plan

Halele'a Forest Reserve lies within the ahupuaʻa of Waiʻoli and Hanalei. The area is characterized by deep, wide valleys, abundant streams, and heavy rainfall. Created in 1905, Halele'a is Kauaʻi's first Forest Reserve, established for the purpose of forest and watershed protection. Today, the public lands of Halele'a Forest Reserve contain a portion of Waiʻoli Stream. There are no public trails or major roadways located within the Waiʻoli Valley section of the Reserve.

The Halele'a Forest Reserve Management Plan identifies the management priorities for the forest reserve. DLNR's Division of Forestry and Wildlife's ("DOFAW's") current management objectives for Halele'a Forest Reserve include maintaining Okolehau Trail, monitoring invasive plants/animals, enhancement of Native rare plant resources, maintenance of Loulu (*Pritchardia*) exclosure(s), and management of pig hunting.

Thus, the Plan's future recommendations include opportunities for enhancements to the Reserve such as the placement of an ungulate barrier fence at Nāmolokama, construction of exclosure fences for selected rare plants (especially *Pritchardia* spp.), and increased public access to Waiʻoli. The tactical goal for increasing public access is to identify the specific location for an easement and communicate with landowners during that coordinated work.

Discussion: The Proposed Action relies on the overall health of the watershed for its source of water. Similar to the Halele'a Forest Reserve Management Plan, the Hui, through the Proposed Action seeks to protect and preserve environmental and cultural resources through appropriate management and use. In addition, the Draft Hui Watershed Management Plan aims to empower the community to care for the natural resources in perpetuity. Utilizing volunteer community workdays will create pilina to Waiʻoli Stream and, in doing so, will develop kuleana to this special place.

7. Findings and Conclusion

The approving agency will issue its determination of significance related to the 13 administrative criteria for significant impacts described in HAR chapter 11-200.1-13 in a notice of determination to the Office of Environmental Quality Control ("OEQC"). In accordance with the provisions of HRS chapter 343, this Draft EA concludes that the Proposed Action will not have adverse impacts on the environmental quality of the area. Rather, the long-term practice is beneficial to the overall environment and its affected natural and human communities.

7.1. Significance Criteria

The approving agency will issue its determination of significance related to the 13 administrative criteria for significant impacts described in HAR section 11-200.1-13 in a notice of determination letter to OEQC.

The availability of this Draft EA will be announced in the State of Hawaiʻi OEQC bi-monthly Environmental Notice publication during the mandatory 30-day public review period. In accordance with HRS chapter 343, this Draft EA concludes that the Proposed Action will not have significant adverse impacts on the environmental quality of the area. As discussed in the table below, based on the thireteen (13) "Significance Criteria" outlined in HAR section 11-200.1-13, the Proposed Action will improve the environmental quality of the area. Moreover, failing to approve the Proposed Action will have significant adverse impacts on the environmental and cultural resources of the area.

Table 6: Criteria for Acceptability.

Significance Criteria	Finding
1. Irrevocably commit a natural, cultural, or historic resource	The Proposed Action will not irrevocably commit a natural, cultural, or historic resource. Instead, it will perpetuate natural, cultural, and historic resources. Their work responsibly uses and stewards water resources and is a model for other communities to commit to maintain their ʻāina and the distinct rural character of their homelands through specific planning and actions. The Hui's work also continues to support Hawaiʻi's agrarian economy, grounded in traditional and customary Native Hawaiian practices, values, and moʻolelo.
2. Curtail the range of beneficial uses of the environment	The Proposed Action will not curtail the range of beneficial uses of the environment. Rather, the Proposed Action is itself an ongoing, beneficial use that contributes to regional cultural, agricultural, and visual resources. Within the immediate area, the Proposed Action supports biological resources by enhancing and

	expanding Native habitats (i.e., for endangered water birds), mitigates the potential impact of major weather events and flooding, and supports climate and water resources through photosynthesis, evapotranspiration, and ground water recharge.
3. Conflict with the State’s environmental policies or long-term goals established by law	The Proposed Action is consistent and aligned with Hawai‘i’s Native Hawaiian and environmental laws and policies. It embodies the values that the State’s policies aim to protect - natural resources, environmental conservation, cultural identity, and the enhancement of the quality of life– and does not conflict with the State’s environmental policies or long-term goals established by law. The Hui’s proposed use of throughflow water from Wai‘oli Stream is grounded in and supported by both traditional and customary Native Hawaiian rights and appurtenant rights, which have the highest protection under the law. This includes the State’s constitutional mandate under Article XII, section 7 to preserve and protect traditional kalo cultivation, a Native Hawaiian traditional and customary practice that has persevered in this location since time immemorial. The Proposed Action therefore operationalizes the State’s environmental policies and long-term goals as established by law.
4. Have a substantial adverse effect on the economic welfare, social welfare, or cultural practices of the community and State	The Proposed Action will not have a substantial adverse effect on economic or social welfare nor cultural practices of the community and State. Rather, the Proposed Action will have a beneficial effect on economic and social welfare, and cultural practices of the community and State. The Proposed Action provides a pathway towards a more diverse economy and resilient local food system; as well as tangible support for kalo cultivation that is at the heart and soul of Hawai‘i’s legacy and cultural identity, and is well recognized and protected by the State.

5. Have a substantial adverse effect on public health	The Proposed Action will have no substantial adverse affect on public health. Because kalo cultivation and the production of nutrient-rich kalo will continue to increase local food security, promote individual health, and support experiential learning opportunities, the Proposed Action will have beneficial impacts on public health and well-being.
6. Involve adverse secondary impacts, such as population changes or effects on public facilities	The Proposed Action does not have any adverse secondary impacts. The Proposed Action does not propose any new infrastructure or additional use of State land. Rather, this EA is part of the process to request a long-term water lease to support ongoing kalo cultivation.
7. Involve a substantial degradation of environmental quality	The Proposed Action does not involve a substantial degradation of environmental quality. On the contrary, the Proposed Action will have neutral, if not beneficial impact on environmental quality by implementing coordinated watershed management efforts, mitigating flood impacts, and continuing to support Native biota that rely on a thriving Loʻi Kalo Irrigation System.
8. Be individually limited but cumulatively have substantial adverse effect upon the environment or involves a commitment for larger actions	The Proposed Action will not have cumulative substantial adverse effects upon the environment. Rather, the Proposed Action will cumulatively have beneficial effects on the environment and further supports existing watershed management efforts. The Proposed Action allows the Hui to coordinate collaborative watershed management in a manner that protects the thriving traditional kalo cultivation practice within the Hanalei Bay Watershed.
9. Have a substantial adverse effect on a rare, threatened, or endangered species, or its habitat	The Proposed Action will not have an adverse effect on the habitat and well-being of rare, threatened, or endangered species within the Waiʻoli Stream and Loʻi Kalo Irrigation System. Rather, the Proposed Action continues to support these species and habitats that are located within the project area by providing habitat for endangered Hawaiian waterbirds.

10. Have a substantial adverse effect on air or water quality or ambient noise levels	The Proposed Action will not have a substantial adverse effect on air or water quality or ambient noise. Rather, the Action will improve air and water quality through photosynthesis, evapotranspiration, ground water recharge, and flood mitigation. Led by low-impact, small-scale farmers, the Proposed Action will not contribute to ambient noise levels. The implementation of the Hui Watershed Management Plan will further improve the overall watershed health, and directly improve water quality throughout the Loʻi Kalo Irrigation System.
11. Have a substantial adverse effect on or be likely to suffer damage by being located in an environmentally sensitive area such as a floodplain, tsunami zone, sea level rise exposure area, beach, erosion-prone area, geologically hazardous land, estuary, freshwater or coastal waters	The Proposed Action will have no substantial adverse effects on environmentally sensitive areas. The stream and Loʻi Kalo Irrigation System are a historic and natural part of the Waiʻoli floodplain, and rely on flooded fields to cultivate kalo. The Waiʻoli Loʻi Kalo Irrigation System itself slows flash floods and reduces the impact of floods, which naturally occurs in this area. Mitigation efforts described in the Hui's Watershed Management Plan such as the phased removal of invasive overgrowth and thoughtful implementation of watershed management has the ability to reduce the intensity of potential damage to downstream users such as the kalo farmers and town of Hanalei.
12. Have a substantial adverse effect on scenic vistas and view planes, during day or night, identified in county or State plans or studies	The Proposed Action will have no substantial adverse effect on scenic vistas and view planes. On the contrary, it would ensure the preservation and continuity of Hanalei Bay Watershed's iconic scenic vistas and views, directly contributing to the panoramic views of natural vegetation and kalo-rich valley floor.
13. Require substantial energy consumption or emit substantial greenhouse gasses	The Proposed Action will have no substantial energy consumption or result in substantial emission of greenhouse gases. This is an existing use; no construction is proposed and any use of machinery equipment during cultivation or for maintenance purposes is relatively small and with a limited time frame.

7.2. Anticipated Determination

Based on a review of the significance criteria outlined in HRS chapter 343 and HAR section 11-200.1-13, the Proposed Action will not result in significant adverse effects on the natural or human environment.

The project is consistent with the Hawai‘i State Plan; the State of Hawai‘i’s Environmental Policy; the 2050 Sustainability Plan; Hawai‘i State Land Use District Boundaries; Hawai‘i Coastal Zone Management Plan; Kaua‘i General Plan; Halele‘a Forest Reserve Plan; Hawai‘i Water Plan; and Department of Hawaiian Home Lands Planning Documents. The Proposed Action will have beneficial effects - protecting and enhancing natural habitat for Native plant and animal species, perpetuating traditional and customary Native Hawaiian practices, continuing to support the local economy and food security, and educating youth and community on the importance of protecting our island watersheds and cultural practices. Overall, the project will provide a public benefit while resulting in beneficial impacts to the surrounding environment.

A Finding of No Significant Impact (“FONSI”) is anticipated for this Proposed Action.

8. Coordination

8.1. List of Agencies, Organizations, and Individuals Receiving copies of the EA

As part of the scoping process for this action, early and ongoing consultation on the Proposed Action has been conducted with various agencies and stakeholder groups. **See Appendix A, Pre-Consultation**. Parties contacted in preparation of the Draft EA, comments received, those that were provided an opportunity to review the Draft EA, and Draft EA comments received are identified below.

	Early Consultation* **stakeholders that submitted written comments are noted with “xx”*	**Will Receive Electronic Draft EA**	**Draft EA Comments Received**
Federal			
U.S. Army Corps of Engineers, Civil Works Division	x	x	
U.S. Fish and Wildlife Service	x	x	
Department of Interior, U.S. Geological Survey		x	
State of Hawai‘i			

Department of Agriculture	x	x	
Department of Business, Economic Development & Tourism	x	x	
Department of Hawaiian Home Lands	x	x	
Department of Health, Clean Water Branch	x	x	
DLNR, Commission on Water Resource Management	x	x	
DLNR, Division of Aquatic Resources	x	x	
DLNR, Division of Forestry and Wildlife	x	x	
DLNR, Office of Conservation and Coastal Lands	x	x	
DLNR, State Historic Preservation Division	x	x	
Office of Hawaiian Affairs	xx	x	
State Representative, Nadine Nakamura	xx	x	
State Senator, Ron Kouchi	x	x	
University of Hawaiʻi - CTAHR	x	x	
County of Kauaʻi			
Department of Planning	x	x	
Department of Public Works	x	x	
Kauaʻi Emergency Management Agency		x	
Office of the Mayor	x	x	
Community			
Hanalei Watershed Hui	xx	x	
Heacock, Don	xx	x	
Hanalei to Hāʻena Community Association	xx	x	
Hanalei Hawaiian Civic Club	x	x	
Hawaiʻi Farm Bureau / Kauaʻi County Farm Bureau	x	x	

Hawaiʻi Farmers Union United	x	x	
Huliauapaʻa	x	x	
Kamehameha Schools	x	x	
Kauaʻi Taro Growers Association		x	
Kido, Michael	xx	x	
Kīpuka Kuleana	x	x	
Nā Maka Onaona / Nā Kilo ʻĀina	x	x	
Waipā Foundation	x	x	

8.2. Submitting Comments

As part of the public notice and review process, this Draft EA will be available for a 30-day review. Comments or requests for additional information may be submitted through any of the following methods:

Electronic Comment Collector Form: bit.ly/3uv4SPW

Email: info@tridason.com & anelatan@hawaii.edu
Please include "Waiʻoli Valley EA" in the subject line of the message.

U.S. Mail: Tricia Dang, PO Box 1361, Honolulu, Hawaiʻi, 96807.
Postmarked by deadline date of July 8, 2021.

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APPENDICES

APPENDIX A: SUMMARY OF PRE-CONSULTATION OUTREACH

SUMMARY OF PRE-CONSULTATION OUTREACH

The following represents a summary of government agencies, community organizations, and individual stakeholders that were contacted by the Hui and its representatives for input on this Draft EA. Substantive written comments are also included.

ENTITY	SUMMARY
FEDERAL	
U.S. Army Corps of Engineers, Civil Works Division	The Hui contacted a Kaua‘i-based agency representative via phone on 9/23/2020 and left a voice message. After no response, the Hui and Agent contacted a regulatory project manager on 10/21/2020. The Agent spoke with the manager via phone on 10/22/2020. Outcome: No comment since work is not occurring in Federal waters.
U.S. Fish and Wildlife Service	The Hui contacted a Kaua‘i-based agency representative. The Agent connected with project leader and deputy project leader via email on 10/21/2020. The Agent spoke with the Project leader via phone on 10/22/2020. Outcome: Confirmed available references for the watershed. No specific FWS information related to Wai‘oli Watershed.
STATE	
Department of Agriculture	The Agent contacted the agency's main line to determine who the best contact would be to discuss the DEA est. 10/20/2021. Phone call was returned to Agent from the Market Development Branch. Outcome: No comment on DEA.
Department of Business, Economic Development and Tourism (DBEDT)	The Agent contacted the agency's main phone line on 10/20/2021 to determine who the best contact would be to discuss the DEA. Phone call was returned to Agent from the Community Based Economic Development (CBED) Branch. Outcome: Staff shared that the nearby Waipā Foundation works with DBEDT on community economic development activities. They provided additional background sharing that the State Office of Hawaiian Affairs (OHA) also collaborates with the Hui. The staff expressed interest in the DEA as the project could qualify for funding related enterprise zones or CBED for 501c3 organizations.
Department of Hawaiian Home Lands (DHHL)	The Hui has been in close coordination with the Department of Hawaiian Homelands throughout this project. For example, the Hui coordinated with DHHL to facilitate a Beneficiary Consultation in Fall of 2020. In January 2021, the Hawaiian Homes Commission voted to accept the Beneficiary Consultation Report including the staff's reccommendation not to seek a reservation of water and to support a long-term water lease at a gratis rate.
Department of Health (DOH), Water Quality	The Agent contacted DOH on 9/22/2020 via phone and spoke with the staff about water quality. Outcome: The staff shared that turbidity is an issue statewide. He noted that rain and silt in the water can influence turbidity in water. He also shared that the State's standards for turbidity are very low and have not been updated. He recommended we look at national standards for turbidity. Staff also indicated that the 2020 report is with the EPA for approval, and shared with the Hui the draft 2020 State Water Quality Report. Staff indicated the 2020 report for Wai'oli, based on data, everything stayed the same - no difference. He shared that the DOH water quality data for the area is from the Waipā Foundation.
Department of Land and Natural Resources, Commission on Water Resource Management (CWRM)	The Hui has been working closely with DLNR-CWRM throughout the process, including amending the Interim Instream Flow Stands for Wai‘oli Stream in May 2021.
Department of Land and Natural Resources, Division of Aquatic Resources (DAR)	The Agent contacted DAR on 9/21/2020 via phone and spoke with the staff about the DEA. Outcome: Staff provided comments that included: (1) acknowledge species can exist in area and include a proactive approach. (2) Because of similarity to and proximity with Waipā, address findings in Waipā Stream. (3) Acknowledgement that there is not much data on fresh water in Hawai‘i and recommended that the Agent contact Hanalei Watershed Hui who has a better understanding of the Hanalei Bay aquatic species.
Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW)	The Hui has been working closely with DOFAW with regard to a watershed management plan in support of a long-term water lease.
Department of Land and Natural Resources, Office of Conservation and Costal Lands (OCCL)	The Agent contacted OCCL on 11/21/2020 via phone and spoke with the administrator about the DEA. Outcome: The Administrator recommended that the DEA clarify that the Project is an ongoing, traditional use and offered his office's support.

Department of Land and Natural Resources, State Historic Preservation Division, Kauaʻi Historic Preservation Review Commission (SHPD)	The Hui contacted the agency's on-island representative on 9/18/2020 and 9/23/2020 via phone, and left a message on the main phone line on 9/18/2020. Outcome: No response.
Office of Hawaiian Affairs	The Hui contacted an OHA representative on 9/25/2020 via email. The Agent followed-up with an email on 10/19/2020. Outcome: OHA representative responded on 9/25/20 and agreed to kōkua. OHA has also been working closely with the Hui to provide supporting research pertaining to the cultural history of Waiʻoli and submitted a number of testimonies in support of direct negotiation for a long-term water lease.
State Representative	The Hui emailed a Pre-Consultation Letter on 9/25/2020 and the Agent followed up 10/20/2020 via email. Outcome: Appreciated heads up. Sent photos to the Hui for DEA use.
State Senator	The Hui and Agent sent Pre-Consultation Letters on 9/25/2020 and 10/20/2020 via email. Outcome: No response.
University of Hawaiʻi – College of Tropical Agriculture and Human Resources (CTAHR)	The Agent contacted CTAHR on 9/28/2020 via phone and spoke with the administrator about the DEA. Outcome: UH CTAHR is supportive of the project and recommended tying the DEA discussion into the grand challenge of today - agricultural districts and the need for food growth to feed current needs and reduce transportation from the mainland. The staff further stated that the Project remains relevant today (re: COVID); the world is different and kalo growth / local farmers can help everyone. The bigger picture is about helping everyone. Farming feeds people.
COUNTY	
Kauaʻi County, Department of Public Works	The Hui emailed the Acting County of Kauaʻi Engineer on 9/25/2020 and the Agent followed up via phone on 9/25/2020 about the DEA seeking Pre-Consultation comments. Outcome: The Acting Engineer indicated the County's support and offered further support from its Department as the Hui needs. He shared that the County continues to work with Hui.
Kauaʻi County, Department of Planning	The Agent contacted the Planning Department on 10/9/2020 via phone. Outcome: The office staff provided technical support related to the County's Heritage Map. The County's Managing Director indicated the County's support and offered further support from its Department as the Hui needs. He shared that the County continues to work with Hui.
County of Kauaʻi Mayor's Office	The Agent contacted the Managing Director of the County of Kauaʻi on 9/25/2020 via phone and spoke with the administrator about the DEA seeking Pre-Consultation comments from its Departments. Outcome: The office will keep an eye out for the DEA comment period. Indicated support for Project.
STAKEHOLDERS	
Makaʻala Kaʻaumoana, Hanalei Watershed Hui (HWH)	The Hui reached out to HWH on 9/21/2020 with respect to water quality impacts and sought data and feedback to ensure that the DEA sufficiently addressed concerns. The Agent followed-up on 9/22/2020. Outcome: Recommended that the DEA discuss water quality for Waiʻoli or surrounding areas addressing turbidity, indirect sewer pollution, impact on aquatic species in the Bay or stream, and address the hoʻi that empty into Hanalei River. Representative provided Agent with several documents for use in the DEA.
Caren Diamond, Hāʻena-Hanalei Community Association	The Hui reached out on 9/25/2020 to ensure it was covering all bases and to address any concerns the Association might have. The Agent followed-up on 10/20/2020 via email. Outcome: Expressed support for the project as "an important step for continuing the traditional farming practices in perpetuity". Representative shared documents related to Waiʻoli and water resources.
Michael Kido, Hawaiʻi Stream Research Center Director	The Hui reached out on 9/22/2020, and the Agent followed-up on 9/29/2020 via email. Outcome: Provided baseline data and edited a portion of the DEA related to aquatic species found in Waiʻoli Stream.

Don Heacock, Retired DAR Kauaʻi District Aquatic Biologist / Kauaʻi Organic Agroecosystems	The Hui reached out on 9/22/2020, and the Agent followed-up on 9/29/2020 via phone. Outcome: Discussed the frequency of ʻoʻopu and ʻōpae in streams and ʻauwai. Indicated that they still see hīhīwai in stream especially prior to 2018. Shared that the DEA should follow Hutchin's 1950 report re: quantity of base flow being diverted, and further added that the Hui should measure the flow, starting in the stream.
Matt Rosener, North Shore Hydrologic Services	The Hui reached out via email on 9/2/20 with regard to resources and data on Waiʻoli, water quality health, and waterbird species. Engaged in discussion. Outcome: Via email, provided relevant information and resources. Conducted water quality testing for the Hui.
Adam Asquith, Ph.D., entomologist and kalo farmer	The Hui reached out on 9/22/2020 with regard to data on Waiʻoli Stream. Outcome: Shared that he does not have any information on Waiʻoli Stream.
Hanalei Hawaiian Civic Club	The Agent sent the Pre-Consultation Letter on 10/21/2020 via email. Outcome: No response.
Hawaiʻi Farm Bureau (or Kauaʻi County Farm Bureau)	The Agent contacted the organization on 9/22/2020 via phone and voice message. Outcome: No response.
Hawaiʻi Farm Union United	The Agent contacted the organization on 10/20/2020 via email. Outcome: No response.
Huliuapaʻa and Kīpuka Kuleana	These organizations have worked closely with the Hui to complete a Cultural Impact Assessment (CIA) that informs this DEA.
Nā Maka Onaona / Nā Kilo ʻĀina	The Hui contacted the organization on 9/23/2020 via phone. Outcome: The organization expressed that they are supportive of the Project. They highlighted the benefits of an aquatic species inventory.
Waipā Foundation	The Hui reached out on 9/2/2020, and the Agent followed-up on 9/3/2020 via email. Outcome: The organization shared multiple reports including its rainfall data and aquatic species research with the Hui. The organization continues to work directly with Hui.

UNIVERSITY of HAWAI'I SYSTEM

[redacted]

Fwd: Connecting Wayne and Tricia

D. Kapua'ala Sproat <[redacted]> Tue, May 11, 2021 at 4:32 PM
To: A Lum <[redacted]>

D. Kapua Sproat (she/her/hers)
Professor of Law, Ka Huli Ao Center for Excellence in Native Hawaiian Law
& the Environmental Law Program
Director, Ka Huli Ao
Director, Environmental Law Clinic
William S Richardson School of Law
University of Hawai'i at Mānoa
2515 Dole St , Honolulu Hawai'i 96822
P (808) 956-7489 [redacted]

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http://www.kamehamehapublishing.org/nativehawaiianlaw/

---------- Forwarded message ---------
From: **Wayne Tanaka** [redacted]
Date: Fri, Sep 25, 2020 at 8:54 AM
Subject: RE: Connec ing Wayne and Tricia
To [redacted] Tricia Dang <tricia@tridason.com>
Cc: Mahina Tuteur [redacted]

Sounds good! Tricia, please just let me know if/when you would like to talk about the EA.

Mahalo nui,

Wayne

From: D. Kapua'ala Sproat [redacted]>
Sent: Friday, September 25, 2020 8:50 AM
To: Tricia Dang <tricia@tridason.com>; Wayne Tanaka [redacted]
Cc: Mahina Tuteur [redacted]
Subject: Connecting Wayne and Tricia

Aloha Wayne!

Happy Aloha Friday! Hope this email finds you smiling and faring well during the pandemic! By his email, i'm connecting you wi h Tricia Dang. Tricia is helping the Wai'ol Valley Taro Farmers complete an Environmental Assessment or EA as one of conditions necessary to secure a long term Water Lease from you folks. My Environmental Law Clinic is con inuing to kōkua the farmers this semester, and we are coordinating with Tricia on the DEA.

As you well know, after the 2018 floods, recovery efforts determined that the farmers mānowai (water intake) is on State Conservation land. This triggered a slew of permit ing and other approvals (despite the emergency proclamations). We have been making steady progress over the last two years and the Hui -- in no small part due to OHA's continued support and your advocacy in particular Wayne -- has a right of entry and easement for their lo'i kalo irrigation system and a revocable permit for their water. This fall, we have been working on a longer term water lease and Tricia is coordinating with the farmers and my clinic to complete the EA.

You have been working most closely with the Clinic and Hui on this over the last couple years. So, Tricia wanted to talk story with you to make sure we're covering all the bases and that we specifically address any concerns or issues OHA may have. Tricia will follow up about a time to talk story. I have also cc'd Mahina who is co-teaching the clinic with me (U'i is out on maternity leave).

Mahalo in advance for your support and kōkua Wayne! And don't hesitate to text or call if you need anything from me or wanna talk story.

mahalo nui,

kapua

D. Kapua Sproat (she/her/hers)
Professor of Law, Ka Huli Ao Center for Excellence in Native Hawaiian Law

& the Environmental Law Program
Director, Ka Huli Ao
Director, Environmental Law Clinic
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P (808) 956-7489 [redacted]

tridason

Tricia Dang <tricia@tridason.com>

RE: WAIOLI VALLEY TARO HUI EA - RE: Connecting Rep Nakamura and Tricia Dang

1 message

Rep. Nadine Nakamura [redacted] Wed, Nov 11, 2020 at 9:58 AM
To: Tricia Dang <tricia@tridason.com>

Thanks for this update!

From: Tricia Dang <tricia@tridason.com>
Sent: Tuesday, October 20, 2020 11:51 AM
To: Rep. Nadine Nakamura [redacted]; Ben Viernes [redacted]
Subject: WAIOLI VALLEY TARO HUI EA - RE: Connecting Rep Nakamura and Tricia Dang

Aloha Representative Nakamura and Ben,

Apologies for the delay in following up on Kapua's email. On behalf of the Wai'oli Valley Taro Hui, I am writing their Environmental Assessment (EA). We anticipate submitting the draft for public comment at the end of this month.

For your awareness, I copied the summary of the EA below. Please let me know if you have any comments/recommendations on anything specific you would like us to cover. We are using this as a reference document that the farmers can use in the future, so if you have anything you are working on that you would like us to include, please send it to me and I can work on incorporating the details (I can also send you a draft to review prior to OEQC submittal). For example, if you have any information that you can share as reference, I would be happy to include key details in the draft EA. Otherwise, I will include you in our electronic distribution once the EA is published.

Generally related to the community - in the EA, we talk about the history and legacy of kalo cultivation in the Hanalei / Waioli area, contributions to local food security, and the Hui's purpose of education/community engagement to empower future generations. Unlike most EAs, there is no new request in terms of physical infrastructure or improvements, rather, the request is the farmers continuing to do what they have been doing for generations with the addition through this formal process. We will be including the approximate range of water needs which is based on a 1989 Water Commission registration of 13.5 mgd and well documented standard water needs for thriving kalo cultivation.

Happy to talk more on the phone if you would like [redacted]

Thanks so much. Summary copied below,
Tricia

SUMMARY OF EA:

The Proposed Action seeks legal approval to continue a traditional and customary Native Hawaiian use of water from Wai'oli Stream (TMK Plats (4) 5-6-001, 002, and 004; (4) 5-5-005 to 009; and, (4) 5-4-003) for lo'i kalo cultivation, a cultural practice that has fed Wai'oli Valley and its people since time immemorial. For the Wai'oli Valley Taro Hui and the Wai'oli community, traditional kalo cultivation is its cultural foundation connecting Halele'a (Hanalei) families over generations and is a time-honored part of this community's history and legacy. More so, the water that flows through this existing yet ancient system is a lifeway that supports kalo cultivation traditions and perpetuates a living Hawaiian culture, while also feeding the community and preparing the next generation to carry on this vital practice into the future. Ma ka hana ka 'ike – the learning is in the doing (Pukui, 1983).

In the wake of the 2018 floods, disaster recovery efforts determined that the farmers' mānowai, the traditional intake of the traditional irrigation system used for kalo cultivation, is on State conservation lands. This triggered a slew of permitting and other approvals, including this water lease under Hawai'i Revised Statutes ("HRS") chapter 171, which the Hui has worked diligently to complete over the last two years. Today, with support from natural and cultural resource partners and the County of Kaua'i, the Hui continues to address and mitigate the damage caused by the devastating 2018 floods. The farmers' ability to maintain and repair the lo'i kalo irrigation system – with sufficient throughflow to support traditional lo'i while maintaining beneficial instream uses – is imperative.

On February 28, 2020, Hawai'i's Board of Land and Natural Resources ("BLNR") unanimously voted to award the Hui a one-year Revocable Permit to continue its water use from Wai'oli Stream and a perpetual easement for its lo'i kalo irrigation system. The Hui anticipates submitting its request for a long-term water lease after completing the HRS chapter 343 environmental review process, consulting with the Department of Hawaiian Home Lands and Department of Land and Natural Resources-Office of Conservation and Coastal Lands, submitting a Watershed Management Plan, and working with the Commission on Water Resource Management to establish numeric interim instream flow standards.

This long-term lease will provide the legal approval for the continued diversion of water from Waiʻoli Stream through the traditional loʻi kalo irrigation system within this watershed, ensuring the farmers have more reliable access to the resources intrinsically tied to traditional cultivation practices that have been documented as part of the history and environment of this area since time immemorial. This Environmental Assessment will detail the existing and beneficial impacts of water use for traditional kalo cultivation from Waiʻoli Stream. At bottom, as Suzanne Case, BLNR Chair, explained during the February 2020 BLNR Board meeting, the Hui seeks to "fit an ancient system into a new legal system."

****

Tricia W. Dang

Tridason LLC

[redacted]

www.tridason.com

***Due to COVID-19 related school and support service closures, please pardon the delay in responding as business and working schedules are affected.*

On Fri, Sep 25, 2020 at 2:17 PM Rep. Nadine Nakamura [redacted] wrote:

> Thanks Kapua and nice to meet you Tricia! Appreciate the update. Happy to assist in any way!
>
> Sent from my iPhone
>
> > On Sep 25, 2020, at 7:54 AM, D. Kapuaʻala Sproat [redacted] wrote:
> >
> > Aloha Representative Nakamura and Ben!
> >
> > By this email, iʻm introducing you fo ks to Tricia Dang. Tricia is helping the Waiʻol Valley Taro Farmers complete an Environmental Assessment or EA as one of conditions necessary to secure a long term Water Lease from the Department of Land and Natural Resources.
> >
> > As you well know, after the 2018 floods, recovery efforts determined that the farmers mānowai (water intake) is on State Conservation land. This triggered a slew of permitting and other approvals. We have been making steady progress over the last several years and they now have a right of entry and easement for their loʻi kalo irrigation system and a revocable permit for their water. This fall, we have been working to secure a longer term water lease and Tricia is working with the farmers and my clinic to complete the EA.
> >
> > Tricia will be reaching out to you, as the farmers' elected representative, to seek your manaʻo on the project/EA. If you have time, a letter of support would be most helpful.
> >
> > As always, if you have any questions, please don't hesitate to reach out to me. We are grateful for your continued kōkua and aloha!
> >
> > mahalo nui,
> >
> > kapua
> >
> > **D. Kapua Sproat** (she/her/hers)
> > *Professor of Law, Ka Huli Ao Center for Excellence in Native Hawaiian Law*
> > *& the Environmental Law Program*
> > *Director, Ka Huli Ao*
> > *Director, Environmental Law Clinic*
> > *William S Richardson School of Law*
> > *University of Hawaiʻi at Mānoa*

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Tricia Dang <tricia@tridason.com>

Re: Waioli EA - Follow up with Tricia

1 message

Makaala Kaaumoana [redacted] Sun, Oct 25, 2020 at 12:43 PM
To: Tricia Dang <tricia@tridason.com>

We have used 85% for a few years now. Original source was taro growers association.
Mk

On Thu, Oct 22, 2020, 10:37 AM Tricia Dang <tricia@tridason.com> wrote:

> Mahalo Makaala!
>
> You mentioned in the call Hanalei produces 85% of the kalo. This is part of my planner dillema - every agency has a different number and method to calculate. Can you point me to your source - otherwise, i went federal and used this....feels very underestimated.
>
> Of the statewide harvest, Kaua'i County accounted for 32 to 56% of the state's kalo acreage and produced between 43 and 75% of the state's total production (NASS 2017a). From 2000 to 2017, kalo production in Hawai'i decreased from 7 million pounds to 3.6 million pounds, and average yields per acre fell from about 15,000 pounds per acre to 10,530 pounds per acre (NASS, 2017).
> **Of course i didn't document the link so now I am in the maze of fed website design.
>
> On Thu, Oct 22, 2020, 10:16 AM Makaala Kaaumoana [redacted]
> > Mahalo for your call. Sorry, not sorry, for talking your ear off!
> > Here are docs and contacts I promised.
> > [redacted]@fws.gov
> > [redacted]@pacificbirds.org
> >
> > cut and paste away!
> >
> > Makaala
> >
> > ---
> >
> > Virus-free. www.avast.com
> >
> > On Thu, Oct 22, 2020 at 9:59 AM Tricia Dang <tricia@tridason.com> wrote:
> > > Aloha Makaala,
> > >
> > > Please send over your H&H proposal when you have chance...and the Targeting Initiative Grant if possible.
> > >
> > > Thanks so much for the lively and informative call!
> > > Tricia
> > >
> > > **********
> > > Tricia W. Dang
> > > Tridason LLC
> > > 808-542-9251
> > > www.tridason.com
> > >
> > > **Due to COVID-19 related school and support service closures, please pardon the delay in responding as business and working schedules are affected.*
> >
> > --
> > Makaala Kaaumoana
> > [redacted]
> > home
> > cell
> > fax

tridason

Tricia Dang <tricia@tridason.com>

Re: Water quality data and other mana‘o

1 message

Tricia Dang <tricia@tridason.com> Tue, Sep 22, 2020 at 4:54 PM
To: Makaala Kaaumoana [redacted]
Cc: "D. Kapua‘ala Sproat" [redacted]

Aloha Makaala,

Mahalo for your help. I just sent an email outlining the reports and studies we have looked at to discuss water quality and native habitats in the Waioli stream (and surrounding streams). However, wondering if you could guide me to any good studies on Hanalei Bay water quality and aquatic species?

The EA requires us to discuss the stream - start to end, which includes a discussion about the water after it leaves the hoi and returns to the main stream and then into the Bay. The challenge in the discussion is 2 hoi enter Hanalei River since the focus is Waioli stream, and then also discuss the water quality in Hanalei Bay and the many factors that play into that. Kapua thought you would be the best source to refer me to info (also Heather at DAR mentioned your name too!)

A summary of our draft proposed action:
The proposed action seeks legal approval to use water from Wai‘oli Stream (TMK 5-5-006:888) for the purpose of lo‘i kalo, a cultural practice that has taken place in Wai‘oli Valley for time immemorial. For the Wai‘oli Valley Taro Hui/Wai‘oli community, traditional kalo cultivation is its cultural foundation. Similar to how the lo‘i kalo irrigation system weaves through the land, the practice of cultivating kalo connects families over generations and is a time-honored part of the community’s history and legacy.

Today, the Hui with support from natural and cultural resources partners and the County of Kaua‘i continue to address and mitigate the damage caused by the devastating 2018 flooding. The ability to maintain and repair the lo‘i kalo irrigation system - a throughflow for in-stream and in-watershed use is imperative. More so, the water that flows through the existing traditional system is the lifeway to support kalo cultivation traditions in the way that our ancestors did, providing nourishment for the community and preparing the next generation to continue the cultural practice into the future.

On February 28, 2020 BLNR unanimously voted to award the Hui a Revocable Permit for Wai‘oli Stream water use. The Hui anticipates submitting its request for a long-term water lease upon completing the Chapter 343, HRS, environmental review process, conducting consultation with DHHL and DLNR-OCCL, completing a water management plan that establishes instream flow standards, and participating in the required auction process.

The long-term lease will allow the continued activity of diverting water from Wai‘oli Stream to the traditional lo‘i kalo irrigation system, ensuring the kalo farmers have access to the water resources intrinsically tied to traditional cultivation practices that has been documented as being a part of the history and environment of this area. The EA will discuss the existing and beneficial impact of water use from the Wai‘oli Stream for traditional kalo cultivation. Thus, the Hui seeks to “fit an ancient system into a new process”.

I will plan to call you tomorrow morning if you are available.

Mahalo,
Tricia

****
Tricia W. Dang
Tridason LLC
808-542-9251
www.tridason.com

***Due to COVID-19 related school and support service closures, please pardon the delay in responding as business and working schedules are affected.*

On Mon, Sep 21, 2020 at 4:32 PM Makaala Kaaumoana [redacted] wrote:

> Aloha e Kapuala a me Tricia, happy to help. I have copied Andy Hood for expert advice and, as expected, I am happy to offer opinion /advice.
> Makaala
> [redacted]
>
> On Mon, Sep 21, 2020, 2:49 PM D. Kapua‘ala Sproat <[redacted]> wrote:
>
> > Aloha Maka‘ala!
> >
> > Hope this email finds you well. I’m reaching out -- as usual -- with a favor to ask. Do you have time to connect with Tricia Dang please? Tricia is working with the Wai‘oli farmers (and my clinic is helping out on the side) with their DEA for their water lease. Wanted to consult with you about a bunch of stuff, but water quality in particular.
> >
> > Cc'd Tricia so you folks can be in touch.
> >
> > mahalo nui,
> > kapua
> >
> > **D. Kapua Sproat** (she/her/hers)
> > *Professor of Law, Ka Huli Ao Center for Excellence in Native Hawaiian Law*
> > *& the Environmental Law Program*
> > *Director, Ka Huli Ao*
> > *Director, Environmental Law Clinic*
> > *William S. Richardson School of Law*
> > *University of Hawai‘i at Mānoa*
> > *2515 Dole St., Honolulu Hawai‘i 96822*
> > **P** (808) 956-7489 [redacted]
> >
> >

tridason

Tricia Dang <tricia@tridason.com>

Re: Historic Report 1964

1 message

c. diamond [redacted] Wed, Oct 21, 2020 at 12:17 PM
To: Tricia Dang <tricia@tridason.com>

Aloha, glad to share, scanned Barbara Robeson's files years ago, here is another interesting water resource doc from 1939

On Wednesday, October 21, 2020, 11:40:19 AM HST, Tricia Dang <tricia@tridason.com> wrote:

Aloha Caren,

Wow! 1964 - I love it (it's the planner in me). Thank you for sharing, I will definitely review and consider for the EA.

Thanks so much,
Tricia

****
Tricia W. Dang
Tridason LLC
808-542-9251
www.tridason.com

***Due to COVID-19 related school and support service closures, please pardon the delay in responding as business and working schedules are affected.*

On Wed, Oct 21, 2020 at 11:09 AM Caren [redacted] wrote:

> Aloha Tricia, this seems an important step for continuing the traditional farming practices in perpetuity . Sending along this document from 1964 which includes Waioli not for inclusion but it may be of interest.
> Mahalo Nui, Caren
>
> >
> >

water resources of Kauai 1939.pdf
6648K

tridason

Tricia Dang <tricia@tridason.com>

Re: Connecting Caren and Tricia - Waioli Valley Taro Hui EA

1 message

Tricia Dang <tricia@tridason.com> Tue, Oct 20, 2020 at 10:57 AM
To: Caren [redacted] >

Aloha Caren,

Following up on Kapua's email. On behalf of the Waiʻoli Valley Taro Hui, I am writing their Environmental Assessment (EA). We anticipate submitting the draft for public comment at the end of this month.

For your awareness, I copied the summary of the EA below. Please let me know if you have any comments/recommendations on anything specific you would like us to cover in this public process. For example, if you have any community documents that you can share as reference, I would be happy to include key details in the draft EA. Otherwise, I will include you in our electronic distribution once the EA is published.

Generally related to the local community - in the EA, we talk about the history and legacy of kalo cultivation, contributions to local food security, the Hui's purpose of education/community engagement to empower future genera ions. Unlike most EAs, there is no new request in terms of physical infrastructure or improvements, rather, the request is the farmers continuing to do what hey have been doing for generations with the addition through this formal process.

Happy to talk more on the phone if you would like - 808.542.9251.

Thanks so much. Summary copied below,
Tricia
Summary of EA:
The Proposed Action seeks legal approval to continue a traditional and customary Native Hawaiian use of water from Waiʻoli Stream (TMK Plats (4) 5-6-001, 002, and 004; (4) 5-5-005 to 009; and, (4) 5-4-003) for loʻi kalo cultivation, a cultural practice that has fed Waiʻoli Valley and its people since time immemorial. For the Waiʻoli Valley Taro Hui and the Waiʻoli community, traditional kalo cultivation is its cultural foundation connecting Haleleʻa (Hanalei) families over generations and is a time-honored part of this community's history and legacy. More so, the water that flows through this existing yet ancient system is a lifeway that supports kalo cultivation traditions and perpetuates a living Hawaiian culture, while also feeding the community and preparing the next generation to carry on this vital practice into the future. Ma ka hana ka ʻike – the learning is in the doing (Pukui, 1983).

In the wake of the 2018 floods, disaster recovery efforts determined that the farmers' mānowai, the traditional intake of the traditional irrigation system used for kalo cultivation, is on State conservation lands. This triggered a slew of permitting and other approvals, including this water lease under Hawaiʻi Revised Statutes ("HRS") chapter 171, which the Hui has worked diligently to complete over the last two years. Today, with support from natural and cultural resource partners and the County of Kauaʻi, the Hui continues to address and mitigate the damage caused by the devastating 2018 floods. The farmers' ability to maintain and repair the loʻi kalo irrigation system – with sufficient throughflow to support traditional loʻi while maintaining beneficial instream uses – is imperative.

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This long-term lease will provide the legal approval for the continued diversion of water from Waiʻoli Stream through the traditional loʻi kalo irrigation system within this watershed, ensuring the farmers have more reliable access to the resources intrinsically tied to traditional cultivation practices that have been documented as part of the history and environment of this area since time immemorial. This Environmental Assessment will detail the existing and beneficial impacts of water use for traditional kalo cultivation from Waiʻoli Stream. At bottom, as Suzanne Case, BLNR Chair, explained during the February 2020 BLNR Board meeting, the Hui seeks to "fit an ancient system into a new legal system."

****
Tricia W. Dang
Tridason LLC
808-542-9251
www.tridason.com

***Due to COVID-19 related school and support service closures, please pardon the delay in responding as business and working schedules are affected.*

On Fri, Sep 25, 2020 at 9:03 AM D. Kapuaʻala Sproat [redacted] wrote:

> Aloha Caren!
>
> Happy Aloha Friday! By this email, iʻm connecting you with Tricia Dang. Tricia is helping the Waiʻol Valley Taro Farmers complete an Environmental Assessment or EA as one of conditions necessary to secure a long term Water Lease from BLNR. My Environmental Law Clinic is continuing to kōkua the farmers this semester, and we are coordinating with Tricia on the DEA.
>
> I'm pretty sure we talked story about this a little when we were meeting with Uncle Pres, but as you likely know anyways, after he 2018 floods, recovery efforts determined that the farmers mānowai (water intake) is on State Conservation land. This triggered a slew of permitting and other approvals (despite the emergency proclamations). We have been making steady progress over the last two years and the Hui now has a right of entry and easement for their loʻi kalo irrigation system and a revocable permit for their water use. This fall, we have been working on a longer term water lease and Tricia is coordinating with the farmers and my clinic to complete the EA.
>
> We wanted to reach out to the Haʻena-Hanalei Community Association and i thought of you cause you wrote the comment letter onhe development in Limahuli and were also tracking OCCL. So, Tricia wanted to talk story with you to make sure we're covering all the bases and that we specifically address any concerns or issues the community association may have. Tricia will follow up about a time to talk story. I have also cc'd Mahina Tuteur who is co-teaching the clinic with me.
>
> Thanks so much Caren, i know you're super busy!

mahalo nui,
kapua

D. Kapua Sproat (she/her/hers)
Professor of Law, Ka Huli Ao Center for Excellence in Native Hawaiian Law
& the Environmental Law Program
Director, Ka Huli Ao
Director, Environmental Law Clinic
William S. Richardson School of Law
University of Hawai'i at Mānoa
2515 Dole St., Honolulu Hawai'i 96822
P (808) 956-7489 [redacted]

UNIVERSITY of HAWAI'I SYSTEM

Fwd: Kokua with Wai‘oli

---------- Forwarded message ---------
From: **Don Heacock** <[redacted]>
Date: Fri, Sep 25, 2020 at 11 21 AM
Subject: Re: Kokua with Wai‘oli
To: Adam ASquith <[redacted]>
Cc: Michael Kido <[redacted] "D. Kapua‘ala Sproat" <[redacted]>, Tricia Dang <tricia@tridason.com>, Mahina Tuteur <[redacted]>

Aloha Kapua e hoaloha,
Have Trisha call me (c[redacted]) because I can sit up a face to face to interview experienced ‘o’opu fishers in Waioli River. We could all benefit from this information.
Aloha no e malama Pono,
DonTaro

Sent from my iPhone

> On Sep 24, 2020, at 8:43 AM, Adam ASquith <[redacted]> wrote:
>
> Kapua and All:
>
> Good to hear that everyone is safe and healthy. Waioli is probably the only stream on the north shore that I have not been up. Sorry that I do not have any observations even.
>
> I sure miss everybody. So glad to hear that your family is still connecting to the resources and the life, Kapua. Sooooo important. As Jerry Santos sings, "Change is a strange thing, it cannot be denied." But, damn, it's a hard pill to swallow sometimes.
>
> I so look forward to reconnecting with everybody when we are over this thing.
>
> Aloha
>
> Adam
>
> > On Thursday, September 24, 2020, 06:26:39 AM HST, D. Kapua‘ala Sproat <[redacted]> wrote:
> >
> > Aloha Mike!
> >
> > This is so very helpful, mahalo plenty! This is exactly why i reached out to you folks! The valley and stream haven't endured major change -- still largely kalo. There is more building in the conservation zone recently, but largely illegal houses so not additional pressure on the stream.
> >
> > Tricia may have more follow up -- but i think this is exactly the kind of info we need. Mahalo Mike!
> >
> > I hope you are safe and well in Washington. I will always think of you in Kalihiwai, especially when i go by your driveway.
> >
> > mahalo plenty!
> > kapua
> >
> > **D. Kapua Sproat** (she/her/hers)
> > *Professor of Law, Ka Huli Ao Center for Excellence in Native Hawaiian Law*
> > *& the Environmental Law Program*
> > *Director, Ka Huli Ao*
> > *Director, Environmental Law Clinic*
> > *William S. Richardson School of Law*
> > *University of Hawai i at Mānoa*
> > *2515 Dole St., Honolulu Hawai‘i 96822*
> > **P** (808) 956-7489 [redacted]
> >
> > Get your copy of *Native Hawaiian Law: A Treatise*
> > http://www.kamehamehapublishing.org/nativehawaiianlaw/

On Thu, Sep 24, 2020 at 5:59 AM Michael Kido <[redacted] wrote:

Aloha Kapua. I'm glad you guys are safe on Kauai. I'm in WA state and it's a little sketchy going out over here even just to the market.

I looked through my Kauai field notebooks and Don is correct that we never conducted any formal surveys in Waioli Stream.

However, I did run across a note from 11/17/89 when we were interested in documenting *'o opu-nakea* spawning in North Kauai streams. The Hanalei Bridge was closed earlier in the week because of flooding and we would check streams at the bridges on our way to Wainiha where we knew fish would be spawning in the 'first riffles' after a major flooding event.

In Waioli Stream we documented *'o opu-nakea* spawning in a roughly 75 meter stretch of stream at the bridge road crossing using underwater visual census (UVC) (basically wetsuit-mask-snorkel). We observed 20+ egg masses laid in nests on basalt substrate which were being guarded by single fish (could not tell if male or female) with highest nest densities recorded below the bridge. t was interesting that there was old coral reef underlying the streambed and egg masses were only laid on stream rocks not the coral.

So, at the time there was a reproductively viable population of *'o opu-nakea* in Waioli Stream although Don saw a tilapia in the stream which was concerning to us.

Native stream animals are adapted to periodic floods even big ones like those that close the Hanalei Bridge so their resident populations persist in the stream continuum (i e. from mountain-to-sea). If there have not been any major disturbances to the watershed or significant plantation-style water diversion, then native stream animal populations are probably still viable in Waioli Stream.

Hope this is of help in developing your EA.

Mahalo

Mike

From: "D. Kapua'ala Sproat" <[redacted]>
Date: Tuesday, September 22, 2020 at 6:11 AM
To: Don Heacock <[redacted]>, Adam ASquith <[redacted]>, Mike Kido [redacted]>
Cc: Tricia Dang <tricia@tridason.com>, Mahina Tuteur <[redacted]>
Subject: Kokua with Wai'oli

Aloha Adam, Mike, and Don!

I'm reaching out -- as usual -- for kōkua please. This semester my environmental law clinic is working with the Wai'oli Taro Farmers. As you may know, they were super buss up in the 2018 floods, after which time recovery efforts revealed that their mānowai is on conservation land. SO: my clinic has been helping them with permitting and everything else. We worked with them (and BLNR) to secure a right of entry, easement, and revocable permit for their water use. And, now we're doing ground work for a water lease under HRS 171.

SO: i'm emailing to connect you with Tricia Dang. She is helping us with the EA for the water lease. And, in particular, we were wondering if you folks had any data or other info about our native stream animals in Wai'oli Stream. In talking with the farmers, they regularly see oopu and opae in the streams and even the auwai. And, they still see hihiwai from time to time in the stream, tho they remember more being in the streams previously (and, admittedly, the stream was heavily impacted by the 2018 floods).

Maybe this is just my own memory -- but i seem to think that you folks did baseline for a lot of our streams over the years and i was hoping you folks did Wai'oli at some point formally or informally. And, as experts, your recollection of the stream (presence or absence of animals and general location) would be helpful. Data even better, but we'd take whatever.

Same for water quality. Wai'oli Stream was actually added to Hawai'i's Clean Water Act 303(d) list in July 2018 for turbidity and enterococci. BUT: that was after the floods and data from Matt Rosener at Waipā has since showed that much of the turbidity cleaned up.

Anyways, Tricia will follow up with more specifics, but i wanted to reach out initially with this ask.

That said, i hope you folks are all safe and well. I came home for Spring Break with my husband and two boys for Spring Break in March and we're still here -- one of the silver linings of the pandemic for sure. Kaua'i (and Kalihiwai in particular) is the best place to ride out something like this. And, it gives us more time to spend with my mom and dad and to eat kale and poi. Anyways, sending aloha and well wishes to each of you. Mahalo in advance for any kōkua you can provide!

PS: i cc'd Tricia and Mahina (our Post Doc who is helping with clinic)

mahalo nui,

kapua

D. Kapua Sproat(she/her/hers)
Professor of Law, Ka Huli Ao Center for Excellence in Native Hawaiian Law
& the Environmental Law Program
Director, Ka Huli Ao
Director, Environmental Law Clinic
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2515 Dole St., Honolulu Hawai'i 96822
P (808) 956-7489 | [redacted]

tridason

Tricia Dang <tricia@tridason.com>

Re: FW: Partnering on EA for Waioli, Kaua‘i

1 message

Matt Rosener [redacted] Fri, Sep 11, 2020 at 2:49 PM
To: Tricia Dang <tricia@tridason.com>
Cc: dominique leu cord [redacted]>

Aloha Tricia,

You're welcome to reference data from the Waipa Garden rain gage, I'm attaching a spreadsheet here that shows monthly and annual totals since 2012 when I first set up the gage. Note that there were periods of missing data for 2011 and 2012, but the annual totals represent complete data for the 2013-2018 calendar years and the 2012-2018 water years (Oct 1 - Sep 30). For 2019, we had 66.80" of rain through 11/25/19 so not quite a complete record for last year. There should be new data since then but we haven't downloaded it yet which is a good reminder for me to do that!

Also, might want to look into records for the NWS Hanalei rain gage which is located in Waioli I think. The NWS station number for this gage is HNIH1, and some of that data is available at: https://w2.weather.gov/hfo/hydrology Not sure the period of record for this gage, but I think it goes back farther than the Waipa gage. Also, the NWS gage has some substantial gaps, including part of the April 2018 flood event. The Waipa gage has the best N. Shore rain record for that flood, it was ~ 55" for the storm in about 28 hours, the NWS certified the 49.69" as a national record for a 24-hour period.

I haven't looked at rainfall for the Hurricane Lane storm, but the data should be included in the attached spreadsheet.

The gage at the Princeville Airport generally gets quite a bit less rainfall than Waipa/Waioli, but it probably has a longer record.

Hope this helps!

matt

Matt Rosener
Hydrologist / Water Resources Engineer
Port Angeles, WA / Hanalei, HI

On Fri, Sep 11, 2020 at 2:56 PM Tricia Dang <tricia@tridason.com> wrote:

> Mahalo Matt!
>
> Reviewed the docs last night and what great research and findings. I am going to use the 1 monitoring site at the mouth of the Waioli Stream in our EA. I will likely explain the indirect impact of residential cesspools along the stream path.
>
> On another note - I am using the rain gauge info from princeville since it is publicly available. Kapua said that Waipa has its own rain gauge. Any chance you can share that data with me. I think she really wanted to at least discuss the amount of rain received in during the April floods and the flooding from Hurrican Lane in the August 2018. If you have basic data you can share, that would be really helpful. Otherwise this is all I got:
>
> *For the North Shore of Kauai, Princeville is the nearest tracking point, reporting 72.42 inches of rain in 2017, 74.53 inches in 2016, and 71.87 inches in 2015. The lowest rainfall between 2003 and 2017 was in 2010 with 52.02 inches and the highest rainfall was in 2004 with 93.17 inches of rain documented. (State Data book, 2019).*
>
> Thanks so much!
> Tricia
>
> **********
> Tricia W. Dang
> Tridason LLC
> 808-542-9251
> www.tridason.com
>
> ***Due to COVID-19 related school and support service closures, please pardon the delay in responding as business and working schedules are affected.*
>
> On Tue, Sep 8, 2020 at 2:48 PM Matt Rosener [redacted]> wrote:
>
> > Aloha Tricia,
> >
> > Had a chance to talk to Stacy today, just wanted to check with her before I shared, but attached here is the grant report I mentioned when we talked last week.
> >
> > You can find the lo'i water chemistry data in Tables 12 and 13 and the snorkel survey data summarized in Table 15, along with the stream bioassessment report by UH, attached also.

Let me know if you have any questions.

Mahalo,

matt

Matt Rosener
Hydrologist / Water Resources Engineer
Port Angeles, WA / Hanalei, HI

On Thu, Sep 3, 2020 at 5:20 PM Tricia Dang <tricia@tridason.com> wrote:

Mahalo Matt. I think the water study would be an excellent addition to document in the EA. We could include a summary and water chemistry data in the draft EA. Then we can include the variable data in the final if time is an issue.

Tricia

****
Tricia W. Dang
Tridason LLC
808-542-9251
www.tridason.com

***Due to COVID-19 related school and support service closures, please pardon the delay in responding as business and working schedules are affected.*

On Thu, Sep 3, 2020 at 11:25 AM Matt Rosener [redacted] > wrote:

Aloha Dominique,

Mahalo for the update on stream project contracting, I hope the Waioli project will be fully funded.

Unfortunately, but I can't think of much to share on what happens to water as it flows through the lo'i. I can say generally that the water quality changes from inlet to outlet, as does the water flow rate. I don't have flow rate data for the Waipa lo'i but if this information would be helpful, this will probably be a good source: https://pubs.usgs.gov/of/2007/1157/ This study primarily looked at water use in lo'i but also has findings on water temperature too.

We did some focused water quality monitoring at Waipa where we used a fallow lo'i as a sort of filter basin that received water from an upstream lo'i before discharging into a drainage ditch. We collected water samples about once a month at points where 1. water enters the lo'i, 2. water exits the lo'i and enters the filter basin, and 3. water exits the basin and flows into the drain ditch. With about 16 sampling dates total, this allows comparison of water quality at lo'i inlet and outlet points. The water chemistry data is compiled and easily sharable if will be useful for the EA. Just let me know if you'd like me to send it over. The other water quality data on physical variables (temp, dissolved oxygen, turbidity) would need to be organized before we can share it, but again, let me know if it would be helpful for the EA, and I'll see what I can do.

Sorry I can't think of anything else I have to share on this.

matt

Matt Rosener
Hydrologist / Water Resources Engineer
Port Angeles, WA / Hanalei, HI

On Wed, Sep 2, 2020 at 1:34 PM dominique leu cord <[redacted] > wrote:

Aloha Matt,

I got an update from [redacted] on [redacted] grants, [redacted]

In the meantime I have a question for you. Tricia Dang, cc'd, is compiling the EA for the Wai'oli Taro Valley Hui (WVTH) which will forward our water Lease application. She is needing:

"I think I have what I need, but definitely could be stronger in certain areas such as describing what happens to water as it flows through the loi, all the wonderful stuff related to freshwater flowing slowly through loi (animals, plants, volume of water, flood reduction, etc)."

I sent her the things in this drive, for reference. I also asked Jen Waipa at USFWS, she said they have little to nothing and to direct ask NCRS or CTAHR. In the drive is the current draft mgmt plan USFWS has for Hanalei Refuge. I'm curious if you could add any other resources. Maybe more specifically to water? As no-take in a kalo system (minus trans-evaporation) or even on water quality or health of in-stream, riparian or native waterbird species?

> > > If get, please email Tricia and/or add to drive. I cant believe there is nothing on this, I would almost expect there to be Hanalei specific studies?
>
> Aloha to Megan, hope you guys get out here sooner than later.
>
> Mālama,
>
> Dominique

Waipa Garden Rainfall Record.xlsx
8526K

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

STAFF SUBMITTAL

COMMISSION ON WATER RESOURCE MANAGEMENT

May 18, 2021
Honolulu, Hawai'i

Amend Interim Instream Flow Standards for Wai'oli Stream
In the Surface Water Hydrologic Unit of Wai'oli (2018)
Wai'oli Stream, Halele'a, North Kaua'i

SUMMARY OF REQUEST:

Staff is requesting that the Commission consider the recommendations for amending the interim instream flow standard (interim IFS) for one stream in the Wai'oli surface water hydrologic unit in North Kaua'i:

WAI'OLI (2018): Wai'oli Stream

LOCATION MAP: See Figure 1

BACKGROUND:

The State Water Code (Code), Chapter 174C, Hawai'i Revised Statutes (HRS), provides that the Commission may adopt interim IFS on a stream-by-stream basis or a general IFS applicable to all streams within a specified area. This submittal seeks to address one stream in North Kaua'i.

The current interim IFS for the stream being considered was established under Hawaii Administrative Rules (HAR) §13-169-48, which, in pertinent part, reads as follows:

> Interim instream flow standard for Kaua'i. The Interim Instream Flow Standard for all streams on Kauai, as adopted by the commission on water resource management on June 15, 1988, shall be that amount of water flowing in each stream on the effective date of this standard, and as that flow may naturally vary throughout the year and from year to year without further amounts of water being diverted off stream through new or expanded diversions, and under the stream conditions existing on the effective date of the standard...

The current interim IFS became effective on October 8, 1988. Following the initial registration of stream diversions works, any new or substantially modified stream diversion works structure requires a permit for construction and amendment to the interim IFS.

Based upon the best available information, as presented in the Instream Flow Standard Assessment Report (IFSAR)[1] (see Exhibit 1) and provided in the informational submittal presented to the Commission at the regularly scheduled meeting on April 20, 2021 (see Exhibit 2), staff have developed a recommendation that seeks to balance public trust uses and is supported by the Wai'oli Valley Taro Hui (Hui) (see Exhibit 3).

Understanding that the availability of hydrologic data in this stream is limited, as new data are developed, decisions may be revised by a future Commission action. Due to the complex and dynamic nature of Hawai'i's stream systems, adaptive management affords staff the ability to proceed in making reasonable management decisions and ensuring that impacts are minimized in the face of uncertainty, thus allowing staff to proceed responsibly while advancing the clear intentions of the Code.

The assessment of instream uses for the Wai'oli hydrologic unit will address the interim IFS for Wai'oli Stream (Figure 1).

Water from the main stem of Wai'oli Stream is conveyed to the tributary on the right bank via a mānowai at about the 160 foot elevation. Diversion 1412 (i.e., the po'owai) then conveys water to the East Wai'oli Ditch (Figure 2). The end users of the East Waioli Ditch (i.e., the auwai) are kalo farmers that are part of the Wai'oli Valley Taro Hui.

TRADITIONAL AND CUSTOMARY NATIVE HAWAIIAN RIGHTS AND PRACTICES

1) The identity and scope of cultural, historical, and natural resources and traditional and customary Native Hawaiian rights exercised in the area.

   In summary, the community frequents Hanalei Bay and Wai'oli Stream, which both serve as a habitat for a range of native stream animals, including 'o'opu nake'a (*Awaous guamensisī* or freshwater goby), 'o'opu naniha (*Stenagobius hawaiiensis* or Naniha goby), 'ōpae kala'ole (*Atyoida bisulcate* or spineless shrimp), 'ōpae 'oeha'a (*Macrobrachium grandimanus* or Hawaiian prawn), and hīhīwai or wī (*Neritina granosa*). The community have long fished and gathered in these waters with nets, poles, and kahe (a ramp-like structure made from bamboo)—some of which they make themselves. And, just as the farmers provide kalo for the people of Kaua'i, the community help to feed those who fish and gather alongside them by sharing their catch[2]. Although fishing, hunting, and gathering are prevalent subsistence practices, it is

[1] https://dlnr.hawaii.gov/cwrm/surfacewater/ifs/2018-Waioli/
[2] Vaughan, M.B. 2018. Kaiāulu: Gathering Tides. ISBN 9780870719226

important to note that the Hui also perpetuates religious and spiritual traditions. For example, several members highlighted the significance of pule (prayer), while others gather fresh water for ho'okupu (offering). The Hui has historic and ongoing traditional and customary practices exercised throughout this kalana, including the use of kalana itself.

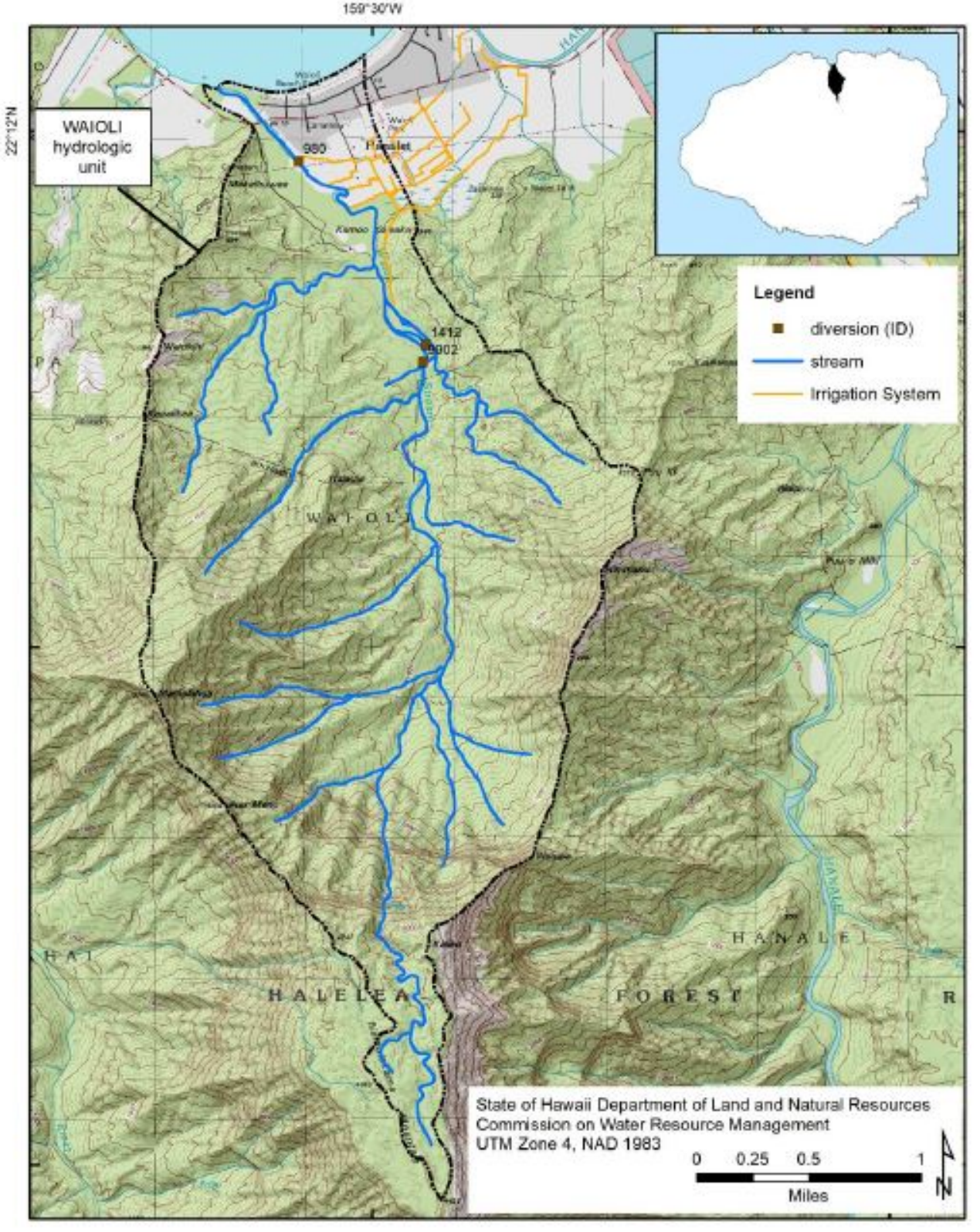
2) The extent to which those resources, including traditional and customary Native Hawaiian rights, will be affected or impaired by the proposed action.

   The proposed IIFS is not anticipated to affect or impair traditional and customary practices of Native Hawaiians identified in this kalana, but instead will help to support and protect them by ensuring, even during drought or low-flow scenarios, a balanced and customary approach to water distribution.

3) What feasible action, if any, could be taken by the Commission within regard to this application to reasonably protect Native Hawaiian rights.

   The Commission can recognize the range of Traditional and Customary rights and practices that exist including but not limited to the lo'i kalo, gathering in and around the stream and 'auwai, spiritual practices, and the traditional land and water management system of kalana.

Figure 1. USGS topographic map of the Wai'oli hydrologic unit, registered diversions (ID) and irrigation systems in Kaua'i.



RECOMMENDATIONS

- Proposed Action: Amended Interim IFS
  Staff recommends that one measurable interim IFS be established for Wai'oli Stream near an altitude of 80 feet, below the confluence of Wai'oli Stream and the Wai'oli tributary on the right bank. The interim IFS shall be established at a flow of 6.3 cfs (4.0 mgd) at all times, unless the Commission declares an emergency or water shortage. Supporting the Native Hawaiian custom of keeping half of the stream's flow remaining in the stream[3], this value represents 50% of the estimated 90th percentile flow (Q_{90}) at the po'owai, which was estimated to be 12.5 cfs (8.0 mgd). Thus, it is expected that during drought conditions, only 50% of the water, shall be diverted from the stream in order to protect instream values. This results in a varying amount of water for kalo production based on the amount of water flowing in the stream (Table 2). The interim IFS may be revised by future Commission action as more data are gathered.

Table 2. Low-flow duration values in Wai'oli Stream, Wai'oli tributary, and downstream points based on the proposed IIFS.

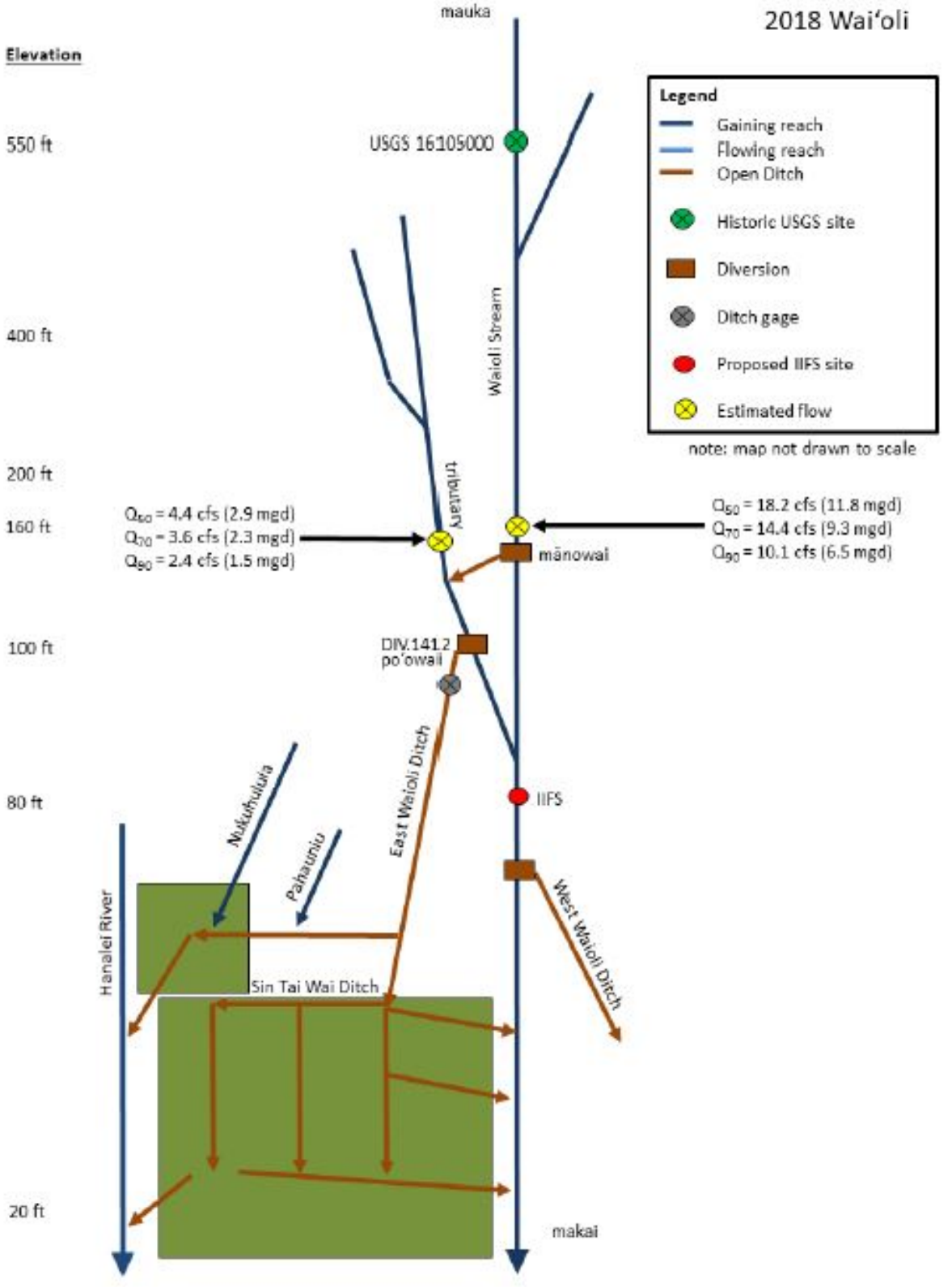
location	Q_{50}	Q_{70}	Q_{90}
Wai'oli Stream above mānowai	18.2 (11.8)	14.4 (9.3)	10.1 (6.5)
Estimated tributary inflow on right bank	4.4 (2.9)	3.6 (2.3)	2.4 (1.5)
Total water available at po'owai	22.6 (14.6)	18.0 (11.6)	12.5 (8.0)
IIFS below confluence of tributary with Wai'oli Stream	6.3 (4.0)	6.3 (4.0)	6.3 (4.0)
Available at the po'owai	16.3 (10.6)	11.7 (7.6)	6.3 (4.0)

- Monitoring
  - The Wai'oli Valley Taro Hui will monitor East Wai'oli Ditch below the Diversion 1412 intake and report the quantity of water removed at the po'owai to the Commission quarterly (e.g., estimated daily flows based on frequent readings). Staff shall work with the Wai'oli Valley Taro Hui to install a gaging device (e.g., Parshall Flume). Readings shall be taken on a sub-weekly basis (i.e., 3 to 4 times per week), with water use reporting to the Commission on a quarterly basis.
  - Staff shall make periodic low-flow measurements in the stream and at the ditch intake.
  - Staff will work with the Wai'oli Valley Taro Hui to make synoptic measurements within Wai'oli to better understand gains in streamflow from the historic USGS station to the mānowai.

- Evaluation
  - Within five years from the date of adoption of an interim IFS, staff shall report to the Commission on the progress of implementing the interim IFS and the application of the adaptive management strategies outlined above, and the impacts of the interim IFS upon instream and noninstream uses.

[3] Dr. Lilikalā Kame'eleihiwa testimony in Waiāhole CCHOA95-1, Commissions FOF No. 976 (CCHOA95-1 Dec. 24, 1997) and Emma Metcalf Nakuaina, Ancient Hawaiian Water Rights: And Some of the Customs Pertaining to Them, in Hawaiian Almanac & Annual For 1894. (1893) p. 79.

Figure 2. Schematic depiction of Wai'oli Stream, historic USGS monitoring station, and estimated flows, in relation to the East Wai'oli Ditch, lo'i and associated ho'i in the Wai'oli and Hanalei area.



- As the current lack of data regarding stream flows have affected Commission staff's ability to estimate low-flow characteristics, if sufficient data are gathered to warrant revising the interim IFS, that will be done at a future Commission date.

- Traditional and Customary Native Hawaiian Rights and Practices
  - Per HRS 174C-101, the Commission recognizes the range of Traditional and Customary practices that exist in this watershed including but not limited to lo'i kalo, gathering in and around the stream and 'auwai, spiritual practices, and the traditional land and water management system of kalana.

Ola i ka wai,

M. KALEO MANUEL
Deputy Director

Note: Exhibits are available from the Commission website at http://dlnr.hawaii.gov/cwrm/surfacewater/ifs/kauai/2018-waioli/.

Exhibit 1 DRAFT Instream Flow Standard Assessment Report PR-2021-01
https://files.hawaii.gov/dlnr/cwrm/ifsar/PR202101-2018-WaioliDraft.pdf

Exhibit 2 Staff Submittal on April 20, 2021
https://files.hawaii.gov/dlnr/cwrm/submittal/2021/sb20210420C3.pdf

Exhibit 3 Written testimony provided by the Wai'oli Valley Taro Hui, etal.
https://files.hawaii.gov/dlnr/cwrm/submittal/2021/sb20210420C3T.pdf

APPROVED FOR SUBMITTAL:

SUZANNE D. CASE
Chairperson

I Mano ka Waiʻoli

Sustaining the Joyous Waters,
A Cultural Impact Assessment of the Waiʻoli Loʻi Kalo Irrigation System

Kauaʻi Mokupuni
Haleleʻa Moku, Waiʻoli Ahupuaʻa
Hanalei Kalana

Dominique Leu Cordy, M.A.
&
Lilia Merrin, M.A.

Prepared for:
Waiʻoli Valley Taro Hui

Prepared by:
Nohopapa Hawaiʻi October 2020

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Abbreviations and Glossary of Hawaiian Terms

Abbreviations

Above mean sea level	amsl
Bernice Pauahi Bishop Museum	BPBM
Board of Land and Natural Resources	BLNR
Commission on Water Resource Management	CWRM
Cubic feet per second	cfs
Department of Accounting and General Services	DAGS
Department of Hawaiian Home Lands	DHHL
Division of Aquatic Resources	DAR
Environmental Assessment	EA
Fahrenheit	°F
Flood Insurance Rate Map	FIRM
Gallons per acre per day	gad
Kauaʻi Historic Society	KHS
National Wildlife Refuge	NWR
Hawaiʻi Revised Statutes	HRS
Hawaiʻi Stream Assessment	HSA
Land Commission Award	LCA
Land Court Application	LCApp
Million gallons per day	mgd
National Register of Historic Places	NRHP
Native Register	NR
Native Testimony	NT
Office of Conservation and Coastal Lands	OCCL
Office of Hawaiian Affairs	OHA
Register Map	RM
Department of Land and Natural Resources	DLNR
State Historic Preservation Division	SHPD
United States Geological Survey	USGS
University of Hawaiʻi	UH
Waiʻoli Valley Taro Hui, Inc.	Hui

Glossary of Hawaiian Terms

aeʻo	Hawaiian stilt, endemic waterbird
ʻai pono	eating of traditional Hawaiian foods
ʻāina	land
ahupuaʻa	land division
akua	god, deity
ʻalae keʻokeʻo	Hawaiian coot, endemic waterbird
ʻalae ʻula	Hawaiian moorhen, endemic waterbird
aliʻi	chief
ʻauwai	irrigation ditch
corm	food-bearing underground stem (see ʻiʻo)
hinana	young ʻoʻopu, formerly caught in nets
hīhīwai	also called wī, freshwater pūpū (mollusk)
hoʻi	out-takes or returns
huli	revegetative portion of kalo that is re-planted, between corm and leaf
kalo	Colocasia *esculenta*, or taro
kalo paʻa	cooked table kalo
Kānaka Maoli	Native Hawaiian
kī	Cordyline *fructosa*, ti, ti leaf, lāʻī, lauʻī
kinolau	physical manifestation
mahiʻai	farmer
moloa maoli	Hawaiian duck, endemic waterbird
kuāuna	bank or border of a kalo patch
kūpuna	ancestors, also grandparent
lāʻī	Cordyline *fructosa,* ti, ti leaf, kī, lauʻī
lawaiʻa	fisher
lau	leaf, specifically often kalo leaf
loʻi	flooded/wetland irrigated field
loʻi kalo	irrigated wetland field growing kalo
lūʻau	kalo leaf
ma kai	to/towards the ocean
ma uka	to/towards the mountain
mana wai	tributary
manaʻo	thought, idea, belief, opinion
mānowai	traditional intake
manu	bird
mele	song or poetic text
moku	district
moʻolelo	oral history, historic tale, legend
muliwai	river mouth characterized by brackish water
naʻau	physically the center of your body, metaphorically: gut, heart, feeling
nāʻū	endemic Hawaiian gardenia
nīʻoi	Hawaiian chili pepper

nūpepa	Hawaiian Language newspapers
ʻōlena	turmeric
oli	chant or chant text
pae ʻāina	archipelago
poʻowai	secondary water diversion
puʻuone loko iʻa	inter-tidal fishpond
wai	fresh water
wī	short for hīhīwai

Introduction

At the request of the Waiʻoli Valley Taro Hui ("Hui"), a 501(c)3 non-profit with federal tax exempt status, Nohopapa Hawaiʻi, LLC conducted a Cultural Impact Assessment ("CIA") for the Waiʻoli Loʻi Kalo Irrigation System. The Hui is applying for a long-term water lease pursuant to Hawaiʻi Revised Statutes ("HRS") chapter 171; this CIA will be appended to an Environmental Assessment ("EA") for the continued use of water from this system. The Proposed Action seeks legal approval to continue to use water from Waiʻoli Stream at its source (TMK 5-6-002:001) for the purpose of wetland kalo cultivation, a Native Hawaiian practice that has been a cultural foundation and has shaped the Indigenous landscape of the greater Waiʻoli community since time immemorial. Similar to how the loʻi kalo (wetland taro) irrigation system weaves through the land, the practice of cultivating kalo connects families over generations and is a time-honored part of the community's history and legacy. This CIA seeks to assess the cultural impacts associated with the proposed long-term water lease for continued wetland kalo cultivation within the traditional Waiʻoli Loʻi Kalo Irrigation System.

The primary purposes of this study are: to account for historical and archival information; document appurtenant rights to water for traditional use; identify cultural resources, beliefs, and practices in the Project Area; give voice to community ʻike (knowledge) and manaʻo (thoughts) on the Proposed Action; and summarize community uses, resources, concerns, and recommendations as they relate to Native Hawaiian traditional and customary practices within the Study Area; specifically, how the Proposed Action might impact these practices, beliefs, and resources, both in the present and in the future.

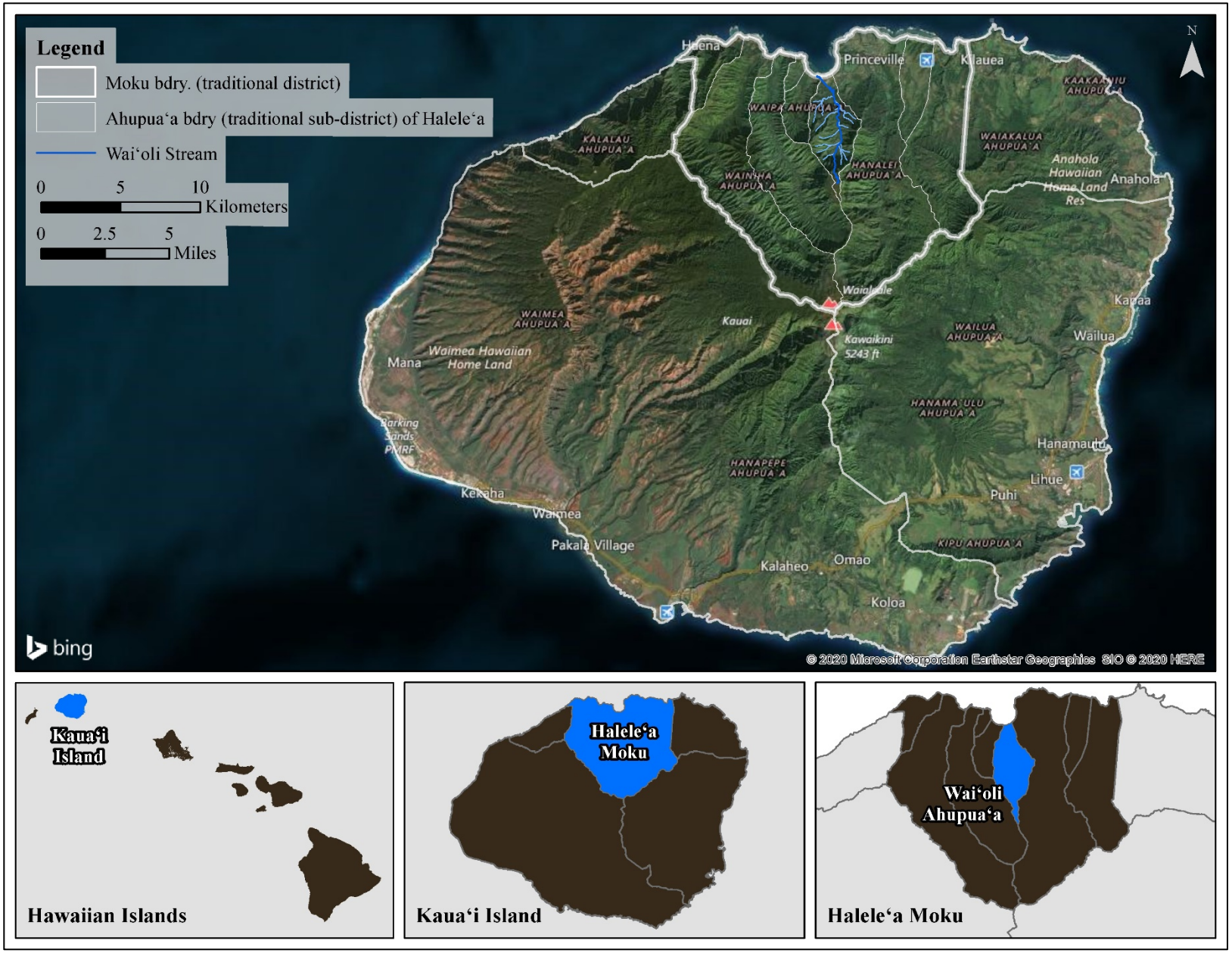

Figure 1. Depiction of Waiʻoli Stream in relation to Kauaʻi Island and the main Hawaiian Islands.

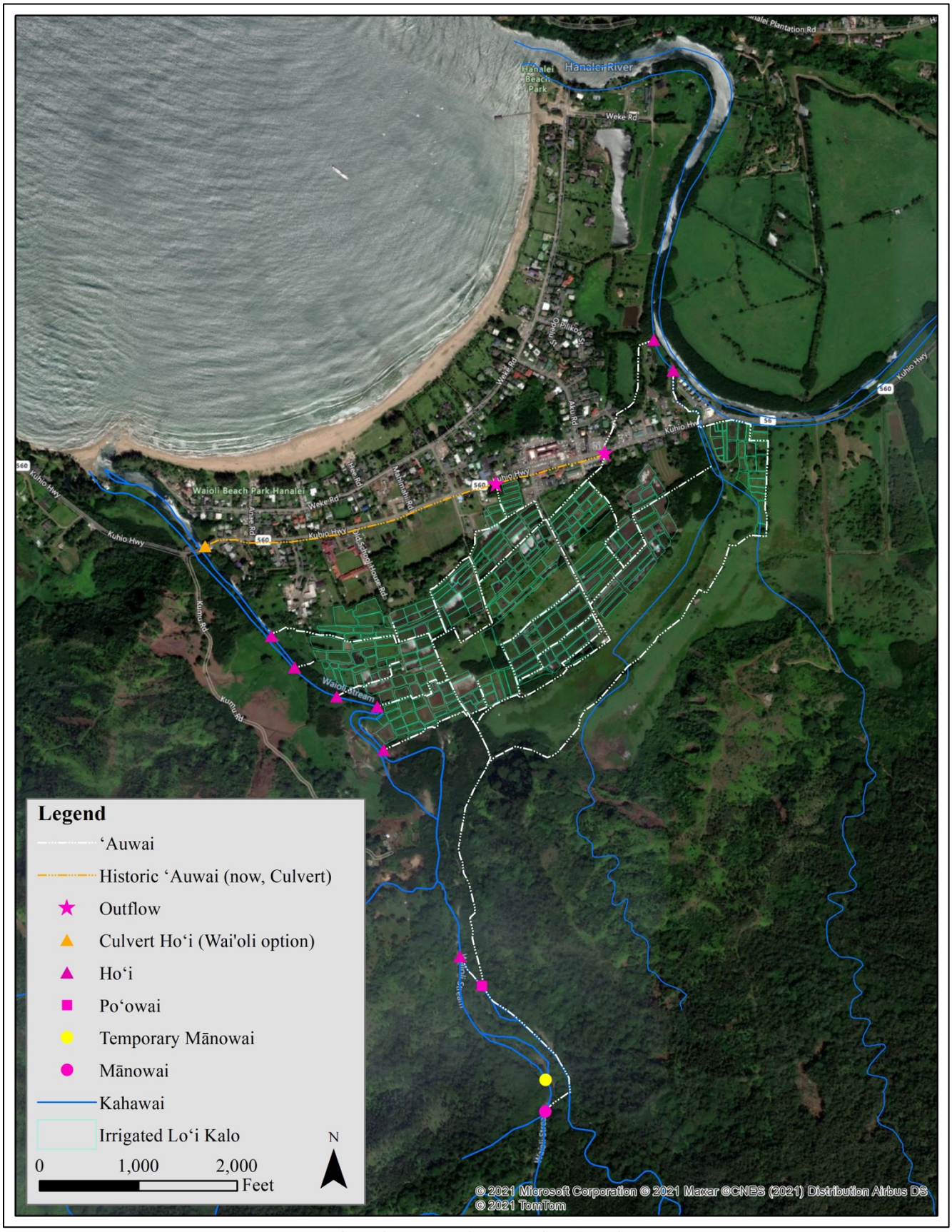

Figure 2. Depiction of Study Area: The Wai‘oli Lo‘i Kalo Irrigation System.

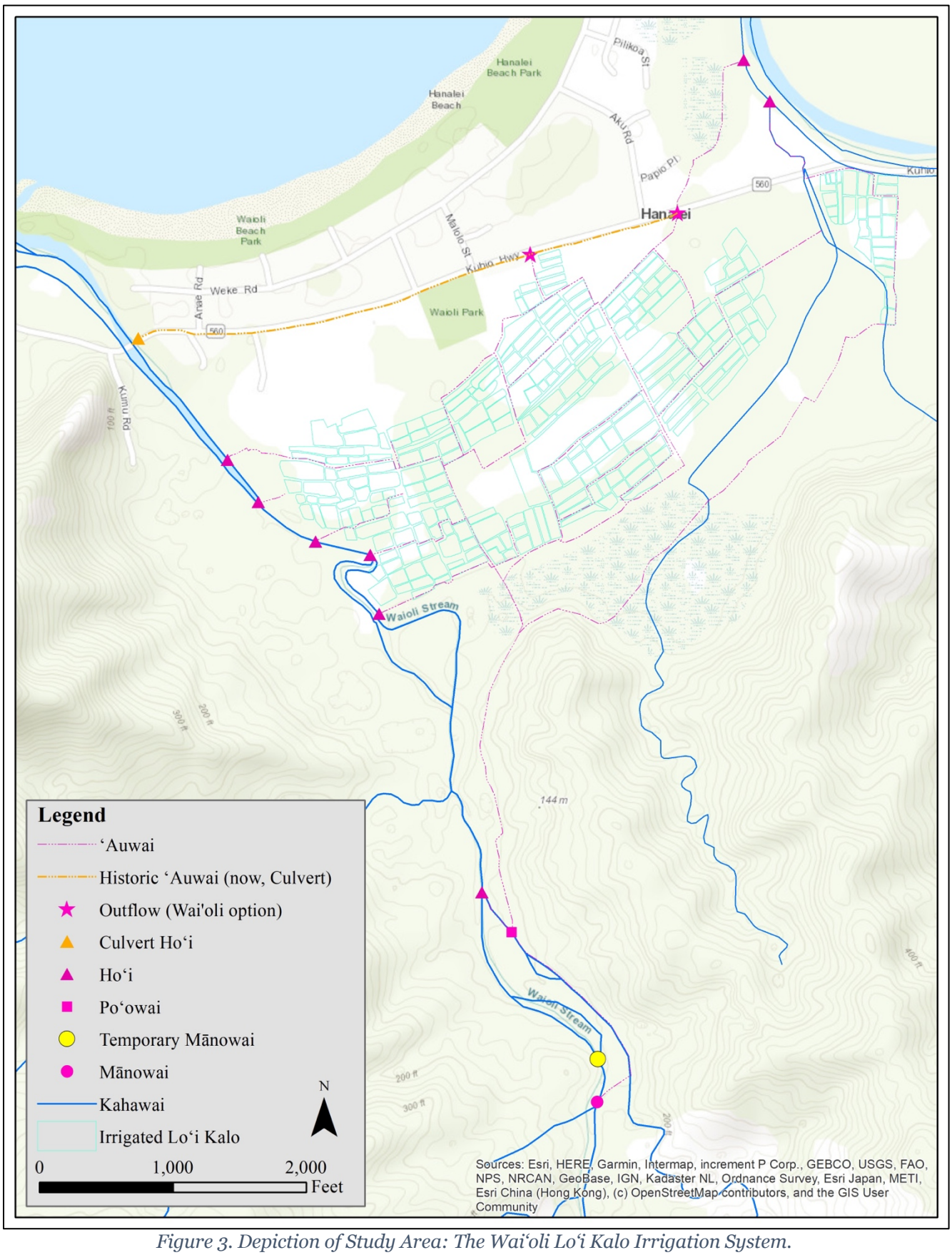

Figure 3. Depiction of Study Area: The Wai'oli Lo'i Kalo Irrigation System.

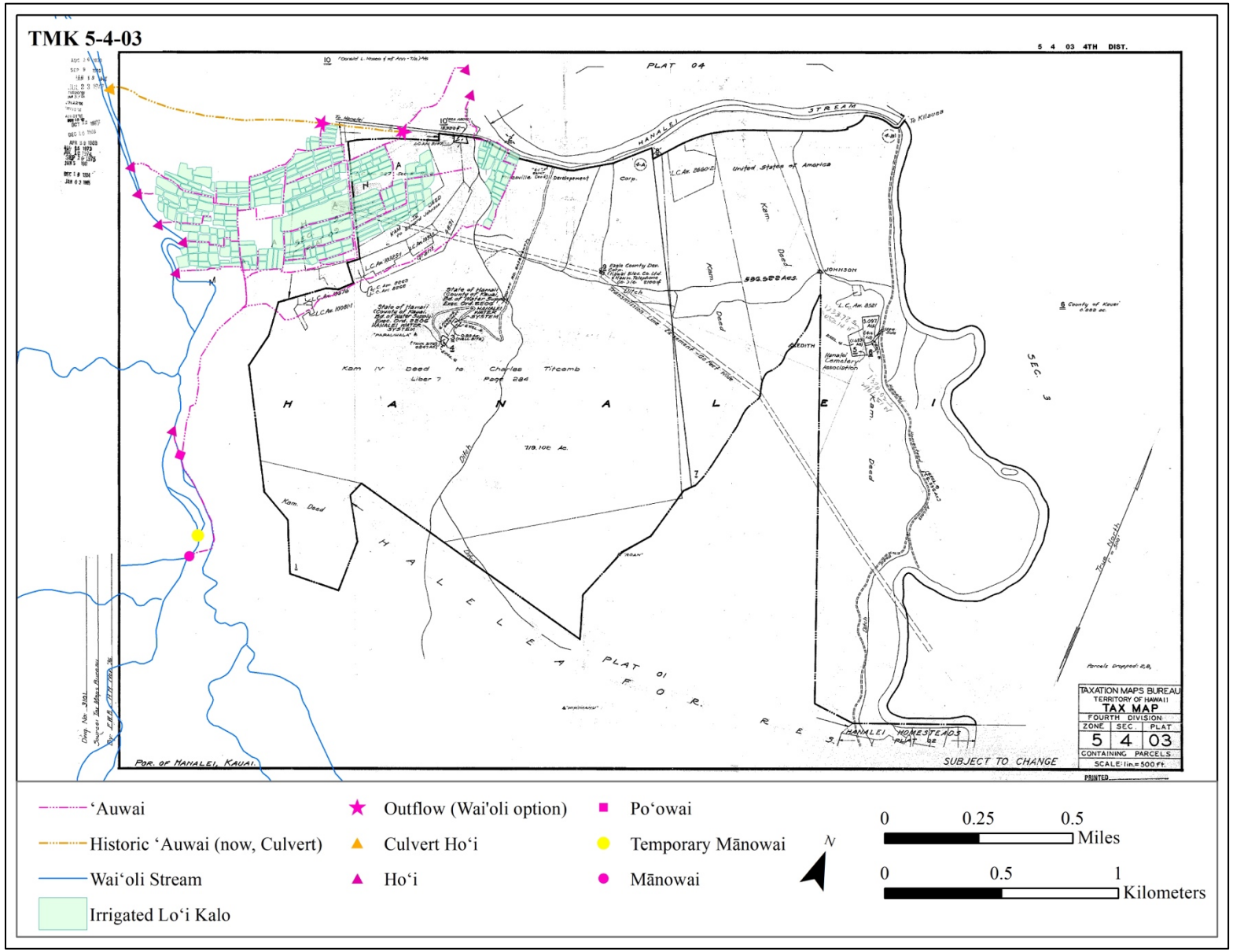

Figure 4. Tax Map Key Plat 5-4-03

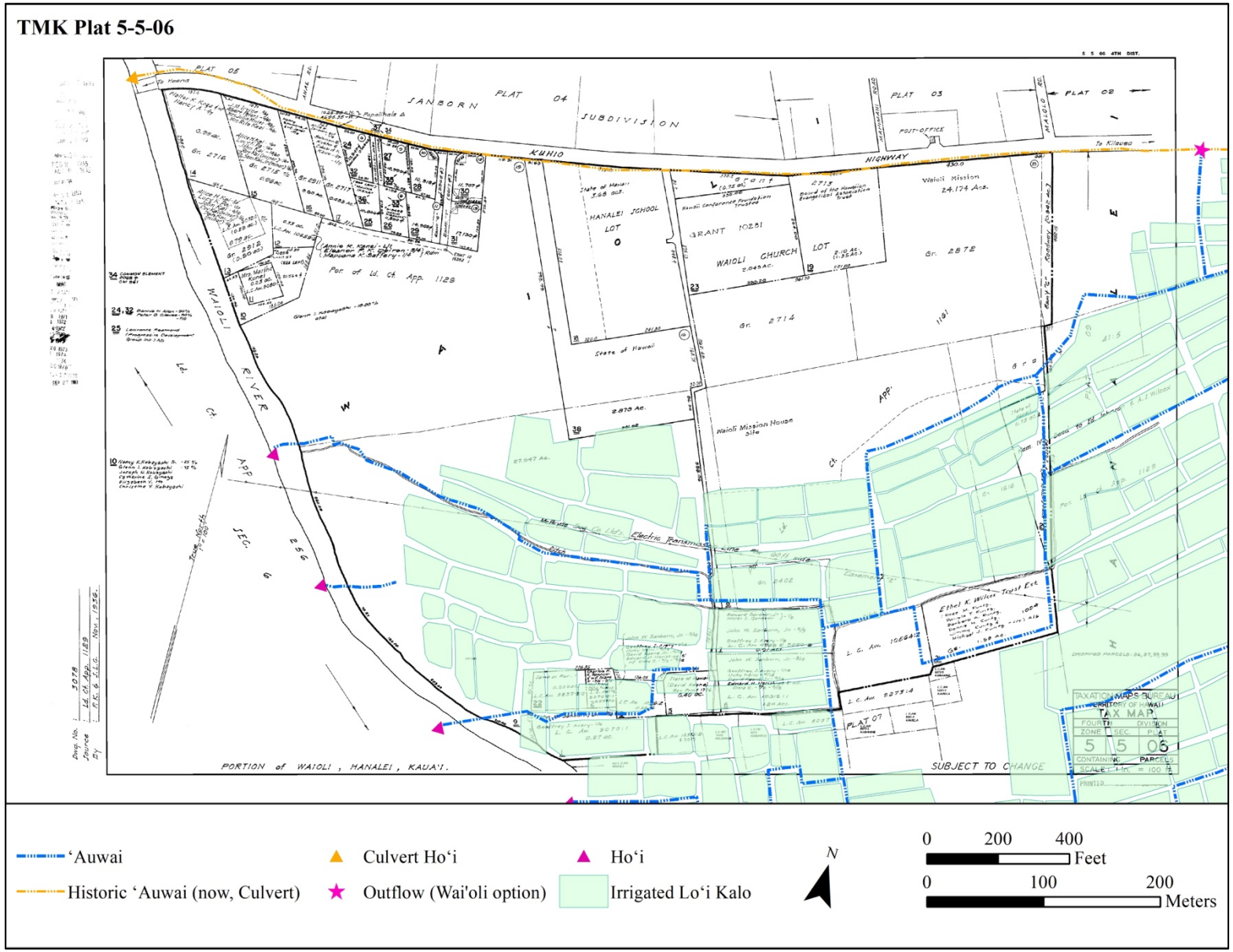

Figure 5. Tax Map Key Plat 5-5-06

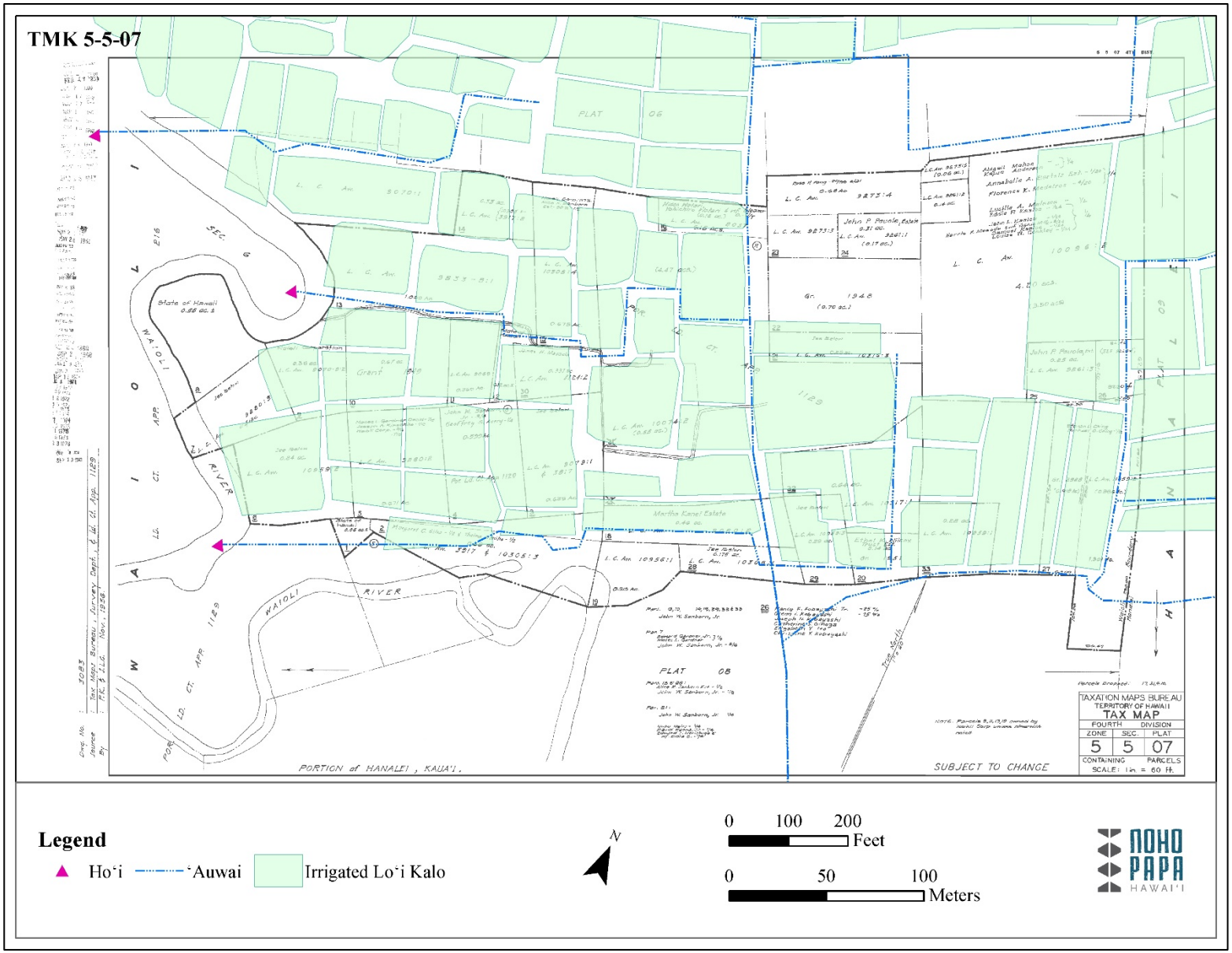

Figure 6. Tax Map Key Plat 5-5-07 depicting location of Wai'oli Lo'i Kalo Irrigation System.

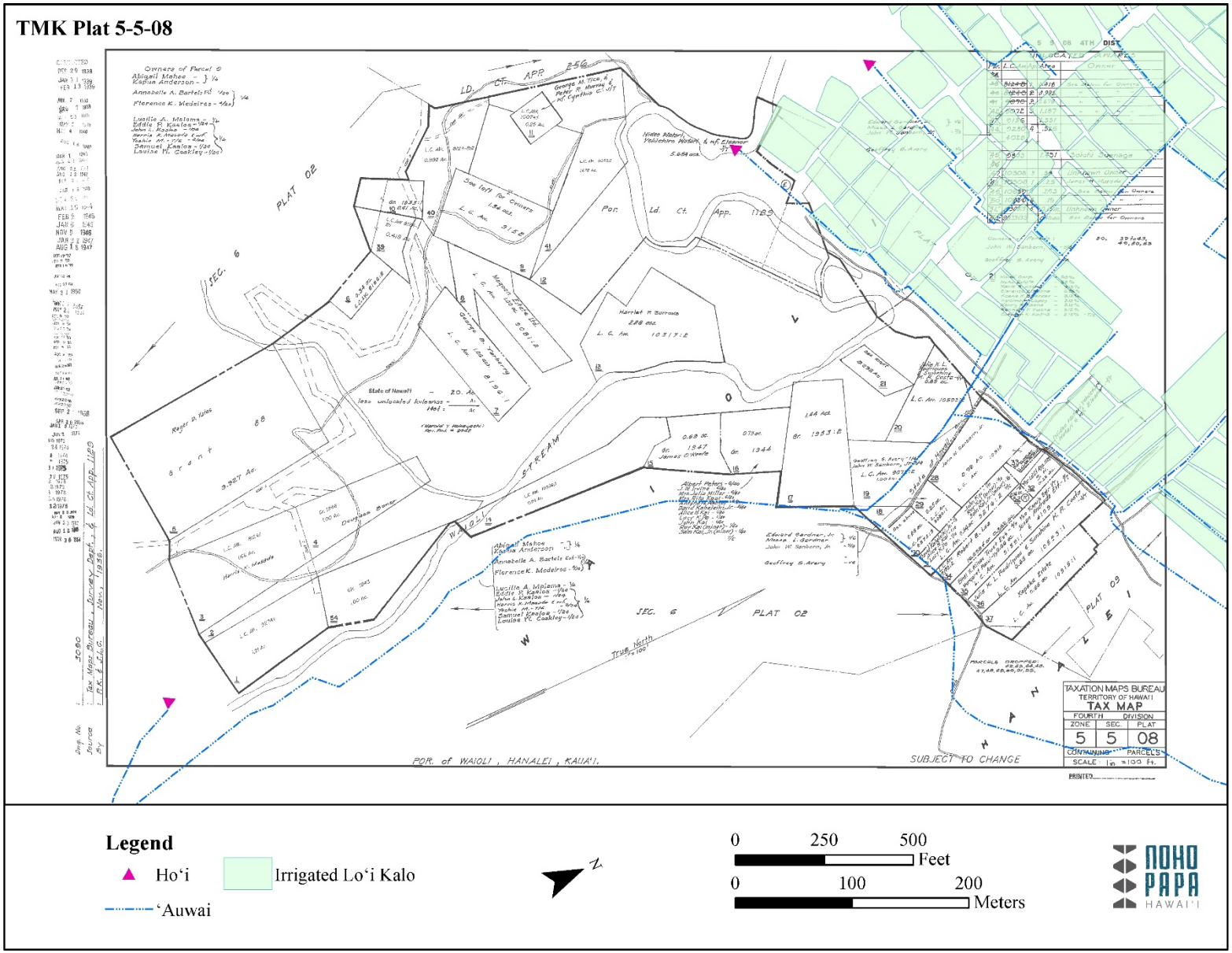

Figure 7. Tax Map Key Plat 5-5-08 depicting location of Waiʻoli Loʻi Kalo Irrigation System.

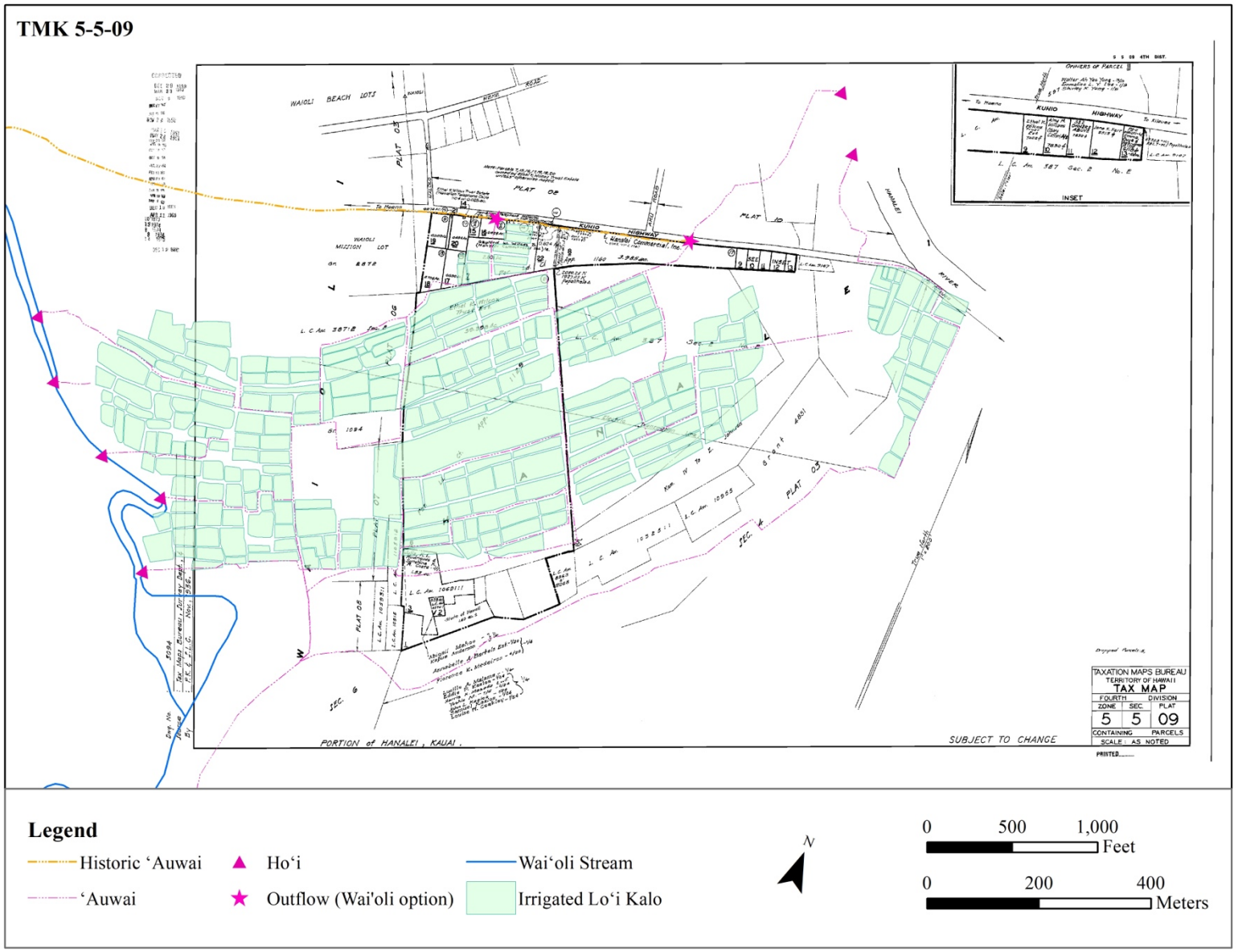

Figure 8. Tax Map Key Plat 5-5-09 depicting location of Waiʻoli Loʻi Kalo Irrigation System.

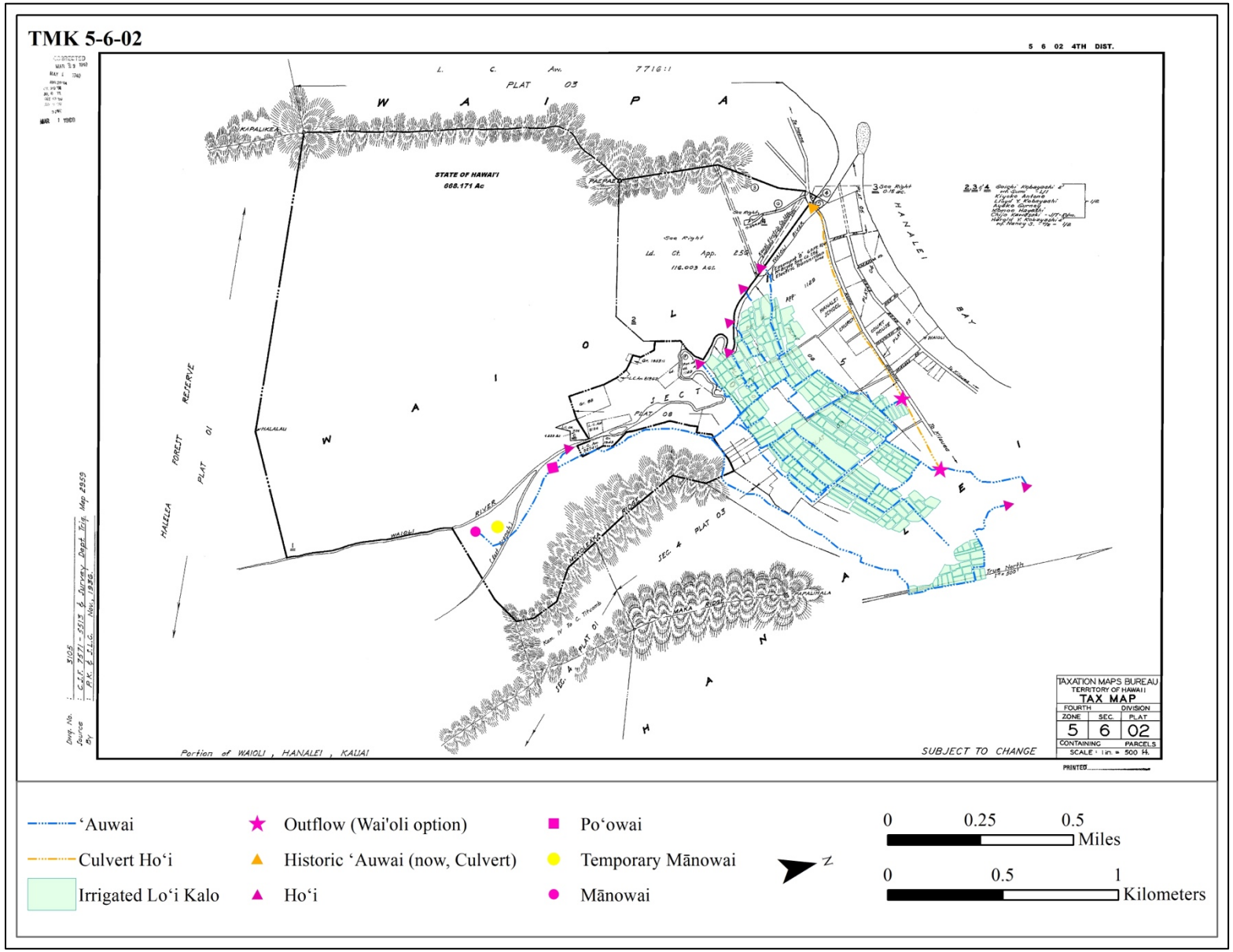

Figure 9. Tax Map Key Plat 5-6-02 depicting location of Wai'oli Lo'i Kalo Irrigation System.

Scope of Work and Guiding Principles

The study spanned a three-month period from August to October 2020. Project personnel included: Kelley Uyeoka, M.A., Dominique Leu Cordy, M.A., Lilia Merrin, M.A., and Momi Wheeler, B.S. While conducting this study, Nohopapa Hawai'i's research team incorporated a set of values to guide our research, analysis, behavior, perspective, and overall frame of reference, including:

- **Aloha ʻāina** - to have a deep and cherished love for the land that created and sustains us
- **Haʻahaʻa** - to be humble, modest, unassuming, and unobtrusive
- **Hoʻomau** - to recognize, appreciate, and encourage the preservation, perpetuation, and continuity of our wahi pana (storied places) and lāhui (nation)
- **ʻIke pono** - to recognize, feel, and understand righteousness, properness and goodness in all we do
- **ʻImi Naʻauao** - to seek knowledge or education; be ambitious to learn
- **Kuleana** - to view our work as both a privilege and responsibility
- **Pule** - to open the connection and communication lines to a higher source of power so that this work is intentionally guided

With these values as a kahua or foundation, the project team also looked to guiding documents, including the Hawai'i Environmental Council's Guidelines for Assessing Cultural Impacts (Appendix A: Guidelines for Assessing Cultural Impacts), A Bill for Environmental Impact Statements (Appendix B: A Bill for Environmental Impact Statements), and Act 50 [State o f Hawai'i 2000] (Appendix C: Act 50 [State of Hawai'i 2000]). Through multiple planning meetings, Nohopapa and the Waiʻoli Valley Taro Hui developed a general scope of tasks to guide this CIA.

1. Project Planning – meetings with the Waiʻoli Valley Taro Hui, made up of sixteen (16) kalo farmers and their families, all with genealogical ties to Halele'a, and topic area experts, including D. Kapua Sproat, Director of Ka Huli Ao Center for Excellence in Native Hawaiian Law and the Environmental Law Clinic at the University of Hawai'i at Mānoa's Richardson School of Law, to develop a framework for this important work.

2. Ethnohistorical Research – gathering relevant cultural and historical information on the Waiʻoli Loʻi Kalo Irrigation System, as well as the surrounding area and resources; and analyzing moʻolelo (oral histories), mele and oli (songs and chants), ʻōlelo noʻeau (poetical sayings), inoa ʻāina (place names), historical maps, photographs, documents, and relevant archaeological reports.

3. Community Ethnographic Interviews – conducting ethnographic interviews with topic area experts and cultural practitioners.

4. Report Compilation – compiling accompanying figures and narratives, and crafting recommendations.

Project Area – The Waiʻoli Loʻi Kalo Irrigation System

Environmental Setting

This Project Area is located on the Island of Kauaʻi, along its north-facing coast, in the moku (traditional Hawaiian land division similar to a district)[1] of Haleleʻa. There are four ahupuaʻa or traditional Hawaiian land divisions that frame Hanalei Bay. From the mountains of these ahupuaʻa, four perennial waters flow their lengths and empty into Hanalei Bay, making up the Hanalei Bay Watershed:

1. Hanalei River
2. Waiʻoli Stream
3. Waipā Stream
4. Waikoko Stream

The ahupuaʻa of Hanalei, Waiʻoli, Waipā, and Waikoko share similar environmental landscapes: sandy shores along Hanalei Bay giving way to low dunes. Immediately inland of the dunes are irrigated loʻi kalo that stretch into the upper valleys, though they span a shorter distance in the shallower valleys on the west. There is great variation in how far inland the upper valleys extend. Hanalei, the easternmost ahupuaʻa, extends over 13.5 stream miles from its mouth to the base of Waiʻaleʻale. Waiʻoli extends over 3.85 miles from its stream mouth to the base of its wai hālau (mountain source): Nāmolokama Mountain. Waipā extends a little over 2 miles from its stream mouth to the base of Mamalahoa. Waikoko, the smallest, and westernmost ahupuaʻa, stretches a mere 0.75-0.80 miles from its stream mouth to its source along the ridge separating Lumahaʻi and Waikoko.

Waiʻoli Loʻi Kalo Irrigation System

The Project Area for the purposes of this report follows the path in which the water flows through the Waiʻoli Loʻi Kalo Irrigation System. The Project Area begins ma uka, in Waiʻoli Stream, 1.8 stream miles from the mouth at Hanalei Bay. Water from the Waiʻoli Stream enters the system here, at the mānowai. A māno wai or mānowai is interchangeable with māno, which is defined as:

> *n*. Dam, stream or water source, headwaters, place where water is obstructed for distribution in channels; *fig*. source of water and of life.[2]
>
> *n*. Artificial head of a stream of water; place where water is assembled for distribution through channels; *fig*. the heart.[3]

A mānowai is also the word used to define the physical heart. It is revealing that the term used to describe the organ that pumps blood through our veins is the same to describe the origin source of any ʻauwai system called a mānowai.

---

[1] There are five (5) moku on Kauaʻi.
[2] Pukui 1986: 239.
[3] Andrews 1922: 419.

An apt metaphor, the mānowai is the source of water for the entire Waiʻoli Loʻi Kalo Irrigation System. As the heart of this system, the mānowai guides water from Waiʻoli Stream into a channel 1.8 miles upstream of its mouth. A mere 0.38 miles downstream from the mānowai is the poʻowai. From the poʻowai, water is split into two paths. The first path returns water to Waiʻoli Stream at the first hoʻi (return or out-take) of the system and the second path allows water to flow parallel to the stream along the main ʻauwai. Close to 0.46 miles down this ʻauwai from the poʻowai (and approximately 0.84miles from the mānowai) is the main Waiʻoli split. At this split, the waters divide to flow north, into the Waiʻoli side of the system and east, towards the Hanalei side of the system.

From the main ʻauwai entering the Waiʻoli coastal plain, smaller ʻauwai branch out, flowing in and out of loʻi kalo before returning to the Waiʻoli Stream at various hoʻi that mark the terminus of the system. Eventually, the waters from the mānowai flow back into Hanalei Bay.
If the mānowai is broken, destroyed or blocked; if it falls into disrepair; if a large flood occurs; or if the rights are lost to collect water at that crucial part of Waiʻoli Stream, the entire ʻauwai system would dry up. Much like a failed heart that can no longer pump blood, if the mānowai fails or is not permitted, there is no water and, thus, no life.

Kalo (Colocasia *esculenta*), taro

Although kalo is cultivated across the Pacific, Hawaiʻi is the only place where kalo achieved agricultural dominance and became the primary staple crop of a people. In Hawaiʻi, kalo is pounded (kuʻi) into paʻi ʻai (pounded but undiluted taro) using a papa kuʻi ʻai (poi board) and a pōhaku kuʻi ʻai (poi pounder). Kalo nourished the bodies of the earliest Kānaka Maoli, and it became a traditional cultural food source. The practice of ʻai pono, the preparing and eating of Native Hawaiian traditional and customary foods, continues today. These foods include many made with kalo: poi, paʻi ʻai, kūlolo, laulau, and lūʻau. Of the kalo plant, one can eat the lau (leaf), the ʻiʻo (corm), and even the stem (hā).

Figure 10. Photograph of kalo fields, Waiʻoli ahupuaʻa, Hīhīmanu in the background.

In the Native Hawaiian pantheon, kalo is more than a plant or a source of nourishment. Hāloa is the elder brother of Kānaka Maoli and holds a special place in the mythological history of Native Hawaiians. There are several origin stories of Kānaka Maoli, but the story of Hāloa is less biblical than others, and perhaps older.[4] The akua (god) of the heavens, Wākea, and the akua of the earth, Papa, were with child, and Papa gave birth to Hoʻohōkūkalani, a daughter. Hoʻohōkūkalani became hāpai (pregnant) but her first child, Hāloa, was stillborn. Hoʻohōkūkalani mourned and her tears watered the earth where she buried her child, Hāloa. From that very spot grew a plant, named Hāloanakalaukapalili, the first kalo plant.

Lau-Kapalili. Lau-kapalala.
Tremble leaf. Broad-leaf.[5]

Hoʻohōkūkalani became hāpai again; this child lived, and he too was named Hāloa, in memory of his elder brother. Hāloa went on to be the progenitor of the Hawaiian people and Hāloanaka, the progenitor of kalo.

Through this moʻolelo, Kānaka Maoli and every kalo plant share a moʻokūʻauhau, a genealogy, through the line of Hoʻohōkūkalani. It is no wonder that the 12-15 month cultivation of this plant is a traditional and customary Native Hawaiian practice. More than one farmer has spoken of the kalo growing in their loʻi as their children.

I maikaʻi ke kalo i ka ʻohā.
The goodness of the taro is judged by the young plant it produces.[6]

To honor their kūpuna (ancestors), Hāloa, and to feed their own children, Kānaka Maoli built "complex irrigation ditches to extract (and return) water from permanent streams and closely controlled water flow and circulation within the fields to control stagnation, temperature and prevent disease."[7] In almost every windward lowland valley with a perennial water source, kalo was cultivated, until the irrigated loʻi (wetland field) agricultural system that sustained it evolved into a uniquely Native Hawaiian cultural landscape.

Cultivation practices of kalo farmers – both of long ago and today – are rooted in the cultural practice of kilo (observation). At least two of the kalo farming families in Waiʻoli observe the moon and plant according to the Hawaiian Moon Calendar, kaulana mahina. In this practice, there are moons for harvesting, moons for planting, and moons for weeding. Irrigated loʻi kalo farming requires the observation of kalo, the seasons, weather, as well as the maintenance of the irrigation system, from ma uka at the mānowai, to the hoʻi along the stream, to the muliwai at the stream mouth. Kalo farmers recognize the need to maintain balance throughout the entire system to grow healthy kalo.

The Waiʻoli Loʻi Kalo Irrigation System is an extremely interconnected Indigenous Hawaiian agroecosystem[8] that stretches across the coastal plains of Waiʻoli and Hanalei, and is situated

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[4] *Moolelo Hawaii Kahiko: Ka Moolelo o ko Wakea ma Noho ana ma Kalihi – Ka Laa ana o keo Ahua Ulu o Kameha'ikana,* Ka Nai Aupuni, 22 June 1906; *Moolelo Kahiko No Hawaii, Mokuna III, Ka Moolelo o ko Wakea,* Ka Hoku o Hawaii, 9 April 1929.
[5] These were the names given to the leaves of the very first kalo plant, which according to legend was named Hāloa. Kalo leaves are sometimes referred to poetically by these terms. Pukui, No.1952, 1983: 211.
[6] Parents are often judged by the behavior of their children. Pukui, No.1232, 1983: 133.
[7] Kurashima et al. 2019.
[8] Kurashima et al. 2019.

behind the dune system that stretches from the mouth of Waiʻoli Stream to the base of Papalihala. The majority of the Project Area elevation is at sea level to 10 feet above mean sea level (amsl). The elevation of the poʻowai is at ≤50 feet above mean sea level and the mānowai is between 100-125 feet amsl (GDSI data set, Kauaʻi 50-foot contours). The remainder of the ʻauwai, the loʻi, and all hoʻi are situated within 0-10 feet amsl.

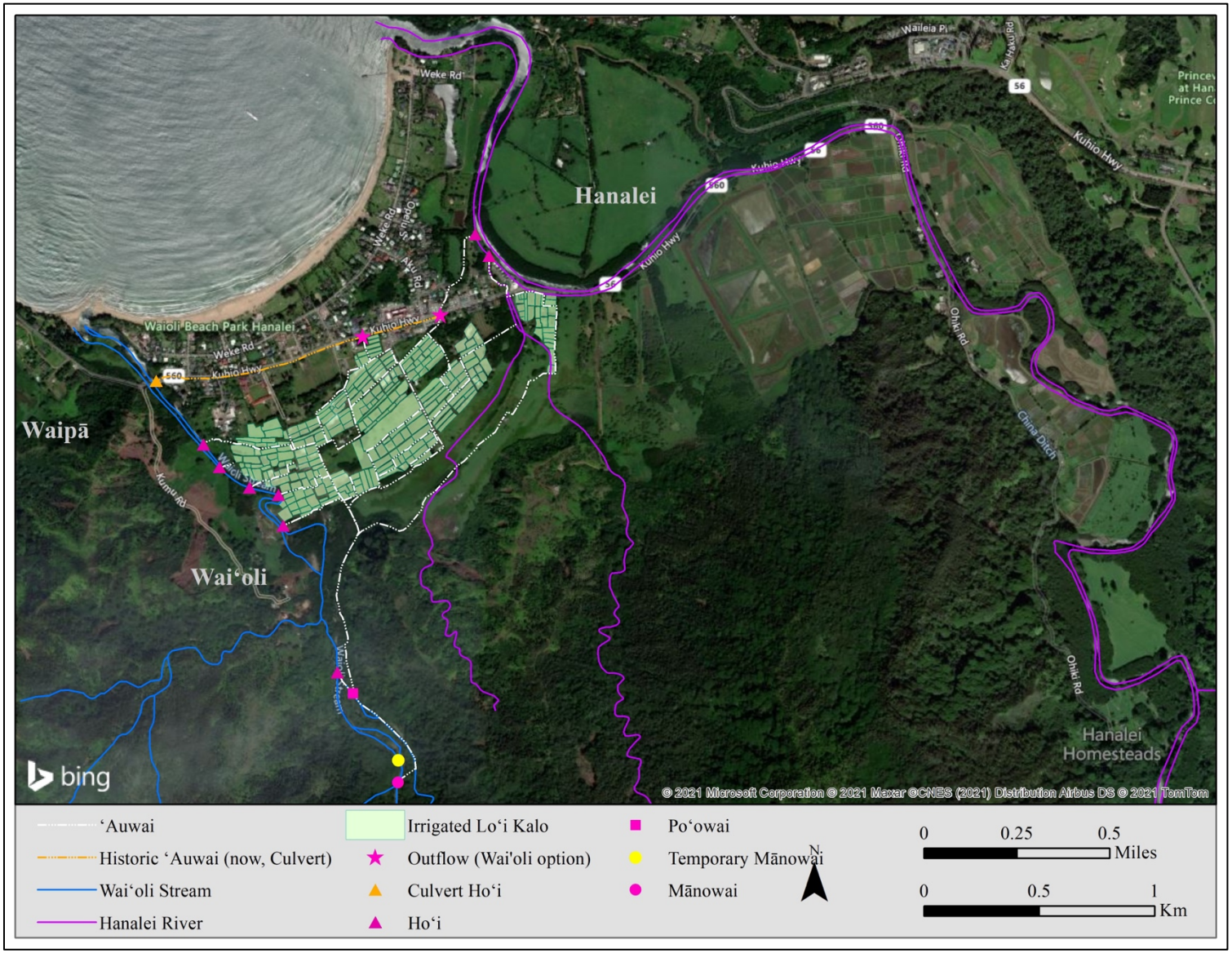

Figure 11. The Project Area, showing the Waiʻoli Loʻi Kalo Irrigation System as reconstructed from historical research, community interviews and GIS data.

Archaeological Context

This portion of the report generally discusses previous archaeological studies along or beyond the boundaries of the Project Area to better understand the larger settlement patterns, history, and cultural landscape of the area.

No archaeological work has been conducted within the irrigated fields of the Waiʻoli Loʻi Kalo Irrigation System. A chronological summary of archaeological work conducted within and nearby the Project Area is presented in the table below. Some archaeological work has been conducted along Kūhiō Highway, in the coastal sand areas seaward of the Waiʻoli Loʻi Kalo Irrigation System. This seaward archaeological work consists of discrete projects or inadvertent discoveries associated with private home development or public works projects (e.g., pipelines, roadwork, etc.).

The archaeological reports in the coastal sand areas have recorded iwi kūpuna (ancestral remains) along the coastal dunes, which is consistent with where people would have lived and buried their ʻohana (family members). This corresponds with the pāhale, per Māhele claims, which were the dominant land use in the sand dunes seaward of the Project Area and Kūhiō Highway.

Table 1. Previous archaeology in Waiʻoli ahupuaʻa and the surrounding area.

Reference	Location	Type of Study	Results and Comments
1976 Neal (KHS)	North shore Route Hanalei bridge – Hāʻena	NRHP Nomination Form	
1979 Cleghorn	Hanalei Refuge	Arch Reconnaissance	
1979 Hammatt & Folk	Waiʻoli Mission Hall	Arch Excavations	
1980 Schilt	Hanalei Refuge	Arch Investigations	
1980 Kennedy	Waiʻoli	Arch Reconnaissance	
1991 Kennedy	Hanalei	Arch Data Recovery	
1993 Shapiro, Shapiro, & Cleghorn	Hanalei Refuge	Arch site records from arch field investigations	
1993 Shapiro	Hanalei Refuge	AIS post field summary	
2014 Runyon, Shideler & Hammatt	Hanalei (town)	AIS	
2017 Hazlett & Dega	Waiʻoli-Hanalei	Draft – Arch Monitoring Plan	
2017 Hazlett & Dega	Waiʻoli-Hanalei	Arch Assessment	
2020 McMahon	Hanalei	Arch Field Inspection	
2020 McMahon	Hanalei	“Ka Paʻakai Analysis”	

Formation of Traditional Irrigation Systems across Hawai‘i

Because of the absence of archaeological study specific to Wai‘oli, project staff surveyed manuscripts and reports beyond Wai‘oli Valley, in neighboring Hanalei as well as other traditional irrigation systems similar in scale, production, and geographic setting to Wai‘oli. This is far from a complete review of the development of irrigated kalo cultivation. The purpose of this research, rather, is to better estimate when irrigated lo‘i kalo cultivation developed in Wai‘oli.

There is no agreement in the archaeological community today on a definitive early settlement date in Hawai‘i. The most likely dates for settlement are between AD 300-600 and AD 800-1000.[9]

The traditional irrigated kalo system at European contact usually consisted of lower valley and upper valley patterns. Canals or ‘auwai that branch out to multiple lo‘i (walled fields) are characteristic of wetland plains in the lower valleys, with water draining back into the valley stream. In upper valleys, there are descending terraces with water flow commonly from an upper valley tributary stream or spring into the uppermost terrace, and then flowing terrace to terrace and back into the stream. The chronology of the formation of these systems is not fully known in most areas of the islands.

All researchers agree that there would have been kalo cultivation in the wetlands of lower valleys during initial settlement of the islands, but likely not in walled irrigated fields. There are dated kalo soils in the lower valley wetlands of Wai‘anae, Waikīkī, and Honouliuli on O‘ahu in the AD 1000-1100 range, which suggest more extensive wetland planting on the leeward side of O‘ahu and probably some type of water control, and perhaps walled fields. Kalo evidence within walled fields (root stains, field soils, etc.) has been found in lower- and mid-valley floodplains from several major islands on both windward and leeward sides with dates ranging from AD 1200s-1400s (Kailua on O‘ahu, Wailau on Moloka‘i, Waipi‘o on Hawai‘i). A range of dates for upper valley terraces in Maunawili in Kailua and Luluku in Kāne‘ohe on windward O‘ahu span a range of AD 900s-1200s, with Luluku possibly earlier, and one would expect contemporaneous, if not earlier, walled fields in the lower valley wetlands of Kailua and Kāne‘ohe.

Researchers have not established a complete chronological development of wetland to irrigated fields in any prime early sites throughout Hawai‘i. One example is in Waipi‘o, Hawai‘i Island, where dating of fields found that irrigated fields were present in the mid-valley floor in the AD 1200s-1400s and that the side valley terraces of Hi‘ilawe dated in the AD 1600s, suggesting side valley terracing came later than that on the valley floor. Because this sampling did not include the seaward portions of the valley floor behind the coastal dune, it is unknown when this area was put into walled irrigated fields. The researchers noted that this was a wetter area, and thus may have converted to fields with canals later than the mid-valley areas or at the same time.

Early Settlement in Halele‘a

Hanalei Bay is likely to have been an early settlement area on Kaua‘i. “As with windward O‘ahu, the windward coast of Kaua‘i would have been a favorable environment to early settling parties,

[9] Kirch 1979; Cordy 2000; Cordy unpublished manuscript (pending, 2021).

and future work in this region will likely turn up additional indications of lengthy occupation."[10] Early Kānaka Maoli arriving at Hanalei Bay would have found an optimal environment – high rainfall for rain-dependent crops, wetlands for kalo, and sandy beaches and calm seas for easy access to marine resources. After landing on shore, arriving peoples would have most likely started to establish their "transported landscapes,"[11] immediately tending to the animals and plants they had brought with them on the canoe. Kalo would have been one of these important early plants, but would not have been planted in large irrigated field systems at that time, which would come later.

In early settlements, housing along with tree crops and probably rainfall-dependent crops would have been placed along the bay, with kalo in the adjacent wetlands of Hanalei and Waiʻoli, or nearer to the base of the mountains if the seaward-most part of the coastal plain was too wet.[12] In the early years as the population grew, it was likely that more houses appeared on the sandy shore and possibly some up on the dry slopes right behind the wetlands.[13] For the upper valley of Hanalei, a date range of AD 600s-900s has been determined from deposits under later irrigated kalo soils, suggesting earlier slash-and-burn cultivation and some form of housing just at the beginning of the upper valley, but not a complex irrigation system.[14] If correct, this date would suggest that irrigated wetland kalo was not yet spread into the upper valley of Hanalei, but people were farming near the front of the upper valley less formally. Based on settlement patterns across Hawaiʻi, it can be assumed that the inland coastal plain of Waiʻoli would have likely had an established loʻi kalo system before those in upper Hanalei Valley.

Though the cultural landscape in Waiʻoli and greater Haleleʻa would have taken time to establish after early settlement, it is fair to assume that the Waiʻoli area would have been an optimal early settlement area and that most of the coastal wetlands of Waiʻoli were in loʻi with water coming from canals by AD 1200s-1400s (if not earlier). Still, the exact chronology is not known at this time. The Māhele documentation detailed in the next section on Ethnohistory, specifically the Native Testimony in support of Land Commission Awards, establish loʻi use from the 1500s.

Soils and Flooding

Waiʻoli has some of the most productive soils for wetland kalo agriculture in the entire State of Hawaiʻi, and have supported an extensive irrigated system of loʻi kalo in the Waiʻoli and Hanalei floodplains for hundreds of years.

[10] Kirch 1985.
[11] Kirch 1989.
[12] James W. Gay, *Plain of Waioli, Situated on the Island of Kauai.* Register Map 927, October 7, 1873.
[13] Griffin et al. 1977.
[14] Schilt 1980.

Table 2. Table of Study Area soils.

Munsell Symbol	Soil Description	Farmland	Erosion
HmA	Hanalei silty clay loam, 0 to 2 percent slopes	Prime farmland if protected from flooding or not frequently flooded during the growing season	Not highly erodible land
HnA	Hanalei silty clay, 0 to 2 percent slopes	Prime farmland if protected from flooding or not frequently flooded during the growing season	Not highly erodible land
Mta	Mōkūleʻia clay loam, poorly drained variant	Not prime farmland	Not highly erodible land
MZ	Marsh	Not prime farmland	Not highly erodible land
W	Water > 40 acres	Not prime farmland	Not highly erodible land

These flood prone soils are necessary to support the intensive wetland cultivation that characterizes the Waiʻoli Loʻi Kalo Irrigation System. Harold Baker's 1975 study *Agricultural Lands of Importance to the State of Hawaii* provides an appraisal of farmland based on soils across the State (Table 2). Forty-five years later, Baker's report is still used to categorize and assess soils; it is a companion download to the soils shapefile layer on the Hawaiʻi Statewide Geographic Information System ("GIS") Program website.[15] Baker's value for prime farmland, however, is measured through the lens of intensive farming. It is curious that such fertile soils would get a conditional farmland classification as prime farmland only "if protected from flooding or not frequently flooded during the growing season."[16] The very nature of the Waiʻoli Loʻi Kalo Irrigation System prevents frequent and seasonal flooding. The mānowai is designed to break away during large flood events, preventing inundations of the agricultural system. This flood control mechanism has been in place for centuries in Waiʻoli – well before the State of Hawaiʻi or Territory of Hawaiʻi farmland typology evolved.

From an agricultural perspective, the cultural cultivation of kalo requires adaptability and a community of practice to maintain over 6.15 miles of ʻauwai. Adaptability is important for a system like Waiʻoli's, which is situated in a floodplain. Annual rainfall in the Project Area averages about 118.22 inches/year (3,000 mm).[17] Rainfall, however, can vary greatly throughout the year. In addition, in the uppermost reaches of Waiʻoli Valley at its wai hālau, Nāmolokama Mountain, the average rainfall in a year has been recorded at 236-275 inches.[18] Extreme weather events in 2018 caused massive damage to the Waiʻoli mānowai, generated landslides along Makaihuwaʻa, the ridge separating Waipā and Waiʻoli, and sent floodwaters across the coastal plains of Waiʻoli and Hanalei, into Hanalei Town. As mentioned previously, the mānowai, the

[15] State of Hawaiʻi, Office of Planning GIS Program.
[16] Baker 1975.
[17] Giambelluca et al. 2013; State of Hawaiʻi Office of Planning GIS data.
[18] Giambelluca et al. 2013; State of Hawaiʻi Office of Planning GIS data.

intake at the top of the system, is designed to fail under large flood events, as is the poʻowai; this way, torrential waters aren't forced into the system, possibly destroying the main ditch and the system of ʻauwai and fields below.

Although many have referred to the April 2018 flood as a 100-year flood or a 500-year flood, it was actually a 143-year flood. A similar rain event occured in Waiʻoli in May 1877, and was recorded in the following account in a Hawaiian language newspaper (nūpepa).[19]

Ka Nupepa Kuokoa: 2 Iune 1877	Ka Nupepa Kuokoa: 2 June 1877
Ma ka lā 16 o kēia māhina, he kuāua koʻikoʻi kai hāʻule iho ma nā Mauna uliuli o Hanalei. A ua ʻike ʻia aku ka piha pono o nā awāwa i nā wai e hiolo mai ana ma ke alo o nā pali, a i ka puka ʻana mai o kēia wai i kai, ua hōlapu aʻela ʻo ia i nā hale, a me nā ʻĀina kokoke i ka lihi kahawai, a ua paʻa pū kekahi mau ʻāina i ka lepo, ke aʻa me nā paukū lāʻau. He nui nō nā waiwai i pohō ma muli o kēia pilikia ʻike mua ʻole ʻia. Eia nā mea i lilo loa aku i ka wai, Puaʻa, Moa, Kao, Lio, a me kekahi mau waiwai ʻē aʻe, he mau kaʻa Hoki kekahi, a he mau kaʻa hali ko kekahi, a me nā hale. He nui ka pohō o ka poʻe mahi Laiki. ʻAʻole i hoʻoʻuluʻulu pono ʻia ka nui o kēia pohō, ʻakahi nō a pili pono kēia inoa iā Hanalei ka ua loku o Hanalei, ka ua loku ʻia ke hele ala a noho pono nā pōhaku a me nā pīhā a i loko o nā loʻi kalo. ʻAʻole ʻo ia wale he pali kekahi ua hiolo ʻia. ʻAneʻane piha ka ʻEka i kahi a kēia pali i hiolo ai kona mau lepo. He mau lono kai lohe ʻia mai. Aia ma Anahola kekahi haʻawina o kēia ulia pōʻino. Me ka mahalo. R. Puʻuiki Hanalei Kauaʻi Mei 19, 1877	On the 16th of this month, a large rain bank fell on the dark mountains of Hanalei. And we saw the valleys filling with water that tumbled down the face of the cliffs, and when the water came out toward the ocean, it spread over houses, and on the lands close to the edge of the rivers, and some places were covered with dirt, rocks and large pieces of wood. There was a lot of property that was destroyed because of this disaster that had never been seen before. Here are the things that were completely lost in the flood water; pigs, chickens, goats, horses, and some other kinds of property, some mule carts, and some peoples haul carts, as well as houses. There were a lot of losses for those farming rice. The amount of loss has not been truly summarized, we have just come to understand this name associated with Hanalei, Hanalei in the torrential rain, when torrential rain flows the rocks and other detritus materials end up inside of the taro fields. That was not all, a cliff also tumbled down. The acreage where this cliff fell was filled by its dirt. These are just some things I heard. In Anahola there were also some other things that came from this disaster. With thanks. R. Puʻuiki Hanalei Kauaʻi May 19, 1877

[19] R. Puuiki, *Ka Wai Kahe Nui ma Hanalei*, Ka Nupepa Kuokoa, 2 June 1877. Translated by Devin Kamealoha Forrest.

Although Pu‘uiki’s account of the May 1877 flood event does not explicitly state that the landslide occurred in Wai‘oli, but it can be inferred based on the annotations of the map in Figure 11. This map was made in 1893, and annotations next to the landslide identified two dates: 1875 and 1877. According to exhaustive research in the nūpepa, Pu‘uiki’s article was the only reference found to date that refers to a major cliff collapse event in the Wai‘oli/Hanalei area. It occurred along the slopes of Makaihuwa‘a and changed the course of the Wai‘oli Stream, altering the riparian zone, and rendering some lo‘i un-farmable (too wet). This landslide was recorded on more than one historic map.[20]

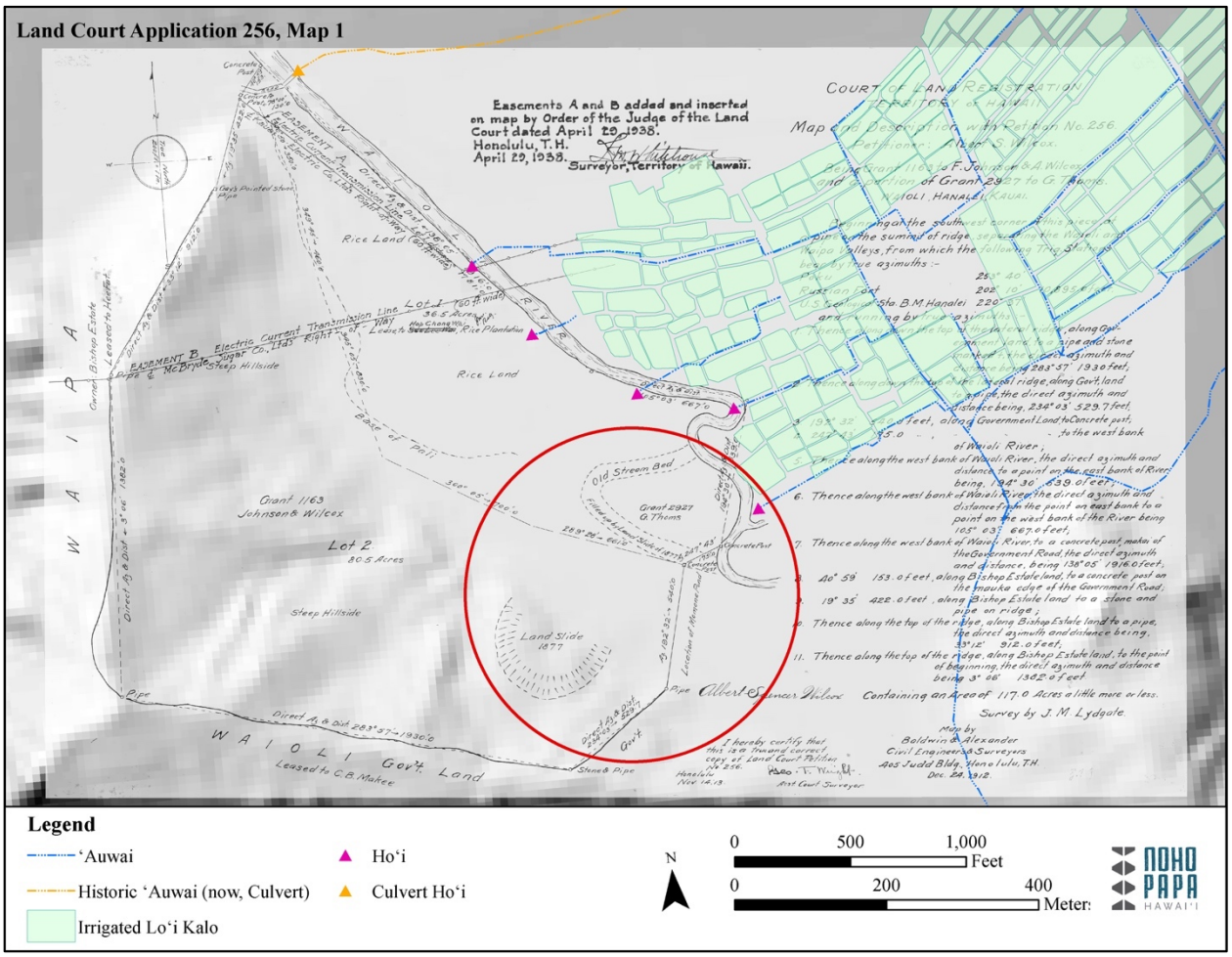

Figure 12. Land Court Application M256, Map 1, situating the Wai‘oli Lo‘i Kalo Irrigation System with the 1877 landslide and stream course alteration.

In 1877 and again in 2018, intense flooding damaged the Wai‘oli Lo‘i Kalo Irrigation System and the communities who depend on it. Despite this, both the system itself and the people have managed to adapt and persevere. Given the parallels between these two events, it can be reasonably assumed that there were other massive floods in the past. The coastal plains of Wai‘oli and Hanalei, though incredibly fertile and abundant, are harsh environments, prone to

[20] Walter A. Wall, *Waioli Kauai*, Register Map Number 1680, 1893; Baldwin & Alexander, Land Court Application 251, Map 1, December 1912; J. M. Lydgate, *Portion of Waioli Kauai*, Register Map Number 2625, May 1922.

flooding and heavy rain in normal times, and intermittent but catastrophic torrential rains, landslides, and floods.

In sum, the Waiʻoli Loʻi Kalo Irrigation System was designed as the most optimal agricultural system for the Waiʻoli plain given the settlement patterns, soils, and rainfall in this area.

Ethnohistory – From Time Immemorial

Methods

The research team examined a variety of repositories and resources to develop a general description of the natural, cultural, historical, and archaeological background of the Waiʻoli Loʻi Kalo Irrigation System. Project staff gathered information about the natural landscape by reviewing County, State, and Federal GIS data, atlases, maps, scientific reports, reference books and archaeological investigations. Staff compiled inoa ʻāina, moʻolelo, oli, and ʻōlelo noʻeau from both Hawaiian and English language sources in books, newspapers, online databases, and archives. Staff also collected historical accounts of the Waiʻoli ahupuaʻa from primary and secondary documents including records, journals, newspapers, and previous reports from various state and private collections such as the Bernice Pauahi Bishop Museum ("BPBM") Archives, the State Historic Preservation Division ("SHPD"), and Kauaʻi Historic Society ("KHS"). The research team gathered historical land documents and Māhele data from the Buke Māhele, Boundary Commission Records, and the Biennial Report of the Commissioners of Crown Lands, 1894, and retrieved historic maps from the State of Hawaiʻi's Department of Accounting and General Services ("DAGS") online database. Last, project staff complied archaeological information from previous archaeological reports and studies available from SHPD. The digital archival repositories utilized include: Ulukau, AVA Konohiki, Hawaiʻi Office of Planning GIS repository, Papakilo Database, Kīpuka Database, various Hawaiian language newspapers, and others.

Place Names – Nā Inoa ʻĀina

The thousands of place names recorded and still used today provide a glimpse of how nā poʻe kahiko (people of old) understood the landscape of Hawaiʻi. A place name may explain a commemorative event, describe an important person or the physical environment, reveal the function of the land, or do all of these things at once. When explaining the concept of mana that is instilled in a name, Pūkuʻi writes:

> Once spoken, an inoa took on an existence, invisible, intangible, but real. An inoa could be a causative agent, capable of marshaling mystic elements to help or hurt the bearer of the name. And so went the belief, the more an inoa was spoken, the stronger became this name-force and its potential to benefit or harm.[21]

Waiʻoli literally translates as "joyous water." It is the land division, a stream, and a channel, encompassing an area of 3,350 acres. The upper portion of Waiʻoli contains three massifs: Māmalahoa, Nāmolokama, and Hīhīmanu. Māmalahoa is in the west, perhaps named after the wife of Kāne; Nāmolokama ("interweaving bound fast") in the south, which is known for its

[21] Pukui, Haertig & Lee 1972: 94.

abundant waterfalls and Hīhīmanu ("sting-ray") because of its ray-like appearance, that encompasses the back valley of Waiʻoli.[22]

The lower portion of Waiʻoli is bounded to the east by the kalo lands of Kuhimanu ("direction of the birds"), which abuts Kamōkoleaka ("red hued ridge") a ridge that connects to Hīhīmanu bordering and branching into the adjoining Hanalei ahupuaʻa. On the western border, dividing the ahupuaʻa of Waiʻoli from the ahupuaʻa of Waipā, is a ridge paralleling Waiʻoli River named Makaihuwaʻa ("eyes for the canoe prow") which according to Wichman, is the site where menehune fishermen built a platform and placed large torches, creating the first lighthouse in Hawaiʻi.[23] On Makaihuwaʻa is the ʻōhiʻa grove of Kūpākoili, which extends from Waiʻoli into the adjoining ahupuaʻa of Waipā. The wood was used in ancient times to create farming implements and in more recent history, to create a lānai and party area for a visit from King Kalākaua in 1874.[24] The grove started to shrink in size in 1913 and very little evidence of the grove exists today.[25]

In addition to these ancient place names and boundaries, Waiʻoli has names that stem from its connection to initial missionary settlement in the early 19th century. For instance, Betelema/Betelehema, founded in 1820 by Whitney, was a religious community that helped William Alexander expand the Waiʻoli mission station.[26] Another mission-influenced place name is a kukui grove named Kālema, "Salem," which is where William Alexander would hold church services prior to the construction of the mission meeting house.[27]

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[22] Wichman 1998: 136.
[23] Wichman 1998. Akina, however, claims that the menehune in fact built the entire ridge in a single night as a way to "hookaulana mau i ko lakou inoa menehune" or "ensure the fame of the menehune people." Akina 1913: 18.
[24] *Ka Huakai a ka Moi Kalakaua i Kauai*, Nuhou, 24 March 1874.
[25] Kamahele, *Ka Ike hou ana o ke Kamahele i ka Mokupuni o Kauai*, Ka Nupepa Kuokoa, 5 December 1913.
[26] N. Keoahu, *Waioli Kauai Ian 23, 1835*, Ke Kumu Hawaii, 15 April 1835.
[27] *Papa Hoike i na Kula o Waioli*, Ka Nonanona, 15 March 1842; *Ka Anesona Moolelo no Kauai*, Ka Nupepa Kuokoa, 25 May 1865.

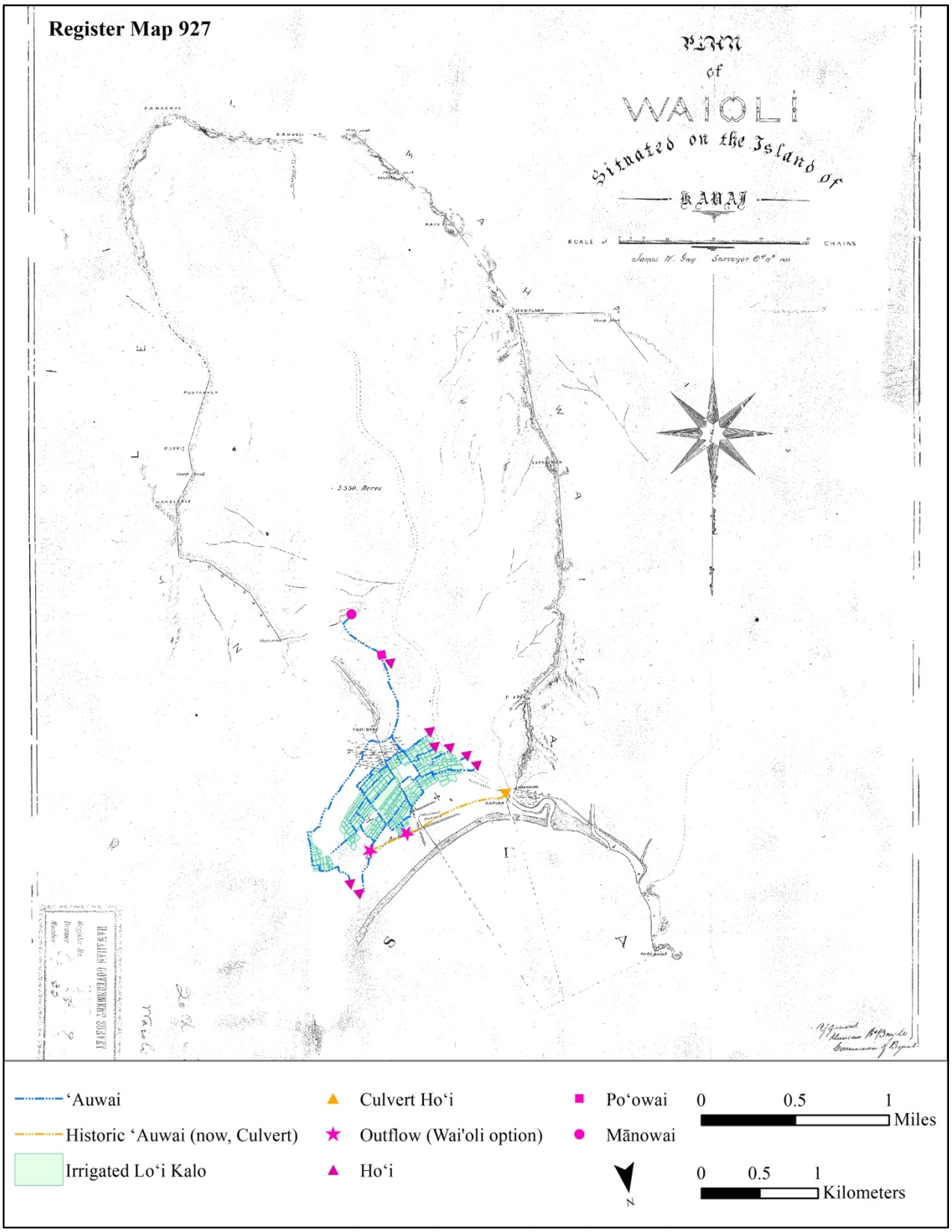

Figure 13. Register Map 927 depicting location of Waiʻoli Loʻi Kalo Irrigation System.

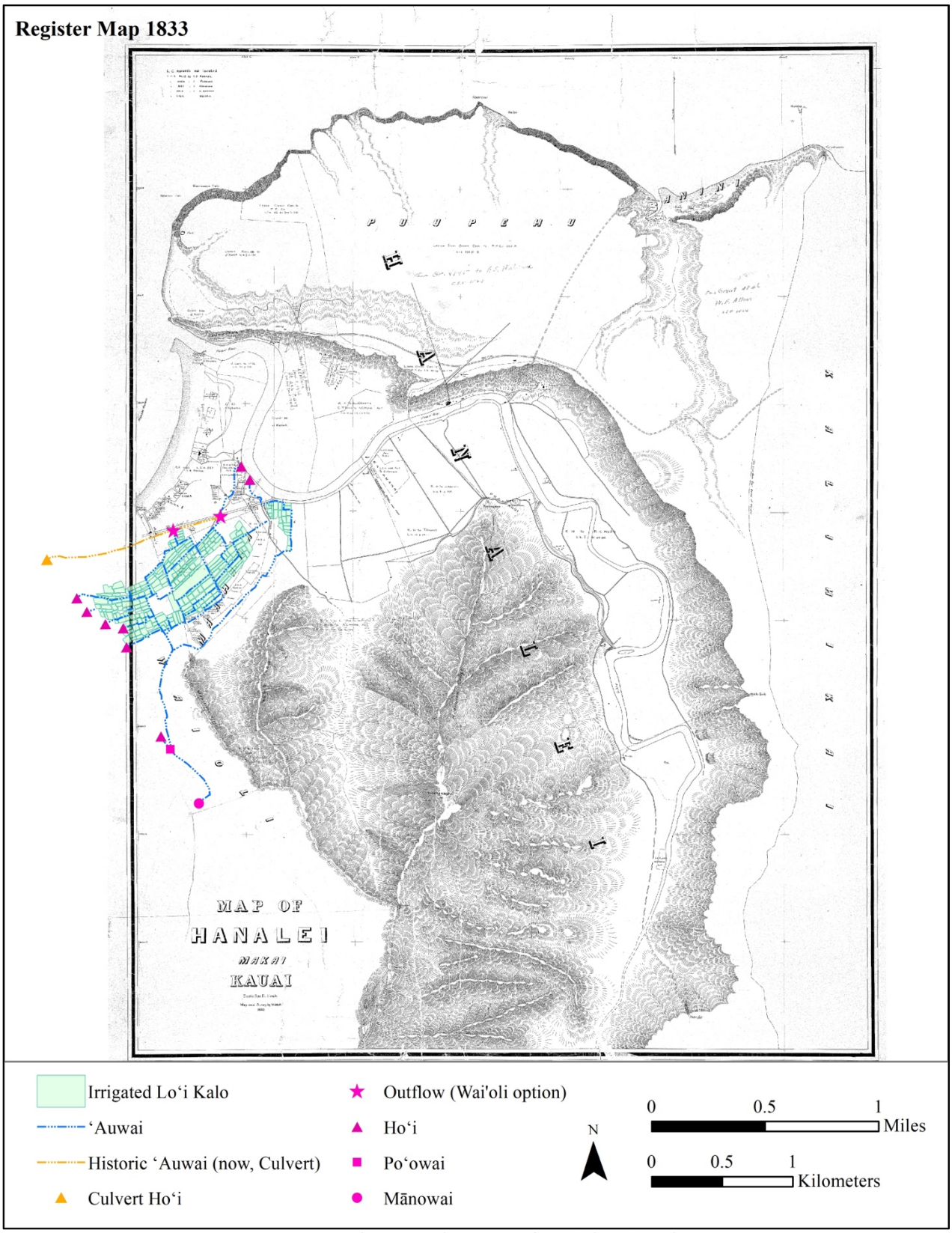

Figure 14. Register Map 1833 depicting location of Waiʻoli Loʻi Kalo Irrigation System.

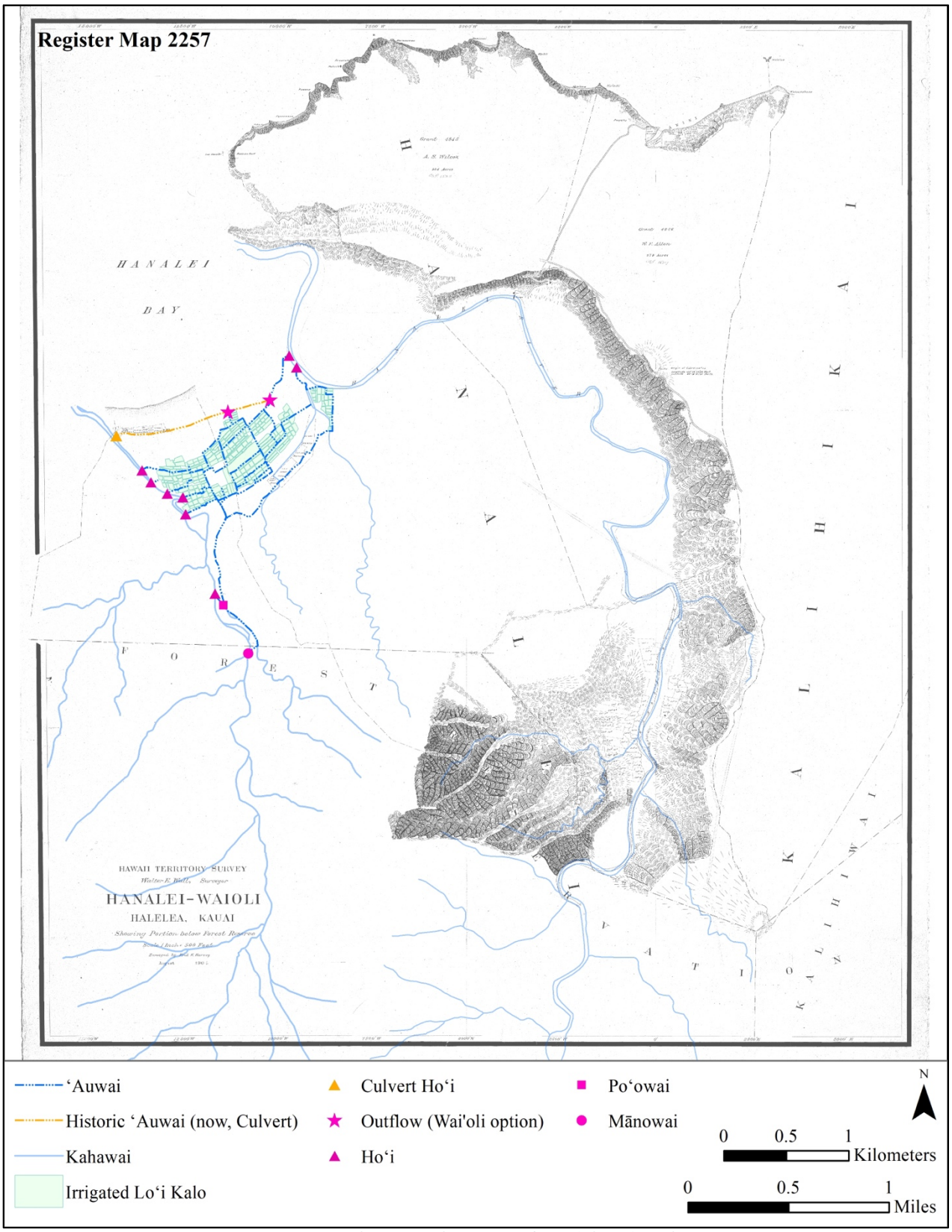

Figure 15. Register Map 2257 depicting location of Wai'oli Lo'i Kalo Irrigation System.

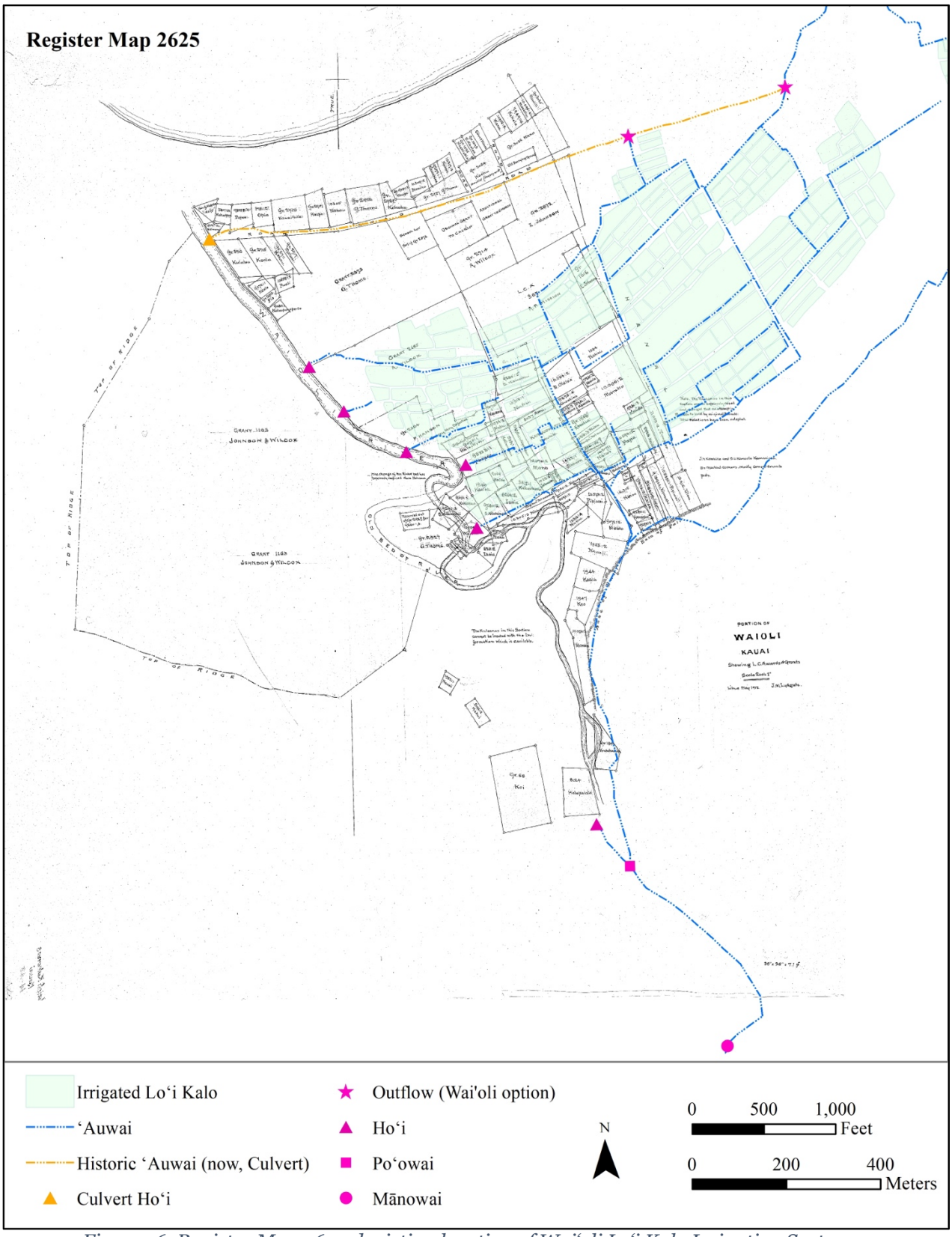

Figure 16. Register Map 2625 depicting location of Wai‘oli Lo‘i Kalo Irrigation System.

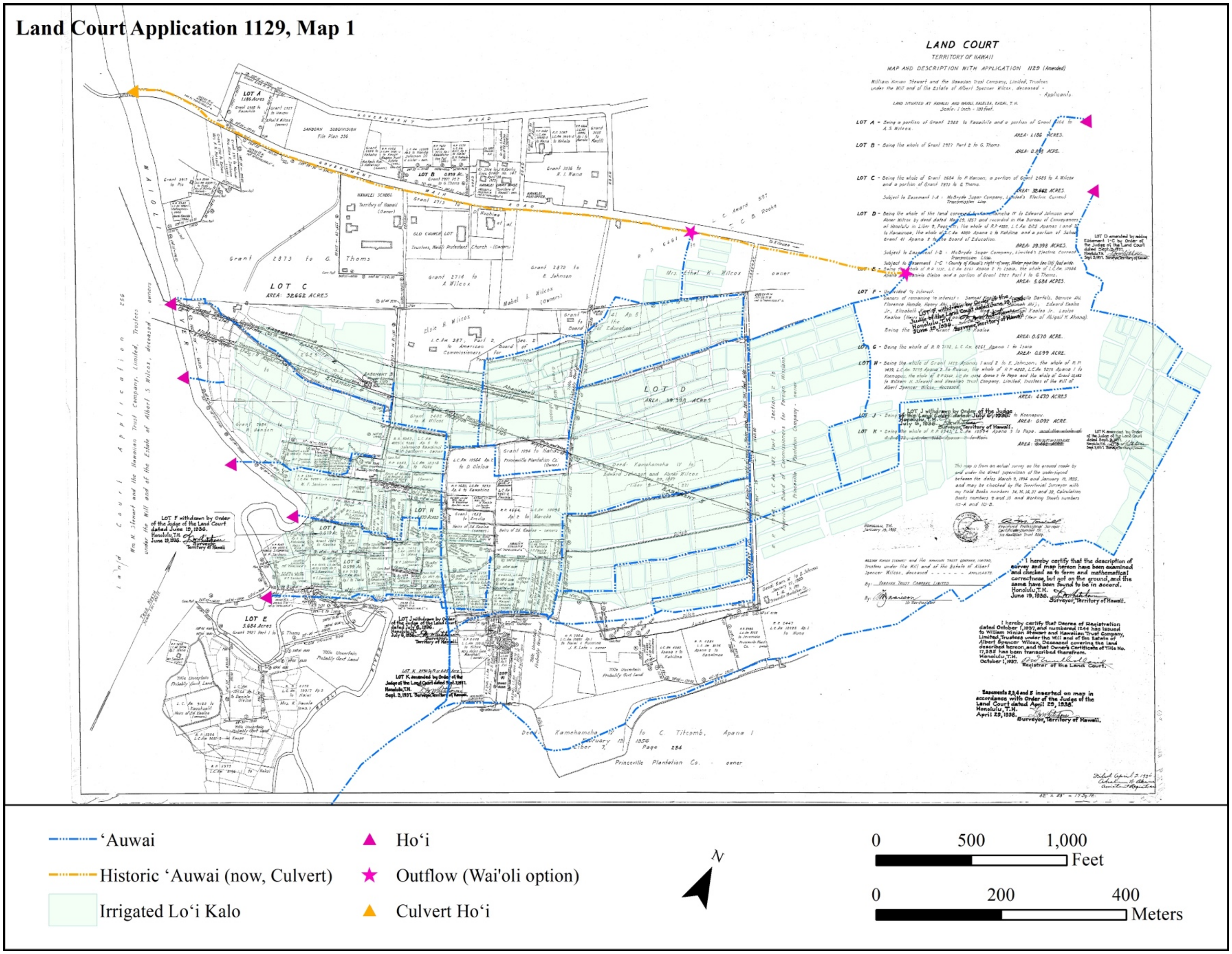

Figure 17. Land Court Application 1129, Map 1 depicting location of Wai'oli Lo'i Kalo Irrigation System.

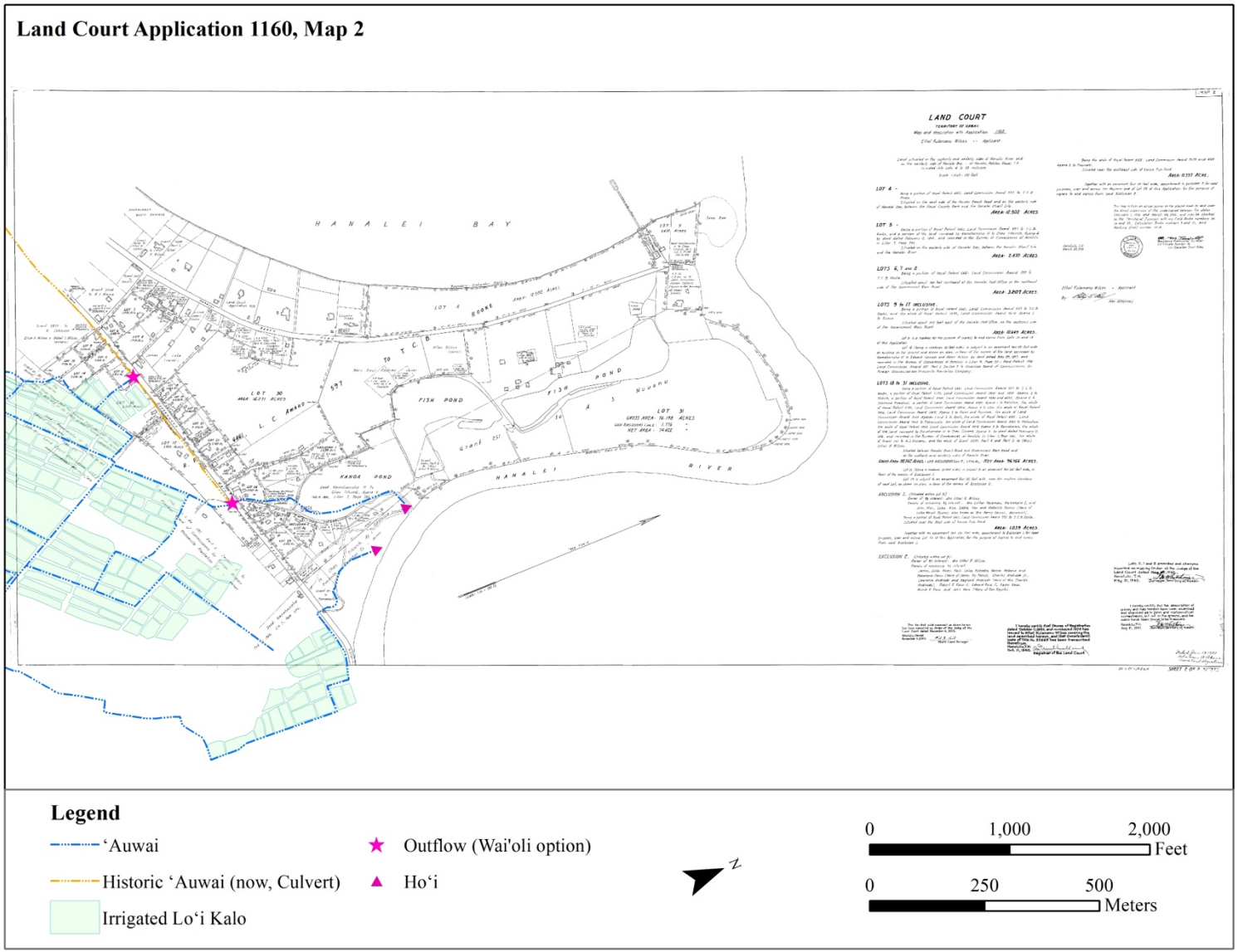

Figure 18. Land Court Application 1160, Map 2 depicting location of Waiʻoli Loʻi Kalo Irrigation System.

Ka Wā Kahiko

Hawaiian oral traditions have been passed down from one generation to the next for hundreds of years, and have been written and recorded in contemporary times. There is no written record of Waiʻoli prior to the advent and proliferation of writing in the Hawaiian Islands. Hawaiian oral traditions, however, such as full moʻolelo, mele, and oli, started to be documented and distributed in the mid-1830s via the nūpepa.[28] These moʻolelo and mele provide a glimpse into the early settlement of Kauaʻi as well as life in Waiʻoli and the surrounding Haleleʻa moku.

Nā Moʻolelo a me Nā Kaʻao

The terms moʻolelo and kaʻao (legend) have been used interchangeably to refer to legends or historic tales, with kaʻao sometimes referring to a fictional legend or fanciful tale. Pūkuʻi describes the tradition of storytelling as "a principal source of entertainment while simultaneously providing instruction in the many interwoven aspects of life – ancestry, history, religion, human relations, crafts, and the natural world."[29] Before Hawaiian became a written language in the 1820s, cultural knowledge was perpetuated through various forms of oral repetition and passed down from generation to generation through mele, hula, kūʻauhau (genealogy), kaʻao, or moʻolelo.[30]

Moʻolelo, like mele, are also very valuable in offering a more descriptive account of the evolution of an area. One of the oldest nūpepa articles identifies Kauhane as the chief of Hanalei during the reign of Lono.[31] The article does not include an in-depth narrative, it only notes that Lono's rule over Kauaʻi was just and peaceful. Two of the most noted residents of Waiʻoli were Pīkoiakaʻalalā and Puapualenalena.[32] Pīkoiakaʻalalā was born to his father ʻAlalā and his mother Koʻukoʻu. Pīkoi's parents were accomplished panaʻiole, rat shooters, who passed this skill on to their son. Koʻukoʻu gave birth to seven keiki akua, supernatural children, before finally giving birth to Pīkoiakaʻalalā and his sister Kauʻiomānoa, who were born in human form. During his childhood, Pīkoi would often compete with other panaʻiole, no one being able to best him except Puapualenalena, a supernatural dog belonging to a prominent family in Waiʻoli. Panaʻiole was both a sport and a profession, as the moʻolelo explains, and it is because of Pīkoi's skill that he is called throughout the islands to shoot mischievous creatures that are pestering various aliʻi. Though rats and mice may seem like a common nuisance that can be easily remedied today, they were a very real problem in the Waiʻoli mission — Mrs. Alexander wrote in 1834 that they were numerous and enormous in size.[33]

The moʻolelo of Pīkoi and Lonoikamakahiki provide insight and strong inference that a Native population was living in the Waiʻoli area before the arrival of westerners in Hawaiʻi. ʻAlalā and Koʻukoʻu resided in and raised eight children in Waiʻoli. Their Pīkoi befriended a supernatural dog of another resident, leading to the strong inference that more than one family resided in the Waiʻoli area during that time. Especially because it is Pīkoi's childhood acclaim that leads to the rest of his island travels.[34] In the moʻolelo of Lonoikamakahiki and its mele, Lono and Kapaihi

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[28] Nogelmeier 2003: 107.
[29] Pukui & Green 1995: xii.
[30] Kalākaua & Daggett 1888.
[31] *No Lono*, Ke Kumu Hawaii, 30 March 1836. This is a different Lono than that of Lonoikamakahiki from Hawaiʻi Island.
[32] S. Kaui, *He Kaao No Pikoiakaalala*, Ka Nupepa Kuokoa, 16 December 1865.
[33] Alexander 1834.
[34] S. Kaui, *He Kaao No Pikoiakaalala*, Ka Nupepa Kuokoa, 16 December 1865.

did not interact with people but would feed off the scraps or raw vegetables from Waiʻoli while wandering in the cold uplands, meaning that there were others in the area.[35] The time period can be established based on the aliʻi in the moʻolelo as well as other genealogical scholarship. According to Abraham Fornander and Esther Moʻokini, who researched aliʻi genealogies, Kākuhihewa and Keawenuiaʻumi, who were main characters in both moʻolelo, ruled in the mid to late 1500s.[36]

Nā Oli a me Nā Mele o Waiʻoli

Mele and oli, while not being a full historical narrative, provide succinct descriptions of place, weather, and common day occurrences. These mele convey important ideas and happenings about the people, places, and events of their time.[37] Many of the mele use similar poetic references to the Waiʻoli area, most referring to the amount of rain and the cold. These themes are so synonymous with the area that they are repeated from the earliest record in the nūpepa, through the literary apex in 1860, and until the end of the nūpepa in 1940.[38]

The winds commonly associated with Waiʻoli include Waiʻamaʻu[39] for the entire valley, Makaihuwaʻa[40] ("eyes at the prow of the canoe") coming from the west, and Ualanipili ("rain that brings low the heavens") from Nāmolokama. Common descriptive terms of Waiʻoli in mele include: koʻekoʻe (frigid cold), anuanu (cold), ua loku (torrential rain), hoʻopala (to cause wilting), hoʻoʻīloli (to cause change), and many more. Abundant rain, water and cold are thematic in many of the mele relating to this area. A mele from the moʻolelo of Lonoikamakahiki, son of Keawenuiaʻumi, recounts his voyage to Kauaʻi to escape his misdeeds on Hawaiʻi Island. Lono and his ʻaikāne Kapaihiahilina, whom he befriends on Kauaʻi, wander through Waiʻoli where they eat raw plants and experience constant rains that are so heavy and persistent that it causes the lehua blossoms to wilt and change color.[41]

The mountains of Hīhīmanu, Nāmolokama, and Māmalahoa are also known for their rain and waterfalls, adding to the abundance of water in the Waiʻoli ahupuaʻa. Kaliko, the central waterfall of Nāmolokama and the source of Waiʻoli's water, is noted in mele as the poʻowai, headwater. One mele notes, "kūmano ke poʻowai a Kaliko," or a source of a multitude of water is the headwater of Kaliko, again speaking to the abundance of water that flows through the Waiʻoli Valley and stream system.[42]

Waiʻoli in the Early Historic Era

The Waiʻoli Loʻi Kalo Irrigation System at European contact (1778) would have been similar to that described and depicted in the Māhele records. The loʻi and ʻauwai would have been in the

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[35] *No Lonoikamakahiki*, Ke Auokoa, 19 January 1871.
[36] According to Abraham Fornander, Kākuhihewa was born around 1540 and was the 15th Aliʻiʻaimoku of Oʻahu. Fornander 1880: 272-73. Esther Mookini puts Keawe's birth some time in the 16th century. *Translation Makes Hawaiian Treasure Accessible,* Honolulu Advertiser & Star Bulletin, 20 January 1991.
[37] Nathaniel B. Emerson states that "The most telling record of a people's intimate life is the record which it unconsciously takes in its songs. This record which the Hawaiian people have left of themselves is full and specific." 1903: 271.
[38] Nogelmeier 2003: 116.
[39] Kuapuu, *Ka Moolelo o Pakaa me Kuapakaa Home Rula Repubalika*, 15 March 1902.
[40] J. Poepoe, *Ka Moolelo o Hiiakaikapoliopele Ka Naʻi Aupuni*, 22 June 1906.
[41] *No Lonoikamakahiki*, Ke Auokoa, 19 January 1871.
[42] Emerson 1907: 155.

same place in the early 1800s as they were in the mid-1800s, as would be the permanent houses (pāhale, kahuahale, kauhale), generally on the coastal dunes, but sometimes scattered among high points among the wetland fields[43] or dryland slopes. This section establishes a solid chronological timeline for the depth and breadth of the Waiʻoli Loʻi Kalo Irrigation System.

As literacy rates in the Kingdom of Hawaiʻi increased, so too did the number of nūpepa. These nūpepa announced important government news, featured political commentary, and also documented everyday life throughout the Kingdom. An article about a new law could be followed by an article about a new garden plot in a neighbor's yard with the sweetest vegetables. Some of these articles relating everyday life were sometimes serials done over many years, and give us a glimpse into the evolution of an area.

One of the first articles pertaining to Waiʻoli was in Ke Kumu Hawaii entitled, *No ke Emi Ana o Na Kanaka*, in which a Kauaʻi island census taken in 1835 showed the decline in population.[44] This article was submitted by the mission to address possible mitigating action to deal with the decline. This article was written by W. P. Alexander, a missionary who founded the Waiʻoli Mission in 1834, fourteen years after the arrival of missionaries in the islands in 1820.

Mr. Alexander not only wrote articles for the nūpepa, but also kept records of life in Waiʻoli through his letters, journals, and yearly station reports. When Alexander arrived, he noted that the Waiʻoli's mission was "well supplied with fish, fowl, bananas and melon etc." A year after Alexander's arrival, an article expressed how lush and fertile the land in Waiʻoli was, as well as the ease with which everything grew due in part to the pure clean waters.[45]

From the founding of the mission in 1834, letters, reports, and nūpepa articles continued to document the agricultural wonders of the people in Waiʻoli. In the early years of the mission, Alexander connected his property to the main stream through an ʻauwai system to water the crops on his homestead. These crops supplemented what he was receiving or trading with the Native population.

During the early years of Alexander's tenure, the Bible was being translated into ʻōlelo Hawaiʻi. The Native people in Waiʻoli were so eager for the written word that, according to Alexander's account, they could be seen farming into the evening, with the glow of their campfires lighting the mountains, so that they could farm enough pia (Hawaiian arrowroot) to buy books from the missionaries.[46] The land is so abundant that Alexander bemoaned the nearly 100 barrels of yams that he could not dispense of, and attempted to have them sent to the mission in Honolulu.[47] He also sent calabashes of oranges, tamarinds, and sometimes paddles, all of which he acquired from his own farm or from the Native people trading for books.[48]

The agricultural benefits of the valley were also used by the mission in its efforts to increase education amongst its congregants. In 1837, when the school in Waiʻoli expanded, it required its students to work a parcel of land in Waiʻoli to fund their teachers. Testimony recorded by the

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[43] Such as the pāhale of several kuleana lands awarded in 1851: LCA 10316 ap2 to Nuku, LCA 9070 ap1 to Kokokaia, and LCA 9833 ap2 to Pepee.
[44] W. P. Alexander, *No Ke Emi Ana o Na Kanaka*, Ke Kumu Hawaii, 14 October 1835.
[45] N. Keoahu, *Waioli Kauai Ian 23, 1835*, Ke Kumu Hawaii, 15 April 1835.
[46] Alexander 1934: 187.
[47] Alexander 1934: 185.
[48] Alexander 1934: 186.

mission documented that the school had 4-5 acres of cultivated farmland dedicated to that use, some of which was loʻi.[49]

From the mid-1840s into the 1850s near the end of the Māhele, Waiʻoli experienced agricultural expansion and an increase in foreign crop production. New crops included coffee on the mountainsides closer to the center of Hanalei Valley, indigo in some of the kula areas, and plants to feed the new silk-worm production. These new crops were successful for a time, but would not survive beyond the 1860s.[50] At this point in Waiʻoli's history on into the 1890s, only a few sources recorded observations of farming in the area relating to kalo cultivation. Nūpepa and other records instead tended to focus on the transfers and conversions of larger tracts of land around the Project Area, to new owners or into different uses.[51]

[49] Foreign Testimonies, no. 387: 37.
[50] *No ka Hele ana o Polepe i Kauai*, Ka Nonanona, 3 March 1843; Coffee Times, The History of Coffee in Hawaii, no. 79: 3; Palmer 1913.
[51] *Olelo Hoolaha*, Ka Leo o ka Lahui, 5 September 1889; *Hoolaha Hooko Moraki*, Ka Nupepa Kuokoa, 25 November 1893; Palmer 1913.

Table 3. A Waiʻoli timeline, through a selection of nūpepa articles.

Inoa Nūpepa Nūpepa Name	**Mea Kākau** Author(s)	**Poʻomanaʻo** Source	**Lā** Date	**Manaʻo Hōʻuluʻulu** Notes
Ke Kumu Hawaii	**N. Keoahu**	Waioli Kauai Ian 23, 1835	15 April 1835	13 homes have been built by David Papohaku for the settlement of Betelehema. The land is very fertile and all things grow easily and all the flowers bloom because there is such clean water. There are many deaths on the island as well as people attempting to burn down the mission house.
General Meeting of the Sandwich Island Mission		Station Reports pg. 12	May and June 1839	The congregation has planted seven acres of sugar cane to help fund the building of the meeting house.
Ka Nonanona		He Ipu Pu!	15 March 1842	Waiʻoli is a very fertile place to grow all kinds of plants. Mr. Ioane has grown one of the largest pumpkins.
Ka Nonanona		Papa Hoike i na kula o Waioli	15 March 1842	A feast was made for the performance of the school at Waiʻoli under the kukui grove called Salema on the bank of Waiʻoli River.
Ka Nonanona		Ka Ahaolelo Misionari	9 July 1844	Waiʻoli Select school started by Johnson, the students work/farm for their supplies/food. They are also supported by the congregants.
Ka Nonanona		Laau Kanu	15 October 1844	Planting coffee is successful in Waiʻoli.
Ka Hae Hawaii	**John U. Kuapuu**	Nu Hou Ma Waioli	20 May 1857	Cannons recovered from the Haʻaheo wreckage from April 1824.
Ka Nupepa Kuokoa		Ahahui Mahiai o Waioli Kauai	16 November 1861	October 30, farmers of Hanalei, Anahola and Waiʻoli came together to form a Farming Organization whose goal is to find ways to make farming more successful because of the decline of whaling, leaving people without enough money for their taxes. They want to try rice and tree fern wool and other plants. A copy of their constitution is posted.
Ka Hoku o ka Pakipika	**A.S. Nuuanu (Waipa)**	Pilikia! Pilikia ka Lahui Hawaii!	24 February 1862	Divorce/Adultery rates are 2/3 in Waiʻoli.

Inoa Nūpepa Nūpepa Name	**Mea Kākau** Author(s)	**Poʻomanaʻo** Source	**Lā** Date	**Manaʻo Hōʻuluʻulu** Notes
Ka Hoku o ka Pakipika	**J.W. Kapuailiau**	Hoike Kulahui a me ka Ahaaina ma Waioli	29 May 1862	A lanai and school were built and a feast was prepared for a show by the congregation school. Grass from the riverbanks was used for roofing and the place was decorated with Native and foreign plants of the area.
Ka Nupepa Kuokoa		Na Mea Hou o Hawaii Nei	18 April 1863	Price of poi increasing, perhaps because most people are farming rice.
Ka Nupepa Kuokoa		Ka Anesona Moolelo No Kauai	25 May 1865	A brief history of Waiʻoli Mission starting in 1834 under a kukui grove. At the time of this article there were 421 congregants. The author sees the abundance of this area and that the residents are growing all types of food plants.
Ka Nupepa Kuokoa	**E.J.**	Make Emoole!	26 August 1865	Kaui dies from a landslide while digging an irrigation ditch to run Mr. Thom's sugar mill in Waipā.
Ka Nupepa Kuokoa		Maloo loa o Hanalei, Kauai	14 July 1866	All the lands in Hanalei and the sugar plantations are dry from two months of no rain. The lands closest to the ocean are especially dry.
Ka Nupepa Kuokoa		Hele Kaapuni Ana Ia Kauai	31 October 1868	Author visits the mission at Waiʻoli. Over 200 congregants come to services all heralded by the Waiʻoli church bell.
Ka Nupepa Kuokoa	**S. P. Ahiona**	Palapala Hoike Hana mawaena o na Pake ma ka Mokupuni o Kauai	24 July 1869	Ahiona meets with Chinese who live in Waiʻoli to evangelize. 70 come to services at Waiʻoli Hui ʻia and he meets with some at their stores in Waiʻoli.
Ka Leo o ka Lahui		Olelo Hoolaha	5 September 1889	Tai Lee Wai restricting access to his rice farm in Waiʻoli from 6pm on and in the mornings only those that are allowed may cross through.
Ka Nupepa Kuokoa		Hoolaha Hooko Moraki	25 November 1893	Re-auction of mortgaged rice land in Waiʻoli. 45 acres to Ah Fat from George Wilcox from January 1888.
Ka Nupepa Kuokoa	**Kamahele**	Ka Ike hou ana o ke Kamahele i ka Mokupuni o Kauai	19 December 1913	Hanalei Valley is filled with rice fields.

Waiʻoli Changes in Land Tenure – The Māhele

The Māhele records of the 1840s and 50s provide a wealth of information about Waiʻoli and its agricultural system, including a baseline for the systems' extent. Through Native Registers ("NRs"), Native Testimonies ("NTs"), Foreign Testimonies ("FTs"), and Land Commission Awards ("LCAs"), Waiʻoli land claimants and other witnesses who provided testimony, delineate the scope and use of the land during their or their ancestors' land tenure in Waiʻoli.

Kuleana are a type of Land Commission Award claimed by Kānaka Maoli tenants during the Māhele. Native tenants who were seeking to claim their kuleana would submit testimony to explain the extent of their land claim, which would then be recorded in a Native Register; a witness would support a claim, which would then be recorded in the Native or Foreign Testimony. Typically, the Native Register included how many ʻāpana (land parcels) the applicant was claiming, what type of property, and what, if anything, was being cultivated at the time. Historically, there were at least 41 separate kuleana ʻāpana that consisted of loʻi kalo and 13 kuleana ʻāpana that referred to the ʻauwai in its metes and bounds.[52]

The Native Register would sometimes detail from whom the applicant derived his or her interest (i.e., who gave the claimant the right to cultivate those lands), such as a konohiki (head manager of an ahupuaʻa) or aliʻi, as well as a year or time period. Some would give a period relating to when an aliʻi was in power, typically in the form of "I ke au iā" or "during the time of" followed by the name of the aliʻi. For example, the NR for LCA 8196 to Hakui notes,

E hoʻike imua o oukou no koʻu kuleana	*I make known before you my interest [in this land]*
mai ka wa mai ia Kaikioewa a hiki i keia la	*from the time that Kaikioewa ruled until today*

Kaikioewa died in 1839, and was a contemporary and kuhina (advisor) of Kamehameha I (1758-1819).[53] The NR 9080 to Kahooponopono, whose kuleana includes loʻi and parts of the ʻauwai, explains that his kuleana is "He kuleana kahiko mai koʻu" or "His kuleana is an old one" and also that "Mai ka hiki ʻana mai o na misionari oia ka MH 1820 a hiki i anei koʻu noho ana" or "he has been there since the arrival of the missionaries in 1820 until now." Other similar descriptions of kuleana that are "kahiko" (old) or "mai mua loa mai" (from long before) are described in the Native Testimonies and Native Registers; these references would pre-date the Kamehameha dynasty.[54]

Kaumualiʻi, also a contemporary of Kamehameha I, is referenced many times in these documents as he was the aliʻi nui of Kauaʻi during that period. For example, the NR for LCA 9276 for Kiolea notes, "Penei ke kuleana ana mai a Kaumualii mai a hiki i ka makahiki 1848," translated as "Such is the interest in this land from Kaumualiʻi until the year 1848." Kaumualiʻi, who died in 1824, was the mōʻī of Kauaʻi and negotiated a treaty with Kamehameha I during his campaign to unite the islands under one rule. Similarly, the NR for LCA 9275 to Koenapuu explains, "Penei ke kuleana ana mai a Kaumualiʻi mai a ia keia manawa" or "Such is my interest from Kaumualiʻi until now." As yet another example, the NR for LCA 11059 to Timoteo proclaims, "I ka manawa ia Kaumualii o Kauaʻi nei, mai koʻu mau makua mai a hiki mai iaʻu i keia wa ka pili ana o keia wahi me au," translated as "During the time of Kaumualii's rule on Kauaʻi, from my parents until me during this time, is my connection with this place." It is

[52] Tong 2019.
[53] Tong 2019.
[54] Kamakau 1961: 55.

reasonable to conclude that if lands in Waiʻoli were given during the reign of Kaikioewa and Kaumualiʻi, both contemporaries of Kamehameha I who lived through and experienced "contact" with Captain Cook in 1778, that the mānowai, poʻowai, and ʻauwai system required to support the loʻi kalo claimed by those Native tenants were also in place prior to western contact.[55]

Waiʻoli and Rice

Though the nūpepa, mission reports, and journals describe the abundance of Waiʻoli and the success of the agricultural system, farmers began to feel the hardship from the decline of whaling in the 1860s.[56] This coincided with the discovery of a new type of rice crop, which led to an increased demand to convert loʻi kalo into rice.[57] In 1861, the farmers created an ʻAhahui Mahiʻai (Farm Association) to explore new cash crops such as the new rice cultivar.[58] The kalo lands eventually transitioned, like much of Kauaʻi, into rice or sugar cultivation, which caused a shortage and decrease in the consumption of kalo and poi as well as an increase in poi prices in 1863.[59] Through the late 1860s and into the 1880s, the lands of konohiki and other large landowners in Waiʻoli transitioned into rice, which is a trend that occurred across Haleleʻa.[60] Some Waiʻoli residents, especially those farming kuleana land, stayed in kalo.

1893 Overthrow – Present

Post-1893 overthrow and into the 1900s: Hawaiʻi's cultivation of rice began to decline due in part to competition from California's rice production, as well as problems with pests.[61]

1940s: In Waiʻoli, there was a return to kalo production for those loʻi that had been converted to rice earlier.

1972: In an interview by Larry Kimura on the Ka Leo Hawaiʻi broadcast, Rachel Mahuiki, an elder of the Haleleʻa area, spoke about how all people in the Hanalei area, both foreign and Hawaiian, returned to farming kalo, though primarily the older and adult children of the older generation. The younger generation had not taken up kalo because it was too difficult.[62]

1984: In the August OEQC Bulletin, the Hawaiʻi State Department of Land and Natural Resources, Division of Water and Land Development announced proposed repairs and improvements to the "East Waiʻoli Ditch" as a negative declaration, that is, a "determination made by proposing agencies that certain proposed actions will not have significant effects on the environment and therefore do not require EISs [Environmental Impact Statements]."[63] Improvements to the system included reconstructing the lower intake, the poʻowai, and repairs to the "lower system" (ma kai of the poʻowai). According to the OEQC Bulletin, the mānowai, the "upper intake is the true diversion on Waiʻoli stream and it is not being renovated."[64] At this

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[55] Tong 2019.
[56] Haraguchi 1987.
[57] Haraguchi 1987: xiii.
[58] *Ahahui Mahiai o Waioli Kauai*, Ka Nupepa Kuokoa, 28 November 1861.
[59] *Na Mea Hou o Hawaii Nei,* Ka Nupepa Kuokoa, 18 April 1863.
[60] Monsarrat, Map of Rice Plantation Kalihiwai, Hanalei, Kauai, November 1885.
[61] Haraguchi 1987: xv.
[62] Ka Leo Hawaiʻi HV 24:14, 1972.
[63] OEQC Bulletin, Vol.1 No.14, August 23, 1984.
[64] OEQC Bulletin, Vol.1 No.14, August 23, 1984.

time, between the poʻowai and the main ditch feeding irrigated kalo fields on the Waiʻoli side of the system, the flume and trestle were replaced and permanent pebble trap structures were installed as overflow controls to prevent breaches in the main ditch. The DLNR Division of Water and Land Development recorded these improvements at the boundary of the taro fields as necessary to ensure water flow to "some of the most productive plots in the State."[65]

Late 1980s: Kalo farmers filed Declarations of Water Use with the Commission on Water Resource Management; during this time of heightened development, kalo farmers sought to ensure that the practice of irrigated kalo cultivation continued in Waiʻoli.[66]

2015: The Hawaiian Islands Land Trust ("HILT") acquired two conservation easements on almost 40 acres of wetland kalo in Waiʻoli. Donated by Gaylord and Carol Wilcox and their daughters Nicole Pedersen, Darcie Gray, and Eliza Wilcox, the conservation easements placed permanent restrictions on this important active farm land, protecting it from future development and degradation. The easements not only ensured the land could not be developed, but also identified certain conservation values such as agricultural resources, cultural and historical values, wildlife habitat, and scenic beauty, which will prevent it from being compromised or threatened by future uses of the land.

2018: Close to 141 years after the last recorded massive flood in the area, a record 24-hour rainbomb dropped 49.69 inches of rain on the north shore of Kauaʻi.[67] Resulting floods swelled north shore rivers and streams, inundating the valleys and coastal plains of Waiʻoli, Hanalei, Waipā, Waikoko, Lumahaʻi, and Wainiha.

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[65] OEQC Bulletin, Vol.1 No.14, August 23, 1984.
[66] Strauch, Ayron. Field Investigation Report for Waiʻoli, FI2019020901, Commission on Water Resource Management, Feb. 2019; Kaona, Kobayashi, Masada, Miike, Mitsui, Omo, Spencer, Reyes, Tai Hook, Tasaka, Watari, Yagihara, Registrations of Stream Diversion Works and Declarations of Water Use, DLNR-CWRM, 1989.
[67] Arndt et al. 2018.

Appurtenant Rights

The loʻi kalo in Waiʻoli are appurtenant, riparian, and traditional and customary Native Hawaiian uses of water and public trust purposes, which have some of the highest levels of protection under Hawaiʻi's Constitution and Water Code, HRS chapter 174C. The purpose of this section is to explore the appurtenant rights of the Waiʻoli Valley Taro Hui.

Project staff selected, surveyed, and translated Māhele documents to establish the locations and some of the earliest written records of loʻi in Waiʻoli. Although not always explicitly stated in each document, these loʻi are loʻi kalo, as this is often emphasized in the use of metes and bounds describing an applicant's "kalo lands." At the time of the Māhele, commercial rice had not yet encroached into this area; no mention of rice was noted during our survey, only kalo.

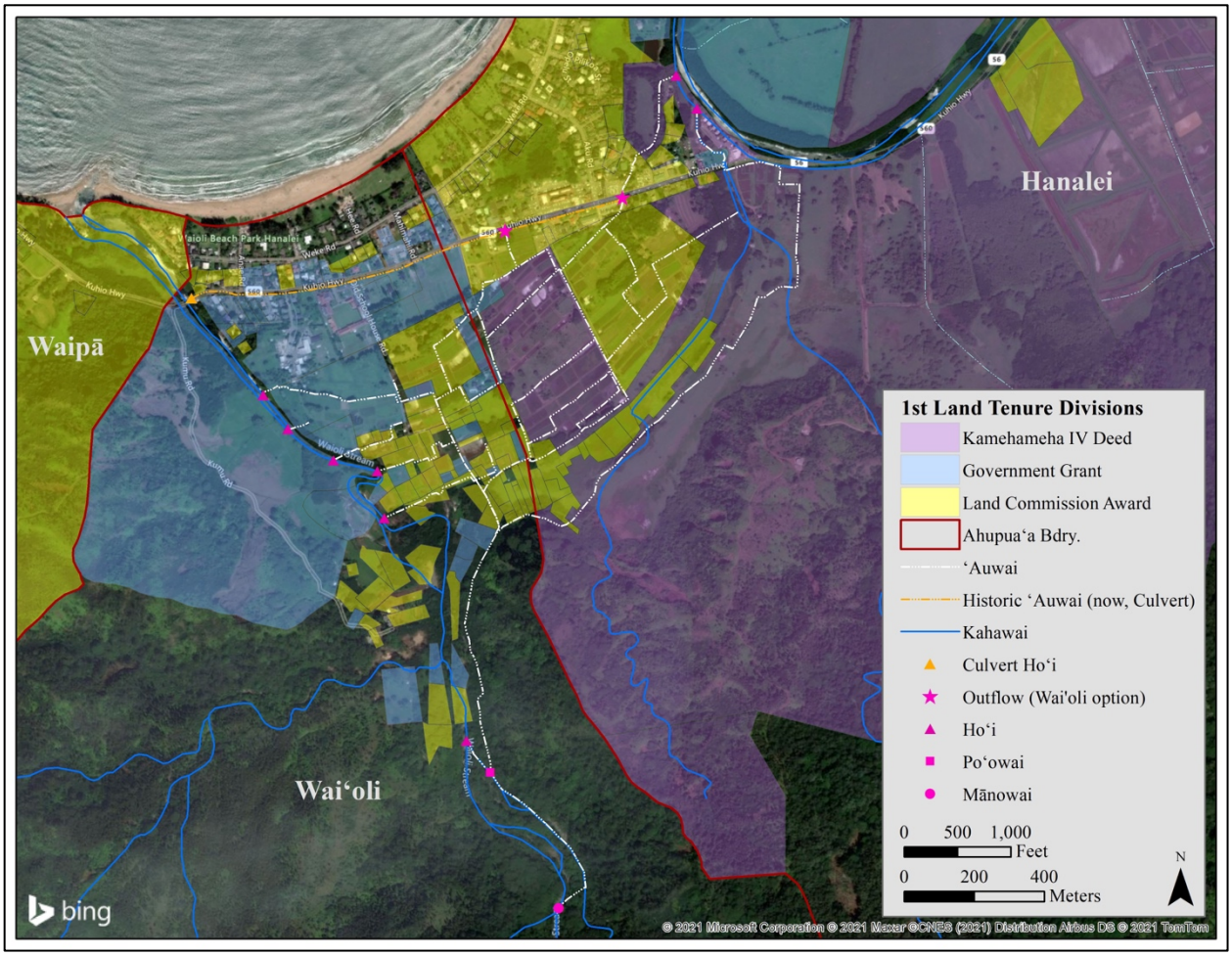

Figure 19. Map depicts the Project Area over the locations of the first land tenure divisions along the Waiʻoli-Hanalei coastal plain at the time of the Māhele.

Following the Māhele, the Waiʻoli ahupuaʻa was retained by the Government whereas the neighboring Hanalei ahupuaʻa was retained by the Crown, excepting kuleana, Grants, and Kamehameha Deeds. Within the Waiʻoli Loʻi Kalo Irrigation System, there are LCAs, Government Grants, Crown lands and a few Kamehameha IV Deeds. Although many of these lands were cultivated and lived on by the same families for generations, it was after the 1840

Constitution, and during the Māhele, that distinctly Kānaka Maoli, hybridized, fee-simple land tenure was established. The Hawaiian Kingdom enjoyed a phenomenal literacy rate early in history, and the detail and breadth of goverment documentation reflect this. A great many surveys, claims, documents, and testimonies were generated for all of the land parcels that were sold, awarded, exchanged, or gifted between 1840 and 1893.[68] Table 4 provides details about the provenance of these different land types.

Table 4. Table of Hawaiian Kingdom land types as formally acknowledged and conveyed by the Hawaiian Kingdom Government.

Land Type	Dates	Notes
Land Commission Awards	1848-1855	LCAs as awarded during the Māhele. LCAs comprise less than 1% of land in Hawai‘i and are often split into two types; 1) konohiki awards, those awarded to the ali‘i, and 2) kuleana awards, those awarded to the native tenants, or maka‘āinana.[69]
Government Grants	1846-1893	Land Grants taken from the Government body of land; includes Royal Patent Grants, Public Works Grants and School Grants.
Kamehameha Deeds	1848-1865	Lands sold from the Crown inventory by Kamehameha III & IV up until Crown lands became inalienable by the 1865 Act.
Government lands	1840-1893	Those lands managed by the monarch and the Government as the public domain.
Crown lands	1848-1893	Managed by the monarch via the Board of Commissioners of Crown lands, as personal property, made inalienable by the 1865 Act, passed on to sitting monarchs, not to lineal descendants.[70]

In the ahupua‘a of Wai‘oli there are forty-one (41) Royal Patent Grants; grants of land sold from the Government body of land (prior to the illegal overthrow). There are fifty-five (55) Land Commission Awards documented in the Buke Māhele for Wai‘oli ahupua‘a.[71] A 2019 Office of Hawaiian Affairs (“OHA”) report found that forty-one (41) kuleana awards had at least one ‘āpana that was lo‘i, although that survey was not exhaustive.[72] Based on a thorough review of these and other documents, a significant majority of LCAs have more than one ‘āpana; some, up to six.

To refine the document survey, project staff indexed the earliest land documents within the footprint of the Wai‘oli Lo‘i Kalo Irrigation System, and then further narrowed the study sample for the purposes of this report and in the interest of time. This section focuses on a portion of the Wai‘oli Lo‘i Kalo Irrigation System that falls within Wai‘oli ahupua‘a. Although not a complete inventory of appurtenant rights within the whole system, this sampling provides a clear picture of established lo‘i distribution and related water uses at the time of the Māhele and into the present.

[68] Excepting the Crown lands which were held in the Crown inventory until they were made alienable and sold post-overthrow, Iaukea 1894.
[69] Chinen 1958.
[70] Van Dyke 2008. The body of the Crown lands was about 1,000,000 acres during the Kingdom period. In a time of shifting roles, the Crown, by managing these lands, retained some of its position and obligation as ali‘i of old.
[71] One of these LCA claims is crossed out in the Buke Māhele, at least two LCAs have duplicate helu (two numbers for the same award), and of course most LCAs have multiple ‘āpana, ranging from 1-6 parcels.
[72] Tong 2019.

We created a table of land use based on information found within the following primary source archival documents:

- Buke Māhele (Land Commission Awards)
- Native Register
- Native Testimony
- Foreign Testimony
- Royal Patent notes of survey (original legal metes & bounds for LCAs)
- Government Grants

Using ESRI ArcGIS software, project staff compared a map of the Hui's potential loʻi today with shapefile layers of LCAs, Government Grants, etc. The result is a geospatial color coded map of modern Hui loʻi depicting traditional land use: a map of Waiʻoli land with appurtenant rights.

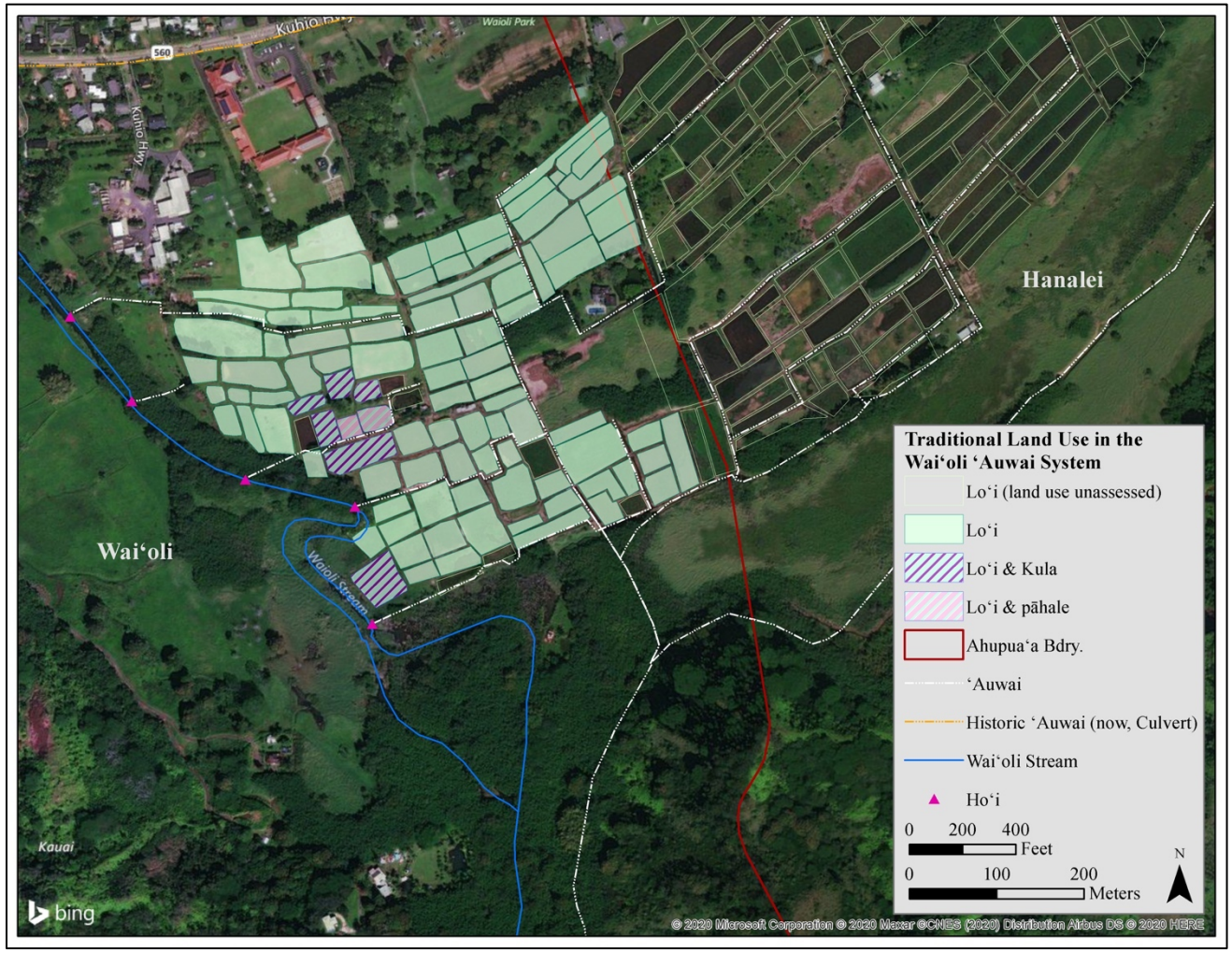

Figure 20. Depicts appurtenant right land use over modern loʻi in Waiʻoli ahupuaʻa.

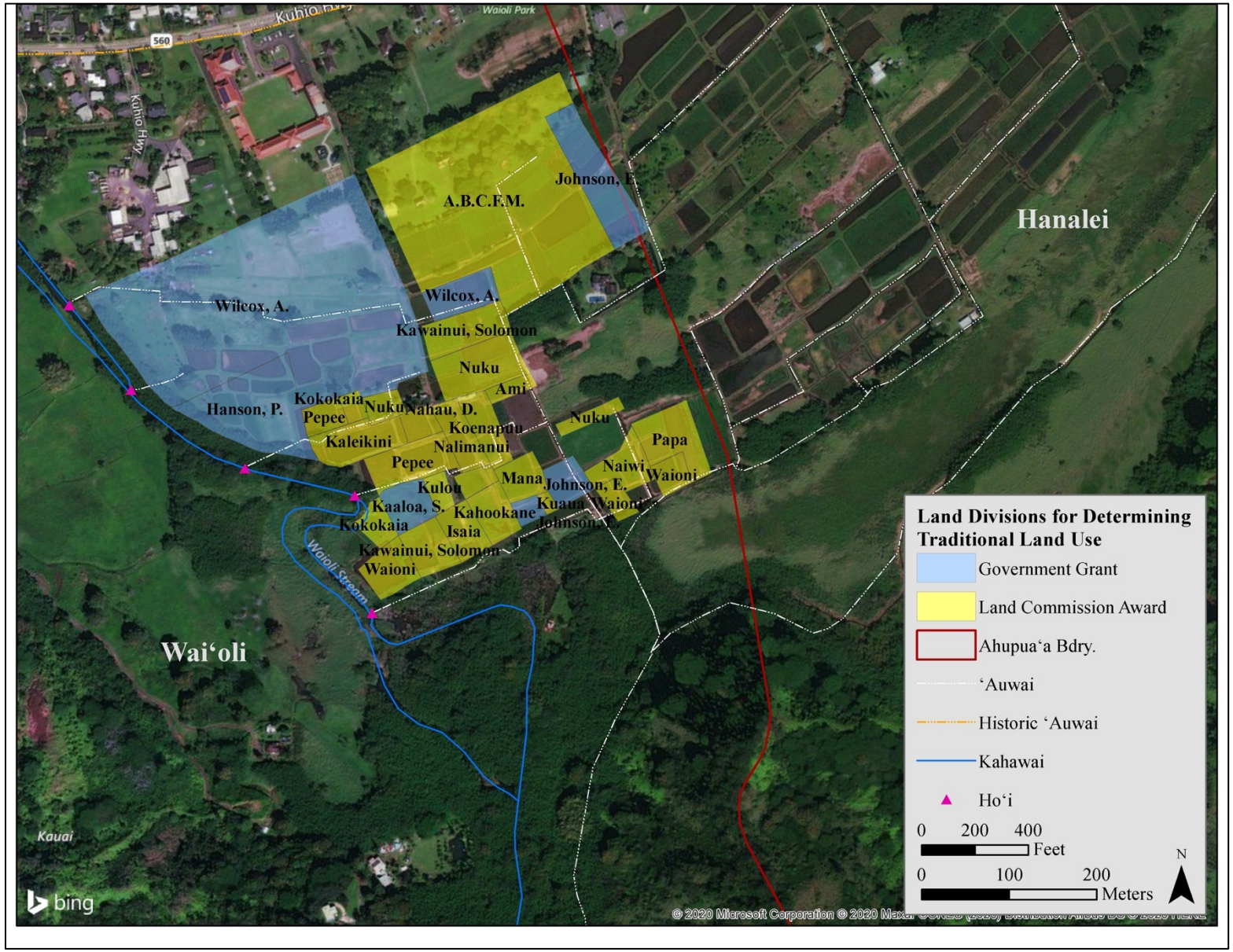

Figure 21. Depicts the LCAs and Grants researched to determine appurtenant rights for irrigated kalo.

Table 5. Selected parcels within the Study Area with solely loʻi land use.

TMK	Land Type	Awardee/ Grantee	Reference Date	Land Use	Source
455006009	Grant	Hanson, P.	1857	loʻi	Gr2685
455007030	LCA	Helepalala	1844	1 loʻi named Waiau	LCA, NR, NT,
455007004	LCA	Isaia	1851	2 loʻi	LCA, NR, NT,
455007016	Grant	Johnson, E	1854	the loʻi of Johnson	Grant, neighboring LCA (Kahookane)
455006008 (por)	Grant	Johnson, E	1855	"kalo lands"	neighboring LCA (A.B.C.F.M.) "surrounded by kalo"
455007010	Grant	Kaaloa, S	1856	2 loʻi	Grant
455007003	LCA	Kahookane		the loʻi [4] named Uhikiko	LCA, NR, NT
455007018	LCA	Kahooponopono	1820	2 loʻi starting at the ʻauwai and the loʻi of Nalimanui	LCA, NR, NT
455006007	LCA	Kawainui, Solomon	1851	1 loʻi	LCA, Gr2402
455007005	LCA	Kawainui, Solomon	1840	1 loʻi named Koele	LCA, NR, NT
455007016	LCA	Koenapuu	1848	kalo, beginning at the loʻi of Mana	LCA, NR, NT
455007009	LCA	Kokokaia	1851	loʻi	LCA
455007016	LCA	Kuaua	1841	1 loʻi named Kamanui (ap1 is along the highway in Hanalei)	LCA, NR, NT
455007011	LCA	Kulou	1846	1 loʻi beginning at the loʻi named Paele	LCA, NR, NT
455007016	LCA	Mana	"...ever since until now 1848"	1 loʻi named Kaumaunui	LCA, NR, NT
455007014	LCA	Nahau, D.	1851	1 loʻi starting at the corner of Kaleikiniʻs loʻi	LCA, NR
455007032	LCA	Naiwi	1851	1 loʻi	LCA
455007015	LCA	Nalimanui	1848	1 loʻi in Waiau	LCA, NT
455006006	LCA	Nuku	1830	1 loʻi named Puhaunui	LCA, NR
455007021	LCA	Nuku	1830	1 loʻi	LCA, NR
455007016	LCA	Papa	1834	3 loʻi bordered by the loʻi of Pipiwai, Koi, Naiwi, Mareko	LCA, NR, NT
455007013	LCA	Pepee	1847	1 loʻi named Kuloko	LCA, NR, NT
455007029	LCA	Waioni	1833	loʻi in the ʻili of Ukiuki	LCA, NR
455007033	LCA	Waioni	1833	loʻi	LCA, NR
455007016	LCA	Ami	1843	2 loʻi in Kalema	LCA, NR

Table 6. Selected parcels within the Study Area with mixed land use, loʻi and other undetermined uses.

TMK	Mahele Land Type	Awardee/ Grantee	Reference Date for Loʻi	Land Use	Source
455006003	LCA	Nuku	1860	loʻi & pāhale	LCA, NT, Gr2625
455006001	LCA	Kaleikini	1851	kalo & dry-land area	LCA, NT
455006022	LCA	Pepee	1860	loʻi & pāhale	LCA, Gr1616 (c1860), Gr2684 (c1860)
455007006	LCA	Waioni	1833	ap2 loʻi & kula	LCA, NR
455006002	LCA	Kokokaia	1860	loʻi & pāhale	LCA, Gr1616
455006008	Grant	Wilcox, A	1857, 1860	“kalo lands” & kula	LCA387, LCA9070
455006008	LCA	A.B.C.F.M.	1855, 1857	loʻi & house/Mission “bounded by kalo” “along kalo patch” “kalo corner”	Gr2403, 2625

Calculating Acreage

There are thirty-two (32) Māhele-era parcels used as a sampling to establish rights to water (Table 5 and Table 6): five (5) Government Grant parcels, and twenty-seven (27) LCA parcels,[73] totaling roughly 45.82 acres.

Of the land parcels depicted in Figure 20 and Figure 21, we have established twenty-five (25) as being in solely loʻi, or in kalo, in the early-mid 1800s (Table 5). here are a total of 16.953 acres of solely loʻi land use (Table 7). The additional seven (7) mixed use parcels inventoried in Table 6 are slightly more complicated for calculating acreage in loʻi during the 19th century. The first five (5) kuleana parcels indicated a mixed use of loʻi and pāhale or loʻi and kula. For those, project staff generally subtracted at least 0.25 acres for the pāhale and/or kula portions.

A Government Grant (Grant 2685) to A. Wilcox (Table 6), was in kalo with some kula, but the extent of either was not established. The estimated acreage for the Wilcox Grant (Table 6), was calculated by gathering information relating to: 1) total acreage when the fee was created, 2) details on land use based on neighboring parcels, and 3) mapping onto the current field system to get a real world unit for measurement[74] (Figure 20). First, the original grant describes its boundary and approximate acreage as 15.5 acres. Second, details on the property's use were available in neighboring LCAs and Native Testimonies. As was typical with these awards, several large neighboring awards to Grant 2685 reveal the use on lands on their boundaries (such as LCA 9280) as in loʻi, in kalo, "kalo lands," surrounded by kalo, etc.[75] Additionally, three (3) small LCAs describe their northern boundary as having kula.[76] Figure 20 depicts these kula lands on the map, they total 0.52 acres. Project staff summed up the remaining modern loʻi fields, which are 10.5 acres. This is a reasonable estimate for loʻi based on the extent of the hoʻi (including one farther ma kai at the bridge), the proximity of ditches to these lands, as well as testimonies explaining that there were loʻi bounding their properties near or in the outer sections of the parcel. The research team notes that the system is equipped for more loʻi than are in kalo or fallow rotations today. Moreover, when calculating the extent of cultivation, this property did not likely have a homestead on it, as the houselot for A. Wilcox was still on mission property in the ma kai section of the kalo lands where it stands today. Therefore, this extensive research yields a reasonable calculation of 10.5 acres of loʻi, 0.52 acres of mixed kula, and a remaining 4.48 acres of mixed use within the Wilcox Grant. Mixed use could include loʻi, kula, or other purposes.

The seventh parcel (Table 6) an LCA to the American Board of Commissioners for Foreign Missions ("A.B.C.F.M."), includes a large lot that has mixed use of loʻi, farming, and activities associated with the mission.The acreage for LCA 387 ʻāpana 2, to the A.B.C.F.M. was calculated using the same reference materials and methods as for Grant 2685. The A.B.C.F.M. LCA measures around 10.75 acres. Project staff know that the lot consisted of extensive loʻi and included bounding ʻauwai because of the descriptions from the Grant document itself, LCA387:2, neighboring parcels, and historic maps.[77] Based on research into the mission,

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[73] Three (3) LCAs from Waiʻoli ahupuaʻa were found in the Buke Māhele, but were unlocated on maps. Project staff were not able to determine if these awards were near the ocean or within the Waiʻoli Loʻi Kalo Irrigation System. They are: LCA 1001 to Levi, LCA 7670 to Kalili, and LCA 10659 to Puali.
[74] Many of the fields have changed little, some have merged or been separated, or the kuāuna have widened, but the field shapes and distributions align to the existing ʻauwai and still serve as a good measurement tool.
[75] Grant 2684, Grant 2403, and LCA 387:2.
[76] LCA 1031:2, LCA 9070:1, LCA 9833:2.
[77] Grant 2402, Grant 1616, and Grant 2685, RM 1680.

however, we know there was a church, out buildings, and other uses. We used the modern loʻi fields and calculated a total of 5.75 acres of loʻi and ʻauwai. The remaining 5.00 acres is a conservative estimate for undetermined use, which could have also included more loʻi and ʻauwai depending on the mission's needs.

Based on the research and mapping detailed above, we have determined that of the lands surveyed and depicted, these are the totals for land use:

Table 7. Analyzes the acreage for loʻi land use using the acreage of LCAs and Government Grants, which could have corresponded to locations of ʻauwai as established in 1893 by RM1680.[78]

Total Acreage	Acres in Loʻi	Land Use	Notes	# of Parcels
16.953	16.953	Solely loʻi	Lands with just loʻi land use as established above and based on LCA & Grant acreage	25
0.903	0.153	Loʻi and pāhale	Subtracting 0.25 acres/parcel for pāhale	3
1.712	1.212	Loʻi and kula	Subtracting 0.25 acres/parcel for kula	2
10.5	10.5	Loʻi	In Wilcox Grant 2685	1
0.52	0	Kula		
4.48	0	Other undetermined use		
5.75	5.75	Loʻi	LCA 387:2 A.B.C.F.M.	1
5.00	0	Other undetermined use		
~45.82	~34.57			32

This data yields a conservative estimate for loʻi in cultivation at the time of the Māhele on the parcels surveyed in this study (Figure 20, Table 5, and Table 6), as it is possible that the 4.48 of other undetermined uses in Wilcox Grant 2685 and the 5.0 acres of other undetermined uses in the A.B.C.F.M. LCA could have included more loʻi. In conclusion, in the study area in the Waiʻoli ahupuaʻa alone, not including its sister watershed of Hanalei, at least **34.57 acres** were in loʻi kalo cultivation in the early-mid 1800s, with all the rights and access to water needed to irrigate those fields. Even with this reasonable figure, we note that the 1990 Hawaiʻi Stream Assessment identified Waiʻoli Stream as one of only six throughout Hawaiʻi that historically supported more than fifty (50) acres of kalo.

Mānowai, Poʻowai, and ʻAuwai

In addition to looking at archival Māhele records, project staff examined historic maps to survey additional documentation of the ʻauwai system. In 2019, research by the Office of Hawaiian Affairs' Specialist Wahineʻaipōhaku Tong identified twelve kuleana LCAs that referenced this ʻauwai.[79] The Waiʻoli Loʻi Kalo Irrigation System is first depicted in part within surveys for Māhele documents between 1851-1852. Then, 42-60 years later, ahupuaʻa level maps were made by the Hawaiian Government Survey,[80] which depicted features of the Waiʻoli Loʻi Kalo Irrigation System in relation to the larger landscape.

[78] Undetermined use area would have almost certainly contained portions of ʻauwai and loʻi lands, but this is a conservative estimate based on existing data.
[79] Tong 2019.
[80] Hawaiian Government Survey was founded in 1870.

Table 8. Kuleana Land Commission Awards in Waiʻoli that are comprised of loʻi and *mention ʻauwai (from Tong 2019).*

LCA No.	Awardee	Date	Description	Description
8037	Ami	1851	"Akahi loi"	"e pili ana i ka **auwai**"
8261	Isaia	1851	ap1 "alua loi"	ap1"e pili ana i ke **auwai** o Kaupaia/Kaupana"
9072	Keolo	1852	ap2 "aina kalo" ap3 "ehiku loi"	ap2 "E hoomaka ana ma ka **auwai** o Waioli"
9079	Kahookane	1851	ap1 "Na loi"	ap1 "e pili ana i ka **auwai** Kaupana"
9080	Kahooponopono	1851	ap2 "alua loi"	ap2 "E hoomaka ana ma ka **auwai**" "e pili ana i ka **auwai**"
9273	Kawahine	1852	ap3 & 4 "akahi loi"	ap3 "e hoomaka ana ma kahi **auwai**" ap4 "e pili ana i kahi **auwai**"
9275	Koenapuu	1851	ap 1-3 "akahi loi"	ap1 "e pili ana i kahi **auwai**" ap3 "e pili ana i ka **auwai** o Waioli"
9276	Kiolea	1852	ap2 "aina kalo"	ap2 "e hoomaka ana ma kahi **auwai**"
10096	Mareko	1851	ap2 & 4 "alima loi"	ap3 "e hoomaka ana ma ka **auwai**" [apana was cancelled]
10308	Nalimanui	1852	ap1, 4, 5 "akahi loi"	ap1, 5 "e hoomaka ana ma ka **auwai**"
10308	Nalimanui	1851	ap1, 4, 5 "akahi loi"	ap 1 "e hoomaka ana ma ka **auwai** o Waioli" ap5 "e hoomaka ana ma ka **auwai**"
10959	Waioni	1851	ap2, 3 & 4 "akahi loi"	ap3 "e hoomaka ana ma ka **auwai**"

The importance of placing the ʻauwai system in time, and in the same footprint as it is today, not only reaffirms, but proves the general cultural understanding that loʻi are wetland fields, and that loʻi kalo, wetland taro patches, were fed by these ʻauwai. Further, these ʻauwai would, in turn, have been fed by a poʻowai from a mānowai on a nearby stream; based on geography, it would have clearly been on Waiʻoli Stream.

The earliest map depiction of part of the system is from 1873 on Register Map 927 (Figure 22).[81] Even though faint, one can make out the main curve of the ʻauwai system; it is in the same dotted line that defines the stream, curving around the base of Kamoo Koleaka. No other details were drawn of the system, this depiction of the main ʻauwai before the main split is the earliest outside of Buke Māhele claims.

An early Hawaiian Government Survey map, covering an area that ends within a few dozen feet of the poʻowai, notes the age of the integrated systems in Waiʻoli loʻi kalo. Register Map 1680 (circa 1893) clearly depicts the main ʻauwai coming from the exact same location it does today, along the base of Kamoo Koleaka (same segment as on RM 927).[82] This map even depicts the main split where the ʻauwai divides, with one branch flowing into the Waiʻoli ahupuaʻa side of the system, and the other branch flowing into the Hanalei ahupuaʻa portion of the system. The 1893 map and the GIS map are so similar, reflecting a system that has been in place for almost 130 years since the date that the map was made (Māhele documents establish an earlier date).

[81] Gay 1873.
[82] W. A. Wall, *Waioli Kauai*. Register Map 1680, 1893.

(Figure 24). This map establishes that the Hui's system is itself a traditional and customary Native Hawaiian resource and practice.

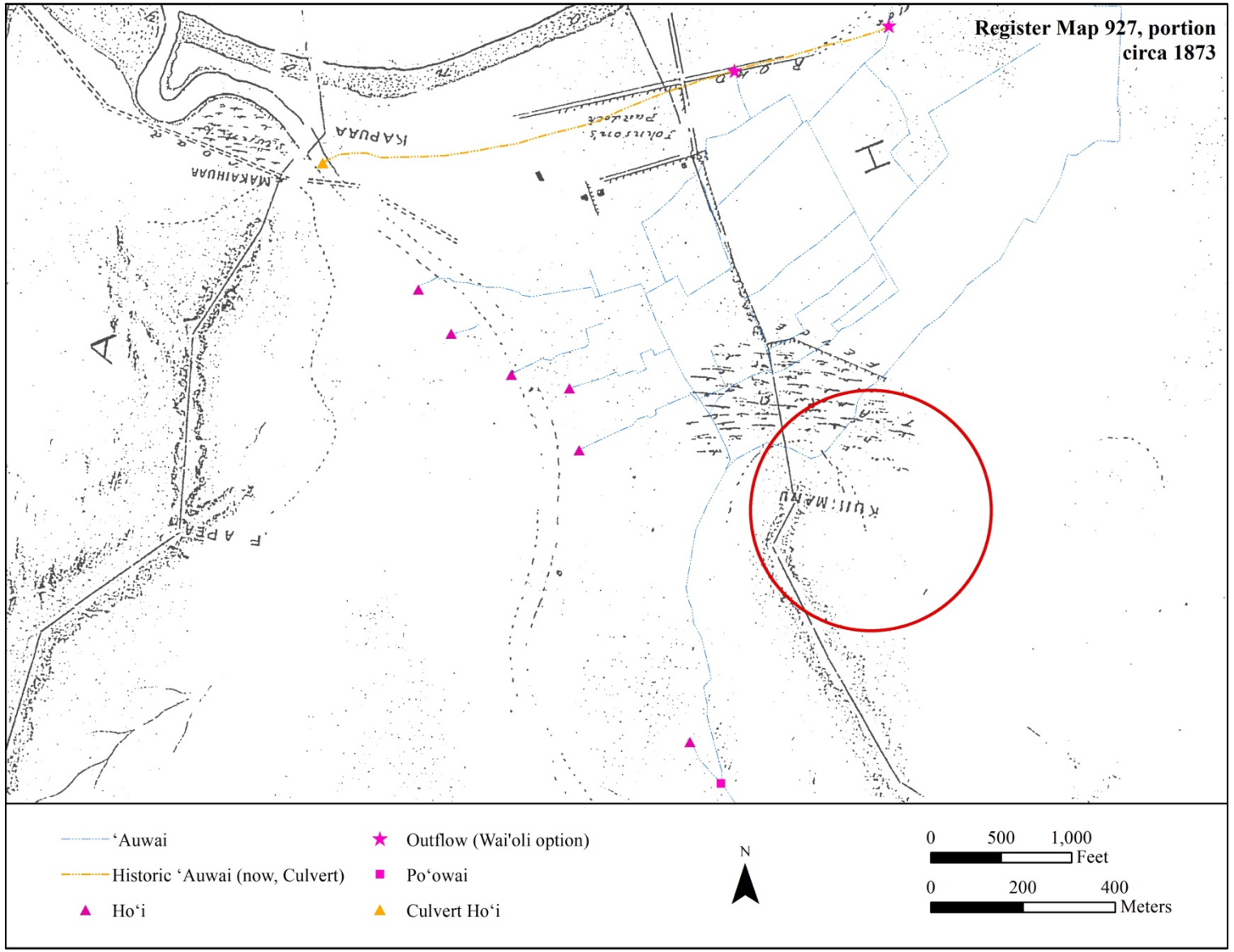

Figure 22. Detailed portion of Register Map 927, circa 1873. The red circle shows where a portion of the main 'auwai flows along the base of the ridge.

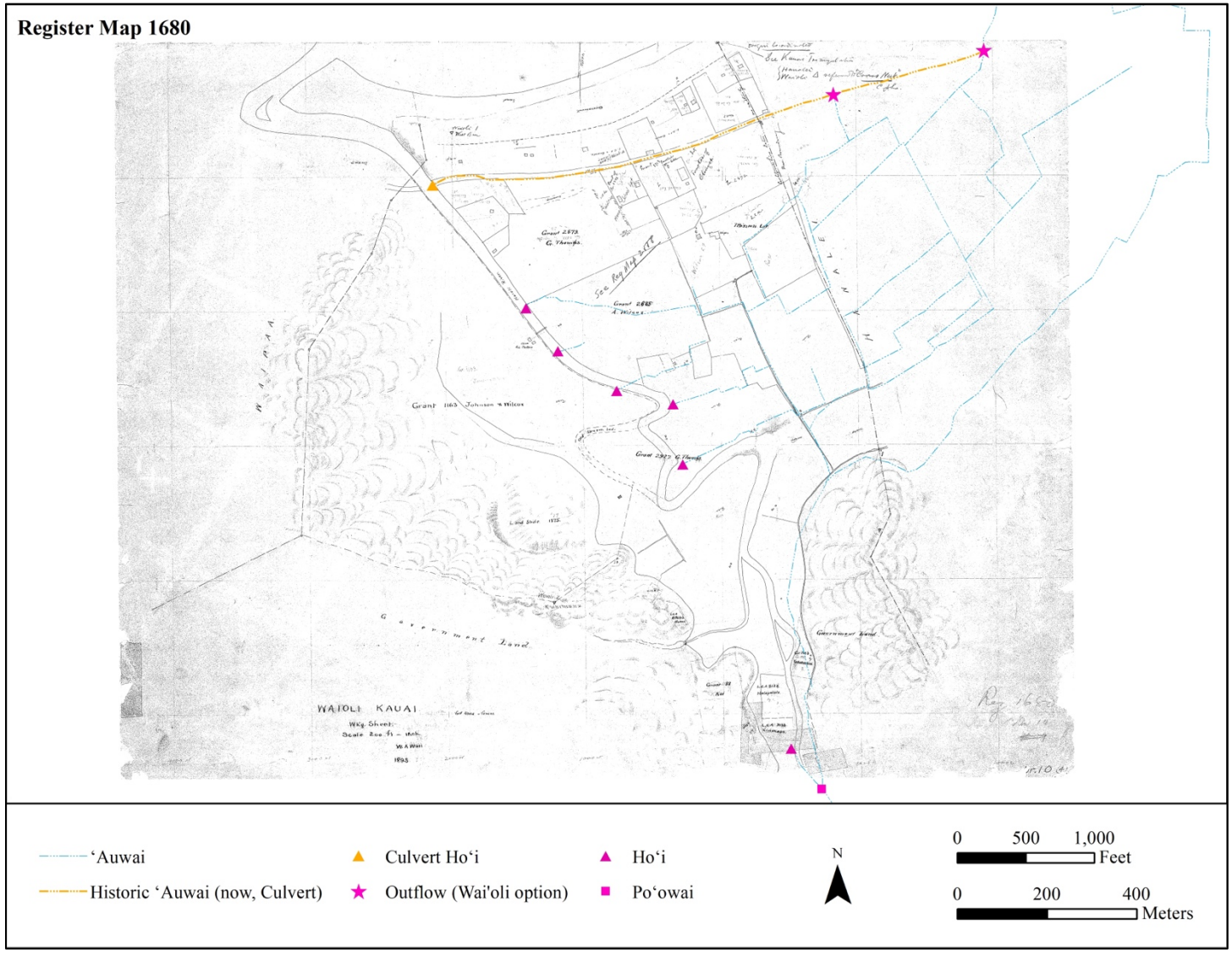

Figure 23. Register Map 1680, circa 1893, depicting the modern Waiʻoli Loʻi Kalo Irrigation System over the same system depicted in 1893. Note that the ʻauwai layer was not warped to fit this map, this is an accurate geospatial overlay

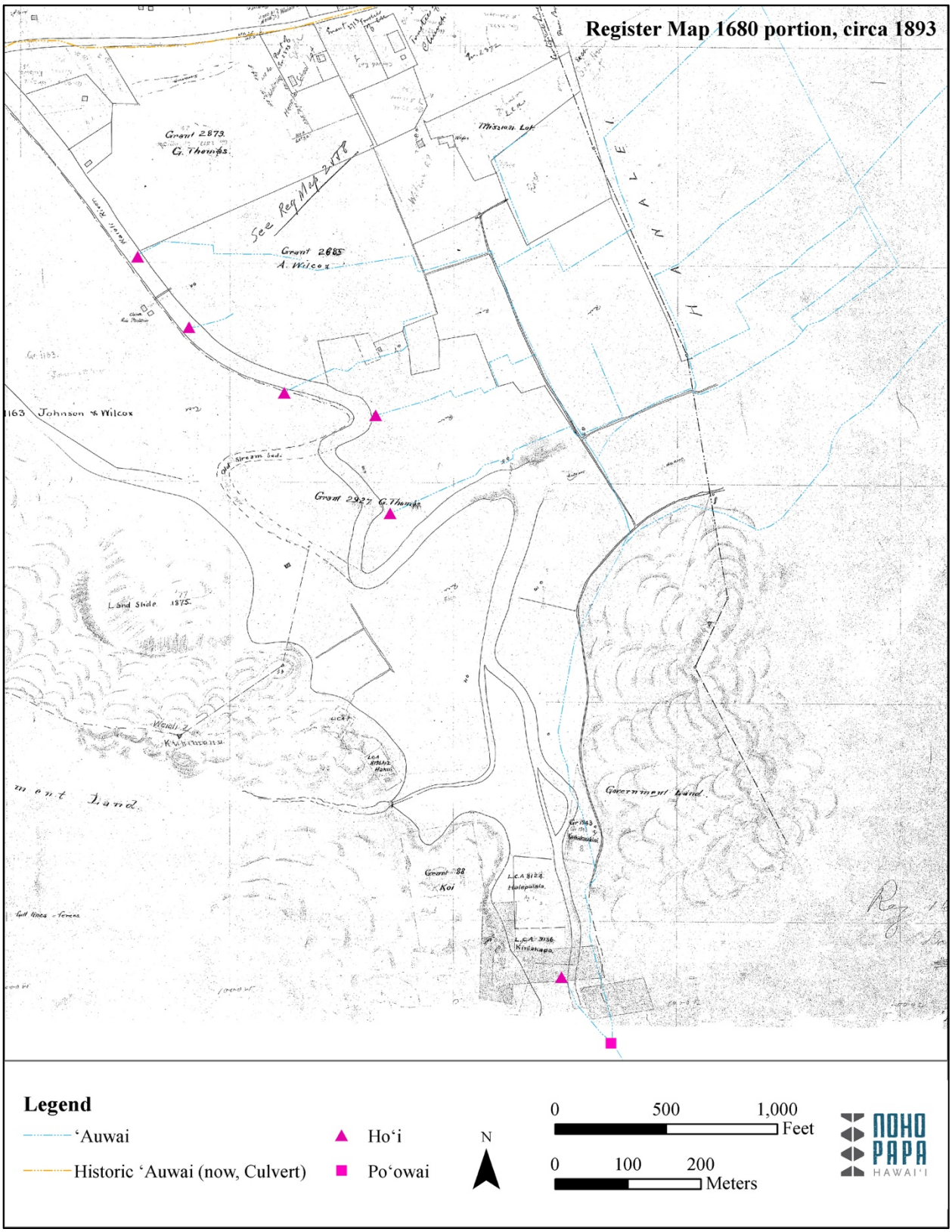

Figure 24. Portion of Register Map 1680, circa 1893, depicting the modern Waiʻoli Loʻi Kalo Irrigation System over the same system depicted in 1893. Note that the ʻauwai layer was not warped to fit this map, this is an accurate geospatial overlay.

Summary of Appurtenant Rights

Research for this section was based solely on primary source archival materials in English and ʻōlelo Hawaiʻi and the use of ESRI ArcGIS software to contextualize the geospatial locations of historic maps and land features.[83]

Based on this research, project staff determined that, *at minimum,* 34.57 acres of the Waiʻoli Loʻi Kalo Irrigation System was in loʻi between 1830-1860, with all the rights and access to water necessary to irrigate those fields. The documentation provided is contemporaneous with the use of loʻi on these various parcels today.

Historic maps establish that the ʻauwai system was partly surveyed and depicted 147 years ago, then in greater detail 20 years later. Using ESRI ArcGIS software to georeference old maps to their real world geospatial locations, project staff clearly established that the ʻauwai system has changed little over the last 127 years. In fact, these extremely early depictions confirm the existence of the mānowai and poʻowai per the extent of the ʻauwai system. When coupled with Māhele claims (discussed above), this attempt to quantify appurtenant rights to a sample acreage is reasonable based on an exhaustive survey of Māhele and other data.[84]

All of this underscores the extent and interconnectedness of the Waiʻoli Loʻi Kalo Irrigation System at the time of the Māhele. Comparing Figure 20 and Figure 24, it is remarkable how little the system has changed over the last 170 years. The Hui's continued use of water from Waiʻoli Stream is grounded in both traditional and customary Native Hawaiian, riparian, and appurtenant rights, which have the highest protection under that law, as well as historic and contemporary instream and in-watershed use.

[83] Project staff did not attribute kalo or loʻi use without examining multiple records. All cases of possible mixed use were noted and discussed in detail above.
[84] By the published date of Register Map 1680, the Office of Hawaiian Government Survey had only been in existence for 23 years.

Ethnography – Traditional & Customary Native Hawaiian Beliefs, Practices, and Resources

Methods

With the goal of identifing and understanding the importance of, and potential impacts to, Native Hawaiian historic and cultural resources and cultural practices of Waiʻoli, project staff conducted ethnographic interviews with community members who are knowledgeable about the Project Area. Utilizing a multi-phase study between August and October 2020, the ethnographic process consisted of identifying appropriate and knowledgeable individuals, reaching out to them with an invitation to participate, conducting oral history interviews in person, summarizing the digitally recorded interviews, analyzing the oral history data, and preparing a summary of findings (Summary of Community Ethnography).

Scoping for this project began with contacting knowledgeable individuals recognized as having genealogical, cultural, and/or historical connections to the project ahupuaʻa and knowledge of watershed management, loʻi kalo farming, and other traditional and customary Native Hawaiian practices, especially within the Project Area. Project staff selected participants who met one or more of the following criteria: 1) were referred to Nohopapa Hawaiʻi; 2) possessed genealogical ties to the Project Area or vicinity; and/or 3) were considered Native Hawaiian cultural practitioners. Nine (9) individuals were contacted to participate, eight (8) individuals participated in the consultation process, and one (1) could not participate due to scheduling issues. Project staff then called and emailed individuals with a Community Contact Letter (Appendix D) to inform them of the project, followed up by telephone, and then met with individuals in person to discuss the project.

During the study, project staff learned that interview participants obtained their knowledge about the project ahupuaʻa from three primary sources:

1. Knowledge and information passed on within the ʻohana from one generation to the next.
2. Knowledge obtained from individuals outside their ʻohana such as teachers, cultural practitioners, and kūpuna.
3. Knowledge gathered through personal observations and practices (such as knowledge acquired through cultural work and practices within the Project Area).

All of the individuals interviewed acquired their knowledge about Waiʻoli through personal experience or observations and from older family and community members who shared with them personal, historical, and/or genealogical information about Waiʻoli and the Waiʻoli Loʻi Kalo Irrigation System.

The study utilized semi-structured interviews that followed a general script covering a pre-determined list of topics while allowing for open-ended discussion. The interviews were conducted in a "talk story" format to allow for a more informal dialogue and free-flowing sharing. Project staff utilized information gathered during the initial phases of archival research and scoping to construct the open-ended interview questions. The primary themes guiding the interviews included:

- ʻOhana and individual connections and relationships to the area
- Moʻolelo, place names, mele, oli, and hula
- Past and present cultural practices and protocols
- Knowledge of natural and cultural resources
- Traditional and historic land use and ownership
- Information about the traditional loʻi kalo irrigation system
- Traditional and historic events affecting practice (ʻauwai, rivers, storms)
- Concerns and suggestions regarding future management of this area
- What does water mean for kalo or kalo farming?

Project staff audio recorded each interview, and later transcribed and summarized some portions. Staff then sent the summaries to each interviewee for review, accuracy checks, and to confirm they were comfortable with the thoughts and information shared. Throughout the study, project staff remained committed to ensuring that the voices of community members were honored and respected, correctly heard, and properly conveyed.

Throughout the study, and particularly before any type of meeting or interview, project staff explicitly and carefully explained to all participants that involvement in the study was strictly voluntary. All participants completed a comprehensive informed consent process, which included receiving project background information, as well as the Participant Informed Consent Forms (Appendix E: Participant Informed Consent Forms), which notifies participants that they can choose to remain anonymous. After proper notification and discussion, some interview participants voluntarily provided verbal, written, emailed, and even texted consent for the researchers to use their manaʻo for this study. Throughout the project period, all participants had open access to the interviewer. All of the interviews were scheduled and arranged for the participant's convenience, and none of the interviews or meetings were initiated until participants felt comfortable with the process. During the course of researching and conducting the ethnographic interviews, no sensitive or confidential information was revealed, and no confidential information was withheld from the current report.

Identification of Topic Areas

In Waiʻoli, many kūpuna and kamaʻāina have maintained close connections to their ʻāina and have kept the stories and practices of their culture alive; continuing the cultivation of this Native Hawaiian cultural landscape since time immemorial. Ethnographic research for this report included conducting interviews with community members to record and acknowledge participants' cultural and historical connections to the Waiʻoli Loʻi Kalo Irrigation System.

The following sections include extended quotations from these in-person interviews as well as testimonies provided by some of our interviewees and other kalo farmers and submitted to BLNR in May 2019 and February 2020, organized by topic area. Four general themes emerged from the manaʻo shared during these interviews and from these testimonies: 1) Individuals'

Connections to the Waiʻoli Loʻi Kalo Irrigation System; 2) Kalo Farming and the Waiʻoli Loʻi Kalo Irrigation System; 3) Traditional and Customary Practices and Resources Dependent on the Waiʻoli Loʻi Kalo Irrigation System; and 4) Concerns and Recommendations. The following sections explain these themes in greater detail.

Individuals' Connections to the Waiʻoli Loʻi Kalo Irrigation System

Project staff contacted nine (9) individuals regarding this CIA. Of the nine, eight (8) individuals participated in ethnographic interviews. The following section includes background information for each interviewee, including information on their ʻohana and/or individual connections to Waiʻoli and Halaleʻa, and their continuation of kalo farming.

Clarence Eli Kaona, also known as "Uncle Shorty," was born in Honolulu and raised on Kauaʻi. He is a third generation kalo farmer in Waiʻoli Valley, 100% Native Hawaiian, and a member of the Waiʻoli Valley Taro Hui. He has been farming the same kuleana land in Waiʻoli since he was a young child. His grandfather farmed kalo in Hanalei Valley in the 1930s, and when he passed away, Uncle Shorty's father took over and then aquired land in Waiʻoli Valley in the 1940s. Uncle Shorty went to Hanalei School and remembers walking from Hanalei up into Waiʻoli Valley to work in his father's taro patch: "I'll be 85 (years young) in November and all those years I've been working in the taro patch. This is the same kuleana that I continue to farm and that will be passed down to my daughter, JoAnne Kaona, and to the generations yet to come." Uncle Shorty took over kalo farming from his father in 1987 and in 1989, filed a Declaration of Water Use with the Commission on Water Resource Management.

Diana Kahiki Spencer ("Aunty Diana" Kaona) is Uncle Shorty's sister and was married to the late Charles Spencer. Like Uncle Shorty, she is 100% Native Hawaiian, was born on Oʻahu and raised on Kauaʻi, first living at Kalihikai and then moving to Hanalei with the family. Their mother, Miriam Puakina Nahulu, was born on Niʻihau and later adopted. Their father, David Kawika Kaona, was born on Hawaiʻi Island, raised on Kauaʻi, and later started to farm kalo. For Aunty Diana and Uncle Shorty, growing kalo is a family tradition. Today, Aunty Diana has loʻi kalo up in Hanalei Valley, about almost three acres where she continues to grind, plant, and weed.

JoAnne Kaona is the daughter of Uncle Shorty and a fourth generation kalo farmer. Her father has farmed their family kuleana along with a handful of other small parcels for decades. She is one of five children and is the only one who helps her father farm their loʻi. For JoAnne, kalo farming defines her ʻohana: "it is what we do." She enjoys helping her father farm and has an appreciation for it as something special that they share together. Even in his 80s, her father still works hard as a kalo farmer and knows that the kuleana will fall upon her to ʻauamo (shoulder) when he is no longer able. She considers farming kalo her kuleana, a way to feed her community, and something that makes her happy. She explained, "After four generations of this work, it would be impossible for me to turn away from a practice that has been with my ʻohana for so many generations. In fact, there is no other alternative for me, I just have to do it."

Kimo Inanod was born on Kauaʻi, has lived in Waiʻoli Valley across from the Hanalei School his entire life, and is a fourth generation Native Hawaiian kalo farmer. Kimo is also an avid hunter, fisher, and gatherer, and regularly accesses the ma uka and ma kai reaches of the Waiʻoli Watershed to exercise traditional and customary Native Hawaiian rights and practices. He is intimately connected with this ʻāina and feels an obligation to ensure responsible use of this land and its resources. For Kimo and his ʻohana, "this is about protecting and restoring our quality of life as Native Hawaiian practitioners and small family farmers."

Lillian Watari grew up on the North Shore of Kauaʻi, living in Wainiha, then Kīlauea and currently in Waiʻoli. She shared "To say kalo farming has been a longstanding custom and tradition in our family would be an understatement. Growing up, I was the eldest of 5 children. As soon as we were physically able, we were out in the loʻi helping our parents and grandparents maintain and cultivate the kalo. At such a young age, the commitment it takes to farm kalo was a burden I did not quite understand. Our lives revolved around the kalo's needs. Our routine consisted of coming home after school, having enough time to grab a snack, and loading up the truck to head down to the loʻi. Looking back now, the value of the lessons I learned working in the loʻi is hard to put into words. I am proud of my family's tradition of farming kalo and the person it has made me. It taught me the value of hard work and the importance of being able to spend time with nature."

Lily Tai Hook ("Aunty Mieko") was raised in Wainiha, later moved to Kīlauea and now lives in Kalihiwai. Her grandfather grew kalo in Lumahaʻi and her father (Allen Harada) also had loʻi kalo in Wainiha. She has farmed kalo in many parts of the Haleleʻa moku. Currently, she and her husband (Wilbert Tai Hook or "Ah Fook") farm kalo up the river in Hanalei as well as within the Waiʻoli Loʻi Kalo Irrigation System. These loʻi are leased from Princeville Agriculture LLC. Just as she was raised in the kalo patch, her children were also all raised in the kalo patch.

Wilbert Tai Hook ("Ah Fook") is married to Aunty Mieko. He has been planting kalo in Wainiha Valley since 1964 and now within the Waiʻoli Loʻi Kalo Irrigation System.

Christine Kobayashi ("Aunty Chris") and her ʻohana have been living and farming in Waiʻoli Valley for three generations and over one hundred years. Her father was born in 1920 on the same land where she was born and raised and continues to farm today in Waiʻoli. Her father lived here and farmed throughout his life, as has Aunty Chris. When she was young, Aunty Chris would do simple tasks like pulling grass and harvesting. As her father got older, he spoke to her one day "realizing that there may be no one left to carry on and maintain our kalo farm. Though I never told him, it was at that very moment that I made the decision and commitment to take over the farm and carry on his legacy. I knew how much he and my mom had struggled to raise five children while farming, and I thought of all of his blood, sweat, and tears that had gone into clearing, preparing, planting, maintaining, and taking care of the kalo and the land. I thought: I can't let all that he put into our farm be for nothing." She currently farms about 3.5 acres of loʻi.

In addition to the above named interviewees, eight (8) Native Hawaiian and/or kalo farming community members provided testimony to BLNR in May 2019 and February 2020. The information below describes their ʻohana and/or individual connections to Waiʻoli and Haleleʻa.

Demetri Rivera ("Dimi") farms with Chris Kobayashi in Waiʻoli. Dimi farms about 5.13 acres of loʻi, kuāuna (banks), and roads and has been farming kalo full-time for over 25 years.

Dwight Morishige is a third generation kalo farmer and has been farming in Waiʻoli Valley for over 40 years. He grew up in this community and learned how to grow kalo from his family, his father-in-law, and other farmers in this area.

Bobby Watari is a third generation kalo farmer and has been farming kalo full-time for the past 40 years. Farming kalo is Bobby's life's work and passion. He learned to farm from his father, who moved to Hanalei in the 1950s to farm kalo. Bobby cultivates the kuleana land that his family owns and leases other loʻi from Waiʻoli Corporation. For Bobby, "Farming is so much more than planting and harvesting. We work hard to preserve the land for taro, and to steward

the loʻi kalo system that has been in place long before I started farming. In Waiʻoli, we use a traditional Hawaiian water and loʻi system that researchers have documented as having been in place since before the arrival of Captain Cook in the 1700s. We are honored to be a part of the handful of farmers that continue this important practice – one that has been our way of life in Waiʻoli for hundreds of years." For Bobby, kalo farming is woven into his family life, "We enjoy and are proud of being able to farm as family. The vision I have of farming the same land with my wife, Lillian, stepson, Kaisen, and his kids gives me the strength needed to continue during these difficult times. Knowing our future ʻohana will have access to water and the access needed to maintain our water system would give me hope that they will be able to continue our family tradition of farming taro."

Kaisen Carrillo comes from multiple generations of kalo farmers on both sides of his ʻohana. He is in his 20s, and a fifth generation Native Hawaiian kalo farmer in Waiʻoli and Lumahaʻi Valleys. He is one of only three farmers in Waiʻoli younger than 35 years old. He shared, "I have just started my own family and I am raising my 3-year-old daughter to farm this land as well. I also have another child on the way [born in 2020] who I will also raise in the same way. They will be sixth generation Waiʻoli kalo farmers." He continues, "as difficult as things have been, I love what I do. This is my culture. It is what my family has been doing for generations. I feel a deep sense of pride and honor to ʻauamo my kuleana and perpetuate this practice – especially now when many of my generation are becoming less interested in taro farming. To be honest, there are more lucrative ventures for some. But, what we do goes beyond monetary value; this is about kuleana. It is our way of life and we will continue to farm taro on these lands for as long as we are physically able."

Nathaniel Temanu Tin-Wong is Native Hawaiian, comes from generations of farmers, and has family roots across Kauaʻi. With a young ʻohana Hawaiʻi, he recently moved back to Waiʻoli Valley to farm. He explains: "we strive towards a lifestyle devoted to exemplifying those values and traditions passed on to us by our ancestors: living with the land and farming kalo." Although in relation to fellow Waiʻoli Valley Taro Hui members, he is relatively new to farming, he understands the importance of growing kalo. He shared, "Farming kalo feeds not only my physical self, it feeds my naʻau. My practice, as a kalo farmer, keeps me grounded, and without it, it is easy to get lost. I consider my practice and work important not only to my community, but to humanity as a whole."

Reid Yoshida has had family in Hanalei for 125 years. His great-grandfather came to Kauaʻi to work on the plantations and lived in Hanalei since the late 1800s. His grandfather was born in Hanalei in 1896, and Reid shared that he is fortunate enough to live in the same home that his great-grandfather finished building in 1933. In the 1920s, his great-grandfather started raising rice and then slowly started to plant kalo as a supplemental crop in the 1940s. By the 1950s, due to the competitive rice prices in California, he decided to leave that crop and move towards farming taro. For years, his grandfather continued to farm until his uncle eventually took over the farm. He described his childhood: "Growing up, I spent my time split between Oʻahu where I went to school, and Hanalei where I spent my summer/spring breaks, long weekends, and holidays. Every time that I was in Hanalei, we always worked the farm. When my friends were out playing sports and going to the beach, we were either pulling grass, planting huli, or using the tiller to prep the fields." Reid's family kuleana is the foundation for him continuing to farm kalo, "Many people have questioned my decision to walk away from my career as an engineer to farm taro, but I do it because it is gratifying. I do it because I am able to farm on the same land that my grandfather did and this gives me pride in what I do. I am carrying on my grandfather's legacy and it will not end with me; it will keep going."

Sierra-Lynn Boro-Harada is a Native Hawaiian kalo farmer whose family has been farming kalo for generations. She was raised in the fields where she learned and grew to enjoy the culture of cultivating kalo, the various aspects of hard work, and how to have fun while working. Her dream is to carry on this tradition and lifestyle, and to teach her children and future generations of her family to love it as she does. She shares, "My love for farming is limitless – it is hard to put into words. The opportunity to love what you do, and do what you love, is an experience that I hold dear. It is priceless and I plan to continue my family's tradition of farming here on the North Shore of Kauaʻi."

Wayne Tanji has been farming in Waiʻoli Valley for over 30 years and currently leases 1.8 acres of land where, prior to the flood, he maintained seven (7) wetland kalo patches.

Kalo Farming and the Waiʻoli Loʻi Kalo Irrigation System

This section documents the different aspects of Waiʻoli Kalo Farming as shared by participants, specifically regarding 1) The Need for Flowing Water from the Waiʻoli Loʻi Kalo Irrigation System and the Absence of Alternatives, 2) Changes to the Loʻi Kalo Irrigation System and Waiʻoli Water Over Time, 3) The Importance of Maintaining the Waiʻoli Loʻi Kalo Irrigation System, 4) Impacts of Heavy Rain and Flooding on the System and Loʻi Kalo, and 5) Supporting ʻAi Pono and Sharing with the Community. These various facets of caring for the Waiʻoli Loʻi Kalo Irrigation System demonstrate that this traditional system and the Waiʻoli community are inextricably intertwined—that the system relies on the community to maintain it, and that the community depends on the system and the resources it supports to sustain cultural practices and put food on their dinner tables.

The Need for Flowing Water from the Waiʻoli Loʻi Kalo Irrigation System and the Absence of Alternatives

The continuous flow of water is essential to grow wetland kalo. Without constant flowing water, this Native Hawaiian traditional and customary practice will be extinguished. Participants all noted that if they did not have enough cold, flowing water, their wetland kalo would not grow properly. Importantly, flowing water plays a vital role in maintaining the temperature of loʻi, which ultimately affects the growth and quality of the kalo. Participants shared their thoughts about whether there are other viable alternatives to the current ʻauwai system, and agreed that all other alternatives, including well water, would be impracticable. Moreover, stewarding this system – rebuilding the mānowai after floods and maintaning the ʻauwai – is part of these farmers' Native Hawaiian traditional and customary practice of kalo farming in Waiʻoli.

Kimo put it simply: "If you don't have water, the taro isn't going to grow. The grass is going to come out and overtake the crop. And you're only going to have little bit taro or the taro is going to cook from the heat if there's no water." Waiʻoli kalo is grown wetland because it is used for poi. This necessitates throughflow – having water flow into the loʻi and return to the river to carry heat away. Without "a constant flow of water . . . the water fill up and it just sits . . . and the water comes hot. So the taro matures faster. It won't grow as good if you don't have running water. Cold running water." Kimo explained that water from the Waiʻoli River is the lifeblood for both his loʻi kalo and his culture and way of life as a Native Hawaiian practitioner: "If something should happen to the Waiʻoli ditch, there is no other source of water. That's it right there. Pau."

Demetri shared, "I know that you cannot farm wetland kalo without good, fresh, flowing water from the mountains. If there is a lack of water or inconsistent water, you will get lots of weeds growing and your kalo quality can be so bad, that sometimes, you just gotta plow under. If water

flow is low in the summer and the other hot months, the water is warm and the kalo will rot due to diseases and a poor environment. No sense plant." Aunty Chris echoed the importance of maintaining optimal water temperature, "Taro wasn't made to grow in hot, standing water or murky, mucky stuff."

Aunty Diana reiterated the need for flowing water: "Water is the main thing we need. We need that Waiʻoli water to flow steady." She insisted there is no other alternative to flowing water from the mānowai. "As long as you have the water, that's all you need, is water and your lima."

Changes to the Loʻi Kalo Irrigation System and Waiʻoli Water Over Time

Although the physical system itself has changed little over time, inhabiting the same footprint since at least 1893 (Figure 24), there was a period of about 50-100 years, when rice threatened to replace kalo in Waiʻoli, and across Hawaiʻi. This shift never took hold in Waiʻoli, and the Waiʻoli Loʻi Kalo Irrigation System has been 100% back in kalo since the 1950s.

All of the interviewees mentioned at least one major shift in the system they could recall. No one remembered the main ditch or māno being in a different location, but Kimo did recall when a historic ʻauwai with a hoʻi was later piped by the government, although it still runs to Waiʻoli Stream (see Project Area maps). Aunty Diana remembered this same ʻauwai, when it was open, in front of the Hanalei School, "when get heavy flooding, the water is coming back the same place originally where it was." Uncle Dimi has video from the 2018 flood and you can see the back flow of water flooding the side of the road where this old ʻauwai, now a drain, flows.

Several interviewees also noticed that the water has changed over time. For instance, Aunty Chris observed that "the water up mauka at the māno in the river is much warmer than it used to be when I was growing up as a kid" and described her efforts to make the water cooler by making her fields smaller. She also remembered that a drought sometime in the late 1980s or early 1990s caused diseases and rot in kalo plants because of warm water.

The Importance of Maintaining the Waiʻoli Loʻi Kalo Irrigation System

Sustaining flow into and out of the Waiʻoli Loʻi Kalo Irrigation System is essential to the health of the watershed and kalo. Participants all underscored the importance of maintaining the Waiʻoli Loʻi Kalo Irrigation System, including the methods used to clean the different parts of the system and the potential effects of negligence. One collective theme throughout the farmers' interviews was that maintenance of this system is a kākou effort.

Bobby shared, "Restoring and maintaining our existing loʻi kalo system is so critical, not only for my family's livelihood and the livelihood of the other famers, but also to perpetuate our way of life and the community here in Waiʻoli that we are all a part of. We use a mānowai, a traditional, Native Hawaiian breakaway dam, to take some water from Waiʻoli Stream. That water flows through our ʻauwai, then into our taro patches, then back to either Waiʻoli Stream or the lower reaches of Hanalei River. Like other taro farmers, we need throughflow, water flowing through our taro patches, but we don't 'consume' water like most off-stream users because it goes back to the stream. All of our use is within the watershed where our water supply originates. So, any seepage, for example, also goes back to feed our water cycle in Waiʻoli." He continues, "Our responsible water use and efforts to maintain the watershed and stream system not only benefit us, but so many others. Having worked with these resources for generations, we take care of them and they take care of us. The maintenance work we do on the loʻi kalo system is not only

essential for productive crop yields, but it also ensures a healthy watershed and stream. Regular maintenance is critical to prevent blockages that might result in flooding."

Uncle Shorty and Aunty Diana discussed how the farmers have always worked together to clean the ditch. Aunty Diana shared that hand clearing is the best method because "[t]here's no road or anything. You have to walk along the side of the river" and that "[w]hoever owned property would go up because they used the same water. The water comes from the same place, the same ditch, and so all the farmers go up and work together."

Kimo shared how farmers cleaned different sections of the ditch system, "To me, there's a lower section and the upper section. The lower section, where everybody gets their immediate water. Usually like for me, I would clean from where my pipe intake stay, I would clean so far up, like to where Aunty Chris' guys one cuts off. Me and my uncle usually clean all that probably 20 to 30 times a year. You just go and dig the silt out, cut the hau roots and stuff."

Aunty Lilian, Ah Fook and Aunty Mieko agreed that when cleaning and maintaining the ʻauwai, the most difficult part is clearing the hau bush roots growing into the sides of the ʻauwai.

Aunty Chris stressed the necessity of cleaning the ditch regularly, "…the ditch system will deteriorate [if we don't maintain it] and we have to take care of it. We got to go up there, take care of the invasive [species]." She also shared her experiences cleaning the ditch and the importance of maintaining tradition, "…it's best if whoever shares that particular portion, that they help and they do it. I think in the old days, that's how the system worked before. Going up to clean, they would clean at least couple times a year. It was a given all the way to the māno. You look at the pictures of how productive this place is, but we need to take care of it, you know? It might be just a few families that do this, but it's part of the culture of this place."

Impacts of Heavy Rain and Flooding on the System and Loʻi Kalo

In addition to regular maintenance of the irrigation system, the Hui also comes together in times of heavy rain and flooding to check on and repair the system, on which they all depend.

Demetri shared, "As a Hui, we have been maintaining the mānowai, poʻowai, and ʻauwai on a regular basis and especially during times of emergencies, which happens to be every time there is a big rainfall. In the winter months, we brace ourselves for big rains and storms, hoping that there won't be any more flooding. The 2018 flood, however, was really unlike any other rainfall event we've seen. We need to restore the māno, clear the stream of debris, and fix the ʻauwai quickly, so that we will have enough water to start planting again. Other farmers in our Hui are also not getting as much water as they currently need, and summer is almost here. Having low water flow will further limit the amount farmers can plant and produce."

Uncle Shorty talked about the devastation of the 2018 flood, "In all of my years here in Waiʻoli, I have never seen a flood like that. The damage was devastating. It ruined my equipment and tools, most of the banks that border my patches, and the ʻauwai. The ʻauwai needs further maintenance and restoration. The mānowai that feeds the ʻauwai was completely destroyed. This led to a lack of water that has suffocated our ability to continue farming at the capacity needed to feed our families."

JoAnne also shared about the effects of the 2018 floods on the entire ʻauwai system, "After the 2018 floods, our mānowai, poʻowai, and entire ʻauwai system were completely devastated. Our river changed course and some suspect that it was due to a thousand-year flood event. Of the 3.5

acres of kalo that my ʻohana normally farms, we are now able to farm only 2 acres. A year after the floods, and for the first time in my father's decades of farming, he was not able to produce any kalo. This was due to many factors, including a shortage of water due to damage to our mānowai and ʻauwai, equipment ruined by the floods, and debris and silt clogs in our loʻi. Nevertheless, we Waiʻoli farmers have persevered together through all of these challenges because of our kuleana to our community and our love for farming."

Aunty Chris shared that they are not on a regulated water system which is often unpredictable and that flooding impacts their loʻi and future use, "So there's these two fields that are down there that we never farmed long time purposely because we had to throw both fields away. It was impacted from the floods. We would harvest and then the thing was so loli. Because it got flooded. It's almost like being a farmer, it's hard to keep taking the same risks as we get older and older."

Supporting ʻAi Pono and Sharing with the Community

Kalo is the staple food of a traditional Hawaiian diet, and making and eating poi is a cultural practice. The farmers all support the perpetuation of ʻai pono, or the eating of traditional foods, by sharing and giving kalo away as well as sending it out to be made into poi in the neighboring ahupuaʻa of Waipā, across Kauaʻi, and the pae ʻāina. Participants shared their experiences preparing, eating, and sharing kalo.

Aunty Diana highlighted the need for kalo and the different ways it can be prepared, "That's our staple food. We need poi. We need taro. One thing about taro, you can cook it anyway you like. You can eat by itself. You can bake it. . . We make stew. I make patties. I grate them and then I put condensed milk and then I put meat and then deep fry it. That's my father's recipe."

All participants shared about the many varieties of kalo grown in Waiʻoli over the years, and described their favorite varieties. For instance, Aunty Meiko and Ah Fook favor the Kāī variety; Aunty Lilian hopes the Kauaʻi Lehua and Piʻialiʻi varieties come back. Aunty Chris grows over 20 Hawaiian varieties "to see how they grow in this environment in the field, in the loʻi. And you can just see side by side growing them, which ones are strong and which ones don't seem to be too strong, but we just keep growing it to see, give them a few seasons to grow and see what comes out of it." The table below is an inventory of some of the kalo varieties grown by the Hui at the time of this study.

Table 9. Inventory of kalo varieties cultivated by the Waiʻoli Valley Taro Hui.

Hawaiian Kalo Varieties	Non-Hawaiian Varieties
1. Elepaio Hauliuli	25. Bun Long
2. Eleele Makoko	26. Faa Fausi
3. Eleele Naioea	27. Iliuaua
4. Kapaaloa	28. Paakala
5. Kaiala	29. Palau var.
6. Kaikea	30. Number 6
7. Kaiuliuli	
8. Lehua Maoli	
9. Lehua Palaii	
10. Lauloa Eleele Omao	
11. Lauloa Palakea Eleele	
12. Lauloa Palakea Papamu	
13. Lihilihimolina	
14. Manalauloa	
15. Manaulu	
16. Manini Kea	
17. Manini Owali	
18. Manini Uliuli	
19. Maui Lehua	
20. Nihopuu	
21. Paakai	
22. Piko Keokeo	
23. Uahiapele	
24. Moi	

They also highlighted the importance of sharing and feeding the larger community. For instance, Aunty Lilian allows people to pick kalo leaves from her loʻi for special events and Aunty Diana enjoys giving kalo away to family and people visiting from other islands. “It wasn’t to make money. We just help people. It was fun.” Aunty Chris described the “balance between growing food for ourselves and supplying good kalo to small poi millers who make poi or paʻiʻai for their communities; to ʻāina-based programs on different islands who teach and bring together many young children; and to students and families who do traditional kuʻi with their traditional food. It has been a heartfelt honor to have been part of this and we hope to continue to be a source for these friends and others.”

Bobby also spoke about giving to the greater community, “We feed our community by supplying this staple to small non-profits like the Waipā Foundation and others throughout Hawaiʻi. My son Kaisen also provides lūʻau leaf so local families can again make laulau and other Hawaiian food.”

Dwight shared, “This community has always been close and centered around kalo cultivation. Kalo is a very nutritional food that we grow right in our own town. Culturally, it is important for our younger generation to continue farming.”

JoAnne echoed that sentiment, “Farming kalo teaches us how to act; it teaches us how to mālama our ʻāina. In my work at the Waipā Foundation, a non-profit in the neighboring ahupuaʻa, I work with children and teach them about aloha ʻāina, sustainability, natural resource management, and traditional and customary Native Hawaiian practices. I see it as an opportunity for me to instill a

sense of kuleana in this younger generation to take the teachings of our kūpuna and apply them to our practices today." She continued, "A mission of the Waipā Foundation is to create a healthier community by educating our people about an Indigenous diet while also keeping it affordable. One way to maintain this is by ensuring that our community has local kalo and poi to eat. The Waipā Foundation gets 90% of our kalo from the Waiʻoli farmers, including my father. The Foundation processes kalo and poi at our certified kitchen with volunteer labor and provides paʻiʻai for our community, at or below cost. For example, Waipā's paʻiʻai price for kūpuna is $1 per pound." Last she shared, "Within the greater scheme of things, I see my own kuleana as helping to sustain a healthy lifestyle for our entire community, from keiki to kūpuna. We in Hanalei, and more particularly the farmers in Waiʻoli, have been blessed to be able to farm kalo on ʻāina that has been stewarded in this same way for many, many hundreds of years. The ʻāina is well-suited for wetland kalo cultivation and the ʻohana who have been farming, like my own, for multiple generations, have taken on this kuleana to ensure that accessibility to our lāhui's most basic and essential food is met. This heavy kuleana is a burden to carry, especially when our water needs are not met."

Native Hawaiian Traditional and Customary Practices and Resources Dependent on the Waiʻoli Loʻi Kalo Irrigation System

Participants detailed important resources and cultural (e.g., subsistence) practices reliant upon them in the Project Area. In addition to kalo, participants identified the type of resource(s) collected, their location in relation to the Waiʻoli Loʻi Kalo Irrigation System, and the practices and methods associated with those resources or the protocols observed. The most prevalent subsistence practices in Waiʻoli mentioned during the interviews include 1) Fishing, 2) Hunting, and 3) Gathering. Note that while religious or spiritual practices were not a focus of this study, they persevere. For example, some gather fresh water for hoʻokupu (offering) and others mentioned the importance of pule (prayer). Apart from established traditional and customary Native Hawaiian practices, because many endemic and endangered manu (birds) are also dependent on the Waiʻoli Loʻi Kalo Irrigation System, participants also shared their 4) Manu Interactions.

Table 10. Inventory of traditional and customary practices and resources dependent on the Waiʻoli Loʻi Kalo Irrigation System.

Traditional Cultural Practice	Cultural Resource	Area/Location in Waiʻoli System	Shared by
Lawaiʻa (Fishing)	ʻoʻopu	ʻauwai	Kimo Inanod
		in stream	Diana Spencer
	wī	in stream / ma uka	Kimo Inanod
	prawn	ʻauwai and in stream	Kimo Inanod, Diana Spencer
	ʻōpae	muliwai (stream mouth)	Kimo Inanod, Diana Spencer, Joanne Kaona
	ʻanae (mullet)	stream	Kimo Inanod, Diana Spencer, Shorty Kaona, Ah Fook Tai Hook
	Samoan crab		Ah Fook Tai Hook, Kimo Inanod
	hinana	muliwai	Kimo Inanod
Gathering & Lawaiʻa	ʻohe (bamboo) to make trap	ma uka	Diana Spencer
Gathering	pōhaku to make papa kuʻi ʻai	ma uka along stream	Diana Spencer, Shorty Kaona
	wai, for hoʻokupu, i.e. for Makahiki	ma uka	Nathaniel Temanu Tin-Wong
	maile		Kimo Inanod
	mokihana		
Gathering & Lāʻau Lapaʻau (Hawaiian medicine)	ʻōlena	ma uka & along loʻi kūauna	Diana Spencer, Christine Kobayashi
	koali	Waiʻoli	Kimo Inanod
	kukui	ma uka	Kimo Inanod, Diana Spencer, Shorty Kaona
	noni	ma uka & along kuāuna	Kimo Inanod, Diana Spencer, Christine Kobayashi
	nīʻoi	along kuāuna	Christine Kobayashi
	lāʻī (ti leaf)	along kūauna & Waiʻoli	Christine Kobayashi, Lilian Watari, Mieko Tai Hook, Kimo Inanod, Diana Spencer
Lei	palapalai	ma uka	Lilian Watari
	nāʻū (native gardenia)		Mieko Tai Hook
	hāpuʻu		
Meaʻai	pepeiao		
	ʻuala	along kuāuna	Mieko Tai Hook, Lilian Watari
	maiʻa		
	ʻulu		
	kō		Christine Kobayashi
Hunting	puaʻa	ma uka	Kimo Inanod, Glenn Kobayashi (per Christine)

Fishing Practices

Participants detailed a wide range of traditional and customary fishing practices within Waiʻoli. They also documented the change in fishery resources and practices over time, including where species occur (or occurred), what was caught where, and in what quantities. It is worth noting that the Hui recently drafted a community-based watershed management plan in partnership with DLNR to better steward and restore these ma uka and riparian cultural resources.

Kimo shared about his family practice of catching ʻoʻopu in the ʻauwai and river. He recalled seeing hinana "down at the river mouth" when he was young and observing an abundance of baby ʻoʻopu with his grandparents. When asked about present day ʻoʻopu fishery and fishing practices he noted, "'Oʻopu definitely not as much as before in this river [Waiʻoli]. Definitely. From when I was young until now there's a definite depletion of that. And really I don't think, here in the Waiʻoli system, it's from overfishing. Because there's not too many guys that go in this river." When asked about other fishing practices in certain parts of the river, Kimo shared, "We used to go to the river mouth and catch the transparent ʻōpae. We would catch mullet, Samoan crab, all in Waiʻoli River." When asked about any differences in fish populations over time, Kimo also said, "I would say maybe the lower section from the ocean, maybe up to the bridge, might be overfished. You know what I mean? I mean Samoan crab is actually invasive so get plenty people do that kind of stuff. Mullet, always get plenty. I don't really think too many people eat mullet, āholehole, and that kind of stuff."

Aunty Diana also reminisced about catching ʻōpae and ʻoʻopu and making kahe, which is "like a ramp made with bamboo. When the water goes over, it goes through the bamboo and the fish get stuck on the bamboo." Aunty Diana said today, "Now no more that kind of fish anymore. Now its tilapia, not ʻoʻopu. Now there's prawns and no ʻōpae. It's not like how it used to be before."

Aunty Lilian shared that the ditch once had an abundance of ʻōpae, but now "You can hardly find ʻōpae." Another practice she shared was "only take enough to eat. Don't take and then waste."

Hunting Practices

Hunting in Waiʻoli is focused on the feral Hawaiian mountain pig. Pig hunting is a cultural practice for at least two kalo farming families in Waiʻoli, and is also an important part of how the kalo farmers manage the Waiʻoli Watershed and control the invasive ungulate population. Both participants explained that they never sell the meat, only share it with their families and others, as was taught to them.

Kimo described hunting and gathering in Waiʻoli Valley during his childhood, "From when I was probably 10, 11, I started to hunt with my grandpa and my dad guys back here [mauka Waiʻoli]. But basically, only get mountain pig back here for hunt in Waiʻoli. My grandpa was the first, then my uncle and my dad, and then me. So third generation for hunting."

Aunty Chris shared about hunting pigs, a practice her brother continues today and her father used to do before he passed. Aunty Chris values hunting because the pigs have a negative impact on the loʻi; she explained that pigs love kalo, especially the Hawaiian varieties. "The pigs come, you lose your whole crop. You wait six, seven, eight months or however long. And then it's all taken away overnight." In trying to prevent pigs from ruining crops, Aunty Chris says they hunt them or set traps on their land.

Gathering Practices

Participants described gathering cultivated and uncultivated resources in ma uka portions of Waiʻoli and along the kuāuna for a range of practices, including lāʻau lapaʻau, making lei, and subsistence. They also documented previous generations' practices and the change in gathering activities and resources over time.

For example, Kimo shared about plants his ʻohana would gather in Waiʻoli Valley, including maile, kukui, and koali. He shared that his grandmother would gather "[f]rom the taro patch, on the banks. Used to have and she used to go pick. The noni leaf my grandmother used to put same thing like for boils or if I get something infected, they would use that. The kukui nut when you get sick, they put them in your mouth. The sap."

Aunty Diana also described gathering kukui and noni for lāʻau lapaʻau up ma uka and how "every Saturday my mother used to give us kukui." She recalled growing ti, or lāʻī, near their loʻi when she was young and that her father grew other lāʻau for food and medicine, "My father used to have a garden up there [Waiʻoli]. He planted some vegetables. Beans, onion . . . lemongrass, ʻōlena, noni."

Aunty Chris shared about the different plants she cultivates, along with their uses, along the kuāuna banks between the Waiʻoli Stream and the whole loʻi kalo system, including noni, nīʻoi, ʻōlena, ʻuala, and kō.

Aunty Lilian and Aunty Meiko also plant and use tī from Waiʻoli. They also grow maiʻa (banana) and ʻulu (breadfruit) on the kuāuna. Up ma uka Aunty Lilian gathers palapalai to make lei and Aunty Meiko also looks for hāpuʻu, nāʻū (baby gardenia), and pepeiao.

Manu Interactions

Habitat loss and degradation have perhaps been the most pervasive threats affecting many endemic bird populations across Hawaiʻi. As participants shared, many of these endemic birds (some of which are federally listed endangered or protected species) frequent their loʻi within Waiʻoli. These manu rely on the Waiʻoli kalo fields for habitat, utilizing the alternating stages of watered and fallow kalo fields during a season of cultivation. The many fields that make up the Waiʻoli Loʻi Kalo Irrigation System can be considered puʻuhonua (refuge) for several endangered endemic Hawaiian waterbirds.

The nēnē, or native goose, is not a waterbird, but is a federally protected species. From the kalo farmers' perspective, the nēnē are so abundant within this area that they are almost considered pests; like the mountain pig, nēnē like to eat kalo. For example, Kimo sees so many endemic manu at his loʻi kalo, he joked about how many there are, "You get Hawaiian stilt, every day. Nēnē goose, every day. The coot [ʻalae ʻula], every day. The ʻaukuʻu, I see it every day. Koloa duck, every day. They're not endangered. They can take them off the endangered list, for sure." More seriously he said, "they live there. Or they make their route through my loʻi and what not."

Aunty Diana, JoAnne and Uncle Shorty have all observed nesting nēnē, ʻalae ʻula, and ʻaeʻo within the Waiʻoli Loʻi Kalo Irrigation System.

Aunty Chris had a nesting pair of ʻaeʻo in one of her loʻi kalo this year, two hatchlings successfully fledged and have been seen in the nearby patches of two other kalo farmers.

Ah Fook also emphasized the abundance of birds in the area and their reliance on this habitat, "I don't care where you plant taro, the birds are going there. Where get water, they like and they know what kind of fish; and [koloa] ducks around."

Concerns and Recommendations

Potential Impacts of No Water or Tampering with Water

Participants shared their thoughts about the potential impacts of not having any or enough water and of others tampering with the current water system. For the farmers, any threat to water flowing into the mānowai and through the irrigated loʻi kalo system is a serious concern.

Reid expressed the difficulties in recovering from the 2018 floods, "After the devastating floods in 2018, our small taro farming community has struggled. The damage to our water system has created a lot of stress and has left many of us wondering if there is even a future for taro farming in Hanalei. Immediately after the flood, our water supply was completely cut off. Luckily, we were able to restore some flow to our system, which allowed us to continue farming, but in no way was the volume close to what it was during pre-flood conditions. Over the last couple of years, we have continued to have weather events that cut off the water supply because the overall system was so heavily damaged. This has compounded problems as the low water flow has made it hard for me to replant as much as I would like, which in turn makes it even harder to recover from the April 2018 flood."

Kimo also described what could happen if the system was shut down or "if the State would stop it, I would say within two, three weeks, maybe a month, your crop is dying. Probably 70% would be lost because all your young ones [kalo] up to like six, seven months would either be total loss or the younger ones would probably be total loss, if you cannot get water. … [it] would probably take two years or three years to restart and to get back to normal. If water would stop even for that long."

Uncle Shorty, Aunty Diana, and JoAnne shared their thoughts about the potential impacts of not having enough water. Aunty Diana warned that without sufficient water, the grass would start growing. "The kalo needs water. They get dryland kalo, too. But the kalo still needs water. Without water, you won't be able to have good taro." JoAnne summed up the importance of water in Waiʻoli succintly: "No water, no farming. No farming, no food."

Both Kimo and Aunty Diana talked about one event, 20 or more years ago now, when someone tried to tap the main ʻauwai directly, which cut off the farmers' water. To fix it the taro farmers hauled in materials and hand dug and patched the system. Kimo recalled that when the system was tampered with, there was a big flood which "blew out our whole ditch. So if guys do that illegally or try and tap in without doing it properly, stuff like that can happen again."

Ensuring the Community's Cultural Identity Perseveres

Several participants observed rapid changes in the community in recent years, especially the stresses of tourism and development on traditional ways of life, like kalo farming.

JoAnne shared, "we were blessed to have been afforded a lifestyle that allowed us to enjoy the luxuries of knowing the amenities of our ʻāina. I see the kids that I work with every day and they are consumed with technology and have little opportunity to experience our ʻāina like I did while growing up. Our Hanalei is not the same anymore; I don't recognize the same safe community

that I grew up knowing, and often feel frustrated because our town has become so crazy and inundated with faces that are not kamaʻāina. The shops and restaurants that cater to tourists sit only a few dozen feet across the road from illustrious loʻi kalo, which give our Waiʻoli its joyful name."

Nathaniel also highlighted that "Despite the rapid changes in our community on Kauaʻi with regard to tourism and the slow, but steady, change in demographics, it is important for me that [others] know that 'we are still alive' and that 'we are still here.'"

Bobby noted that "Our network of farms is also under threat from people who want to use the land differently. Waiʻoli is so beautiful and we have so many who bought land in our community and are now trying to build illegally. It's dangerous when they are building illegally upstream from our loʻi because they contaminate the water that feeds our fields and the larger community."

Kimo observed that "Kauaʻi's North Shore has changed dramatically in recent years, and [our] sleepy farming community has been transformed into a bustling tourist destination and construction zone." While a long-term water lease will not repair the mānowai, loʻi, or equipment devastated by the 2018 historic floods, it "will provide an important assurance and semblance of hope that we will be able to persevere into the future and maintain this way of life for our children and the generations yet to come."

Aunty Lillian remarked, "we are resilient, and just want to be able to get back on our feet and continue to practice the culture we love in our small community. Hanalei has changed so much over the years. Yet, what holds together the identity of our community is the kalo farming that has been here since the beginning of time in these islands. It is a true testament to our community that we work together and help each other get through challenges like this. We are proud of who we are and what we do, and hope to continue to pass down this tradition to future generations."

Summary of Community Ethnography

Participants in this study all share a deep connection to and love for Waiʻoli and kalo farming, many coming from generations of kalo farmers. All are committed to perpetuating this cultural practice, providing for the community, and farming the same lands as their kūpuna.

All participants expressed that the continuous flow of water in the Waiʻoli Loʻi Kalo Irrigation System is absolutely necessary for the perpetuation of kalo farming and the many traditional and customary Native Hawaiian practices that depend on the maintenance of the system and the overall health of the watershed. We learn that this system is an intimately interconnected one, and because of this, has changed very little over the last several centuries. The farmers consistently restore the mānowai, clear the stream of debris, and fix the ʻauwai. This monitoring and maintenance is a vital part of their cultural practice; they actively mālama the watershed, and not just during and after storm events. Cleaning and maintaining the Waiʻoli Loi Kalo Irrigation System is a community practice; it is when families gather and share time, food, and fellowship.

Damage caused by the heavy rains and flooding in 2018 continue to impact the farmers' ability to grow kalo. Lastly, all participants highlighted that they take pride in feeding the larger community and supporting ʻai pono, either through sharing kalo with other ʻohana or providing kalo to small community-based non-profit organizations.

Participants identified several historic and ongoing traditional and customary practices in Waiʻoli, including fishing, hunting, and gathering. Many of the resources gathered are located not only within the Waiʻoli Loʻi Kalo Irrigation System, but are also dependent on the healthy flow of the stream above and below the intake and out-takes. Other types of species dependent on this system, as shared by participants, include some federally listed endangered or protected manu who rely on Waiʻoli's loʻi kalo for shelter, feeding, and breeding habitat.

Participants were concerned about sufficient water availability in the future, including the potential effects of not having any or enough water and of others tampering with the current water system. Because kalo farming is a communal system, tampering or removing water has the potential to harm everyone farming within this system, leaving folks without enough water, losing crops, and leaving the entire community without a food source. They also worried about their ability to continue kalo farming in Waiʻoli without the water lease. Lastly, many participants shared concerns about the rapidly changing landscape in Hanalei, including stresses due to tourism and overdevelopment.

Summary and Recommendations

Waiʻoli Valley and its Loʻi Kalo Irrigation System have a deep history of abundance; an abundance that flowed from the Waiʻoli Stream and fed an intricate system of irrigated fields that have been cultivated continuously for hundreds of years. From 1834 to the present, the continuous flow of water through the Waiʻoli Loʻi Kalo Irrigation System has been unusually well documented. A detailed survey of the body of the ʻauwai system, in the same footprint as it exists today, was mapped 127 years ago.[85] A photograph from the slopes of Kamoo Koleaka shows the entire Waiʻoli plain in irrigated kalo cultivation 128 to 130 years ago. The earliest depictions of water in the Waiʻoli Loʻi Kalo Irrigation System appear on a map surveyed and drafted 147 years ago.[86] Surveyed depictions of the ʻauwai and recorded descriptions and testimonies of loʻi kalo in the Waiʻoli System, by Hawaiian farmers, date back 169 years.[87] The written history of Waiʻoli and records of irrigated kalo extend back 185 years.[88] This research reveals not just the presence, but the abundance, of irrigated loʻi kalo cultivation for hundreds of years in this specific area.

Figure 25. Photo taken in 1890-1892 from Kamoo Koleaka, looking out across the Waiʻoli Loʻi Kalo Irrigation System.[89]

[85] W. A. Wall, Register Map 1680, 1893.
[86] James W. Gay, Register Map 927, 1873.
[87] Buke Mahele.
[88] N. Keoahu, *Waioli Kauai Ian 23, 1835,* Ke Kumu Hawaii, 15 April 1835.
[89] Photo Courtesy of Waiʻoli Mission Collection, negative in possession of David Forbes, photo circa 1890-1892. Also in the Bernice Pauahi Bishop Museum archives collection, Kauaʻi, Hanalei, pre-1900, folder 2, CP 96254.

This study documents the unique history of Waiʻoli and the many Native Hawaiian traditional and customary practices that depend on the Indigenous irrigation system, both to the Hui and the greater community.

Cultural Resources, Practices, and Beliefs Identified

This report identified numerous cultural practices that rely on the continued health of the Waiʻoli Loʻi Kalo Irrigation System. Both the Ethnohistorical and Ethnographic research undertaken in this study have established that 1) wetland kalo is central to Native Hawaiian cultural identity, beliefs, and practices; 2) the management of the Waiʻoli Loʻi Kalo Irrigation System is, in and of itself, a traditional and customary Native Hawaiian practice; 3) cold stream water from the mountains, constantly flowing through the system, is critical to the cultivation of wetland kalo as well as the traditional and customary Native Hawaiian practices that depend on it; 4) many loʻi kalo were in cultivation at the time of the Māhele and retain appurtenant rights, which have a high level of protection under Hawaiʻi's Constitution and Water Code; and 5) the existing loʻi kalo irrigation system is the best and only option for the cultivation of wetland kalo in Waiʻoli. Without a long-term water lease ensuring water flow to the loʻi kalo, it would be incredibly difficult, if not next to impossible, for the Hui to continue growing wetland kalo in this area. For the first time in 400 years or more, a continued connection to place and practice would be severed.

Potential Effects of the Proposed Action

All participants concluded that the Proposed Action would produce significant beneficial impacts on Native Hawaiian traditional and customary practices as well as the natural systems and species that they are reliant upon.

The extensive research and community interviews conducted indicate that a "No Action" Alternative to the Proposed Action does not exist. There is no viable alternative to Waiʻoli Stream water, and the continous flow of fresh water is necessary for the cultivation of kalo, which feeds the larger community. The No Action Alternative would therefore violate the State's duties under Article XI section 7 to "assur[e] appurtenant rights and existing correlative and riparian uses" as well as under Article XII section 7 to "protect all rights, customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by ahupuaʻa tenants who are descendants of native Hawaiians who inhabited the Hawaiian Islands prior to 1778[.]"

In sum, Nohopapa Hawaiʻi recommends that a long-term water lease would enable Hui members to continue providing for the larger community through kalo farming, restoring the health of the stream and watershed, and perpetuating vital cultural practices, passing them on to future generations.

> Kalo kanu o ka ʻāina. Taro planted on the land. "Natives of the land from generations back."[90]

[90] Pukui, No. 1447, 1983: 157.

Figure 26. Nathaniel Tin-Wong with his daughter Poliahu, planting her first huli.

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Appendix A: Guidelines for Assessing Cultural Impacts

INTRODUCTION
It is the policy of the State of Hawai'i under Chapter 343, HRS, to alert decision makers, through the environmental assessment process, about significant environmental effects which may result from the implementation of certain actions. An environmental assessment of cultural impacts gathers information about cultural practices and cultural features that may be affected by actions subject to Chapter 343, and promotes responsible decision making.

Articles IX and XII of the State Constitution, other state laws, and the courts of the state require government agencies to promote and preserve cultural beliefs, practices, and resources of native Hawaiians and other ethnic groups. Chapter 343 also requires environmental assessment of cultural resources, in determining the significance of a proposed project.

The Environmental Council encourages preparers of environmental assessments and environmental impact statements to analyze the impact of a proposed action on cultural practices and features associated with the project area. The Council provides the following methodology and content protocol as guidance for any assessment of a project that may significantly affect cultural resources.

BACKGROUND
Prior to the arrival of westerners and the ideas of private land ownership, Hawaiians freely accessed and gathered resources of the land and seas to fulfill their community responsibilities. During the Māhele of 1848, large tracts of land were divided and control was given to private individuals. When King Kamehameha the III was forced to set up this new system of land ownership, he reserved the right of access to privately owned lands for Native Hawaiian ahupua'a tenants. However, with the later emergence of the western concept of land ownership, many Hawaiians were denied access to previously available traditional resources.

In 1978, the Hawaii constitution was amended to protect and preserve traditional and customary rights of Native Hawaiians. Then in 1995 the Hawaii Supreme Court confirmed that Native Hawaiians have rights to access undeveloped and under- developed private lands. Recently, state lawmakers clarified that government agencies and private developers must assess the impacts of their development on the traditional practices of Native Hawaiians as well as the cultural resources of all people of Hawaii. These Hawaii laws, and the National Historic Preservation Act, clearly mandate federal agencies in Hawaii, including the military, to evaluate the impacts of their actions on traditional practices and cultural resources.

If you own or control undeveloped or under-developed lands in Hawaii, here are some hints as to whether traditional practices are occurring or may have occurred on your lands. If there is a trail on your property, that may be an indication of traditional practices or customary usage. Other clues include streams, caves and native plants. Another important point to remember is that, although traditional practices may have been interrupted for many years, these customary practices cannot be denied in the future.

These traditional practices of Native Hawaiians were primarily for subsistence, medicinal, religious, and cultural purposes. Examples of traditional subsistence practices include fishing, picking opihi and collecting limu or seaweed. The collection of herbs to cure the sick is an example of a traditional medicinal practice. The underlying purpose for conducting these traditional practices is to fulfill one's community responsibilities, such as feeding people or healing the sick.

As it is the responsibility of Native Hawaiians to conduct these traditional practices, government agencies and private developers also have a responsibility to follow the law and assess the impacts of their actions on traditional and cultural resources.

The State Environmental Council has prepared guidelines for assessing cultural resources and has compiled a directory of cultural consultants who can conduct such studies. The State Historic Preservation Division has drafted guidelines on how to conduct ethnographic inventory surveys. And the Office of Planning has recently completed a case study on traditional gathering rights on Kauaʻi.

The most important element of preparing Cultural Impact Assessments is consulting with community groups, especially with expert and responsible cultural practitioners within the ahupuaʻa of the project site. Conducting the appropriate documentary research should then follow the interviews with the experts. Documentary research should include analysis of Māhele and land records and review of transcripts of previous ethnographic interviews. Once all the information has been collected, and verified by the community experts, the assessment can then be used to protect and preserve these valuable traditional practices.

Native Hawaiians performed these traditional and customary practices out of a sense of responsibility: to feed their families, cure the sick, nurture the land, and honor their ancestors. As stewards of this sacred land, we too have a responsibility to preserve, protect and restore these cultural resources for future generations.

CULTURAL IMPACT ASSESSMENT METHODOLOGY

Cultural impacts differ from other types of impacts assessed in environmental assessments or environmental impact statements. A cultural impact assessment includes information relating to the practices and beliefs of a particular cultural or ethnic group or groups.

Such information may be obtained through scoping, community meetings, ethnographic interviews and oral histories. Information provided by knowledgeable informants, including traditional cultural practitioners, can be applied to the analysis of cultural impacts in conjunction with information concerning cultural practices and features obtained through consultation and from documentary research.

In scoping the cultural portion of an environmental assessment, the geographical extent of the inquiry should, in most instances, be greater than the area over which the proposed action will take place. This is to ensure that cultural practices which may not occur within the boundaries of the project area, but which may nonetheless be affected, are included in

the assessment. Thus, for example, a proposed action that may not physically alter gathering practices, but may affect access to gathering areas would be included in the assessment. An ahupuaʻa is usually the appropriate geographical unit to begin an assessment of cultural impacts of a proposed action, particularly if it includes all of the types of cultural practices associated with the project area. In some cases, cultural practices are likely to extend beyond the ahupuaʻa and the geographical extent of the study area should take into account those cultural practices.

The historical period studied in a cultural impact assessment should commence with the initial presence in the area of the particular group whose cultural practices and features are being assessed. The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs.

The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both man-made and natural, including submerged cultural resources, which support such cultural practices and beliefs.

The Environmental Council recommends that preparers of assessments analyzing cultural impacts adopt the following protocol:

1. Identify and consult with individuals and organizations with expertise concerning the types of cultural resources, practices and beliefs found within the broad geographical area, e.g., district or ahupuaʻa;
2. Identify and consult with individuals and organizations with knowledge of the area potentially affected by the proposed action;
3. Receive information from or conduct ethnographic interviews and oral histories with persons having knowledge of the potentially affected area;
4. Conduct ethnographic, historical, anthropological, sociological, and other culturally related documentary research;
5. Identify and describe the cultural resources, practices and beliefs located within the potentially affected area; and
6. Assess the impact of the proposed action, alternatives to the proposed action, and mitigation measures, on the cultural resources, practices and beliefs identified.

Interviews and oral histories with knowledgeable individuals may be recorded, if consent is given, and field visits by preparers accompanied by informants are encouraged. Persons interviewed should be afforded an opportunity to review the record of the interview, and consent to publish the record should be obtained whenever possible. For example, the precise location of human burials are likely to be withheld from a cultural impact assessment, but it is important that the document identify the impact a project would have on the burials. At times an informant may provide information only on the condition that it remain in confidence. The wishes of the informant should be respected.

Primary source materials reviewed and analyzed may include, as appropriate: Māhele, land court, census and tax records, including testimonies; vital statistics records; family histories and genealogies; previously published or recorded ethnographic interviews and oral histories; community studies, old maps and photographs; and other archival documents, including correspondence, newspaper or almanac articles, and visitor journals. Secondary source materials such as historical, sociological, and anthropological texts, manuscripts, and similar materials, published and unpublished, should also be consulted. Other materials which should be examined include prior land use proposals, decisions, and rulings which pertain to the study area.

CULTURAL IMPACT ASSESSMENT CONTENTS

In addition to the content requirements for environmental assessments and environmental impact statements, which are set out in HAR §§ 11-200-10 and 16 through 18, the portion of the assessment concerning cultural impacts should address, but not necessarily be limited to, the following matters:

7. A discussion of the methods applied and results of consultation with individuals and organizations identified by the preparer as being familiar with cultural practices and features associated with the project area, including any constraints or limitations which might have affected the quality of the information obtained.
8. A description of methods adopted by the preparer to identify, locate, and select the persons interviewed, including a discussion of the level of effort undertaken.
9. Ethnographic and oral history interview procedures, including the circumstances, under which the interviews were conducted, and any constraints or limitations which might have affected the quality of the information obtained.
10. Biographical information concerning the individuals and organizations consulted, their particular expertise, and their historical and genealogical relationship to the project area, as well as information concerning the persons submitting information or interviewed, their particular knowledge and cultural expertise, if any, and their historical and genealogical relationship to the project area.
11. A discussion concerning historical and cultural source materials consulted, the institutions and repositories searched, and the level of effort undertaken. This discussion should include, if appropriate, the particular perspective of the authors, any opposing views, and any other relevant constraints, limitations or biases.
12. A discussion concerning the cultural resources, practices and beliefs identified, and, for resources and practices, their location within the broad geographical area in which the proposed action is located, as well as their direct or indirect significance or connection to the project site.
13. A discussion concerning the nature of the cultural practices and beliefs, and the significance of the cultural resources within the project area, affected directly or indirectly by the proposed project.
14. An explanation of confidential information that has been withheld from public disclosure in the assessment.
15. A discussion concerning any conflicting information in regard to identified cultural resources, practices and beliefs.
16. An analysis of the potential effect of any proposed physical alteration on cultural resources, practices or beliefs; the potential of the proposed action to isolate cultural

resources, practices or beliefs from their setting; and the potential of the proposed action to introduce elements which may alter the setting in which cultural practices take place.

17. A bibliography of references, and attached records of interviews which were allowed to be disclosed.

The inclusion of this information will help make environmental assessments and environmental impact statements complete and meet the requirements of Chapter 343, HRS. If you have any questions, please call 586-4185.

Appendix B: A Bill for Environmental Impact Statements

A BILL FOR AN ACT RELATING TO ENVIRONMENTAL IMPACT STATEMENTS [UNOFFICIAL VERSION] HOUSE OF REPRESENTATIVES H.B. NO. 2895 H.D.1 TWENTIETH LEGISLATURE, 2000, STATE OF HAWAIʻI

A BILL FOR AN ACT RELATING TO ENVIRONMENTAL IMPACT STATEMENTS. BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF HAWAIʻI:

SECTION 1. The legislature finds that there is a need to clarify that the preparation of environmental assessments or environmental impact statements should identify and address effects on Hawaiʻi's culture, and traditional and customary rights.

The legislature also finds that native Hawaiian culture plays a vital role in preserving and advancing the unique quality of life and the "aloha spirit" in Hawaiʻi. Articles IX and XII of the state constitution, other state laws, and the courts of the State impose on government agencies a duty to promote and protect cultural beliefs, practices, and resources of native Hawaiians as well as other ethnic groups.

Moreover, the past failure to require native Hawaiian cultural impact assessments has resulted in the loss and destruction of many important cultural resources and has interfered with the exercise of native Hawaiian culture. The legislature further finds that due consideration of the effects of human activities on native Hawaiian culture and the exercise thereof is necessary to ensure the continued existence, development, and exercise of native Hawaiian culture.

The purpose of this Act is to: (1) Require that environmental impact statements include the disclosure of the effects of a proposed action on the cultural practices of the community and State; and (2) Amend the definition of "significant effect" to include adverse effects on cultural practices.

SECTION 2. Section 343-2, Hawaiʻi Revised Statutes, is amended by amending the definitions of "environmental impact statement" or "statement" and "significant effect", to read as follows:

"Environmental impact statement" or "statement" means an informational document prepared in compliance with the rules adopted under section 343-6 and which discloses the environmental effects of a proposed action, effects of a proposed action on the economic [and] welfare, social welfare, and cultural practices of the community and State, effects of the economic activities arising out of the proposed action, measures proposed to minimize adverse effects, and alternatives to the action and their environmental effects.

The initial statement filed for public review shall be referred to as the draft statement and shall be distinguished from the final statement which is the document that has incorporated the public's comments and the responses to those comments. The final statement is the document that shall be evaluated for acceptability by the respective accepting authority.

"Significant effect" means the sum of effects on the quality of the environment, including actions that irrevocably commit a natural resource, curtail the range of beneficial uses of the environment, are contrary to the State's environmental policies or long-term environmental goals as established by law, or adversely affect the economic [or] welfare, social welfare[.], or cultural practices of the community and State.

SECTION 3. Statutory material to be repealed is bracketed. New statutory material is underscored.

SECTION 4. This Act shall take effect upon its approval. Approved by the Governor as Act 50 on April 26, 2000.

Appendix C: Act 50 [State of Hawai'i 2000]

Act 50 [State of Hawai'i 2000]. H.B. NO. 2895 H.D.1 was passed by the 20th Legislature and approved by the Governor on April 26, 2000 as Act 50. The following excerpts illustrate the intent and mandates of this Act:

The legislature also finds that native Hawaiian culture plays a vital role in preserving and advancing the unique quality of life and the "aloha spirit" in Hawai'i. Articles IX and XII of the State constitution, other State laws, and the courts of the State impose on government agencies a duty to promote and protect cultural beliefs, practices, and resources of native Hawaiians as well as other ethnic groups.

Moreover, the past failure to require native Hawaiian cultural impact assessments has resulted in the loss and destruction of many important cultural resources and has interfered with the exercise of native Hawaiian culture. The legislature further finds that due consideration of the effects of human activities on native Hawaiian culture and the exercise thereof is necessary to ensure the continued existence, development, and exercise of native Hawaiian culture.

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"Environmental impact statement" or "statement" means an informational document prepared in compliance with the rules adopted under section 343-6 and which discloses the environmental effects of a proposed action, effects of a proposed action on the economic [and] welfare, social welfare, and cultural practices of the community and State, effects of the economic activities arising out of the proposed action, measures proposed to minimize adverse effects, and alternatives to the action and their environmental effects....

Appendix D: Community Contact Letter

NOHOPAPA HAWAIʻI

September 23, 2020

Welina mai me ke aloha,

On behalf of the of the Waiʻoli Valley Taro Hui (WVTH), Nohopapa Hawaiʻi is gathering community manaʻo for inclusion in a Cultural Impact Assessment (CIA).

The CIA will document Hawaiian traditional cultural features and practices in the project area to inform the Enviornmental Assesment (EA). The primary purpose of this project is to summarize and give voice to some of the community's ʻike and manaʻo; as a source to develop strategies, make informed decisions, and recommendations specific to the WVTH EA for a long term water lease.

The study area for these interviews is the Waiʻoli Loʻi Kalo System; which begins mauka, where water enters the system at the mānowai, where it flows into the poʻowai, through the ʻauwai and loʻi kalo in the Waiʻoli and Hanalei plain, to the terminus of the system at various hoʻi along Waiʻoli stream and Hanalei River (see attached maps).

The Waiʻoli Valley Taro Hui is seeking a long-term water lease to continue water flow to the Waiʻoli Loʻi Kalo System. This system of ʻauwai pre-dates European Contact (1778) and has been in continual use since; it includes:

- 5.95 miles of ʻauwai, ditches (Straunch 2019)
- Over 260 individual fields, totalling ≤ 84-acres of farmable loʻi.
- One mānowai on Waiʻoli Stream, ~1.8 miles upstream from its mouth.
- Six hoʻi, two on Waiʻoli Stream, and two on Hanalei River
- One storm drain outflow to Waiʻoli Stream (formerly an open ʻauwai) on the makai side of Waiʻoli bridge.

We would like to engage with individuals, ʻohana, and organizations that have relationships to this specific wahi, to kalo farming and the ʻauwai system in Waiʻoli. In particular, we would like to gather information relating to:

- Personal relationships to this place personal, historical, or organizational.
  - Any moʻokūʻauhau of ʻohana or ʻāina you would like to share
- ʻIna Mauli Ola – natural resources and ecosystems & changes over time, as well as traditional management practices
  - Mauka to makai, wao kele and near shore.
  - River mouth observations
  - Changes in the waterways, hoʻi, loʻi, mānowai.
  - Origins, modifications and maintenance of any historic ʻauwai system improvements, gates, flumes, pebble traps, tunnel, new ditches, stone monuments, etc.
- Any moʻolelo, wahi inoa, oli, hula, mele, traditions, akua, ʻohana, or people associated with this place.
- Cultural protocols and practices (both traditional and contemporary) specific to this place.
  - Gathering practices: mauka, in stream, in ʻauwai, near shore, riparian, mauka.

NOHOPAPA HAWAIʻI

- All things kalo
  - growing, preparing, and eating kalo.
  - The shift from rice farming, back to kalo farming.
- Cultural preservation concerns and recommendations such as:
  - Educational opportunities
  - Restoration opportunities of cultural resources and practices
  - Continued practice
- Recommendations and/or concerns regarding the continued and future stewardship of the Waiʻoli Loʻi Kalo System.
  - Any potential project impacts negative and/or positive
- Referrals to other ʻohana and individuals who are connected to the project area

Our community consultation team members, Dominique Cordy and Devin Kamealoha Forrest, will be contacting you shortly. We look forward to collaborating with you to document your manaʻo for this Cultural Impact Assessment.

Dominique Cordy	(808) 346-1585	liveinthenaau@gmail.com
Devin Kamealoha Forrest	(808) 652-4336	dforrest@hawaii.edu

Me ka haʻahaʻa,

Nohopapa Hawaiʻi, LLC

Appendix E: Participant Informed Consent Forms

NOHOPAPA

INFORMED CONSENT FORM

Aloha mai, Nohopapa Hawai'i appreciates your willingness to share your knowledge of the Wai'oli and the Wai'oli Lo'i Kalo System. The information you share with us will be used to guide and inform Nohopapa Hawai'i's Cultural Impact Assessment (CIA) for the Wai'oli Valley Taro Hui (WVTH). The CIA is a contributing component of an Environmental Assessment (EA) for a long term water lease application.

Nohopapa Hawai'i understands our responsibility in respecting the wishes and concerns of the interviewees participating in this study. Here are the procedures we promise to follow:

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

For your protection, we need your written confirmation that (*circle* yes or no below):

1. You consent to the use of the complete transcript and/or interview quotes for the purposes of this study. Yes No
2. If a photograph is taken during the interview, you consent to the photograph being included in this study. Yes No

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

Christine Kobayashi 9.30.20

(Signature) (Date)

Nohopapa Hawai'i, LLC nohopapa.hawaii@gmail.com

NOHOPAPA

INFORMED CONSENT FORM

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4. **You will be given a copy of this release form for your records.**
5. **You will be given a copy of any photographs taken of you during the interview.**

For your protection, we need your written confirmation that (*circle* yes or no below):

1. **You consent to the use of the complete transcript and/or interview quotes for the purposes of this study.** (Yes) No
2. **If a photograph is taken during the interview, you consent to the photograph being included in this study.** (Yes) No

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

Clarence Kaona 9-26-20

(Signature) (Date)

Nohopapa Hawai'i, LLC nohopapa.hawaii@gmail.com

NOHOPAPA

INFORMED CONSENT FORM

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5. **You will be given a copy of any photographs taken of you during the interview.**

For your protection, we need your written confirmation that (*circle* yes or no below):

1. **You consent to the use of the complete transcript and/or interview quotes for the purposes of this study.** (Yes) No
2. **If a photograph is taken during the interview, you consent to the photograph being included in this study.** (Yes) **No**

I, JoAnne Kaong **, agree to the procedures**

(Please print your name here)

outlined above and, by my signature, give my consent and release of this interview and/or photograph to be used as specified.

JK

JK

9/26/2020

(Signature) **(Date)**

Nohopapa Hawai'i, LLC nohopapa.hawaii@gmail.com

NOHOPAPA

INFORMED CONSENT FORM

Aloha mai, Nohopapa Hawai'i appreciates your willingness to share your knowledge of the Wai'oli and the Wai'oli Lo'i Kalo System. The information you share with us will be used to guide and inform Nohopapa Hawai'i's Cultural Impact Assessment (CIA) for the Wai'oli Valley Taro Hui (WVTH). The CIA is a contributing component of an Environmental Assessment (EA) for a long term water lease application.

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For your protection, we need your written confirmation that (*circle* yes or no below):

1. You consent to the use of the complete transcript and/or interview quotes for the purposes of this study. (Yes) No
2. If a photograph is taken during the interview, you consent to the photograph being included in this study. (Yes) No

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

Diana K. Spencer 9-24-20

(Signature) (Date)

Nohopapa Hawai'i, LLC nohopapa.hawaii@gmail.com

NOHOPAPA

INFORMED CONSENT FORM

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5. You will be given a copy of any photographs taken of you during the interview.

For your protection, we need your written confirmation that (*circle* yes or no below):

1. You consent to the use of the complete transcript and/or interview quotes for the purposes of this study. Yes No
2. If a photograph is taken during the interview, you consent to the photograph being included in this study. Yes No

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

Conrad Kimo Inaoka 9/28/20

(Signature) (Date)

Nohopapa Hawai'i, LLC nohopapa.hawaii@gmail.com

NOHOPAPA

INFORMED CONSENT FORM

Aloha mai, Nohopapa Hawai'i appreciates your willingness to share your knowledge of the Wai'oli and the Wai'oli Lo'i Kalo System. The information you share with us will be used to guide and inform Nohopapa Hawai'i's Cultural Impact Assessment (CIA) for the Wai'oli Valley Taro Hui (WVTH). The CIA is a contributing component of an Environmental Assessment (EA) for a long term water lease application.

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For your protection, we need your written confirmation that (*circle* yes or no below):

1. **You consent to the use of the complete transcript and/or interview quotes for the purposes of this study.** **Yes No**
2. **If a photograph is taken during the interview, you consent to the photograph being included in this study.** **Yes No**

I, Lillian Watari **,** **agree to the procedures**

(Please print your name here)

outlined above and, by my signature, give my consent and release of this interview and/or photograph to be used as specified.

Lillian Watari — 9/26/20

(Signature) **(Date)**

Nohopapa Hawai'i, LLC nohopapa.hawaii@gmail.com

NOHOPAPA

INFORMED CONSENT FORM

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5. **You will be given a copy of any photographs taken of you during the interview.**

For your protection, we need your written confirmation that (*circle* yes or no below):

1. **You consent to the use of the complete transcript and/or interview quotes for the purposes of this study.** **Yes No**
2. **If a photograph is taken during the interview, you consent to the photograph being included in this study.** **Yes No**

I, Lily Tai Hook **, agree to the procedures**

(Please print your name here)

outlined above and, by my signature, give my consent and release of this interview and/or photograph to be used as specified.

Lily Tai Hook — 9/26/20

(Signature) **(Date)**

Nohopapa Hawai'i, LLC nohopapa.hawaii@gmail.com

NOHOPAPA

INFORMED CONSENT FORM

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5. **You will be given a copy of any photographs taken of you during the interview.**

For your protection, we need your written confirmation that (*circle* yes or no below):

1. **You consent to the use of the complete transcript and/or interview quotes for the purposes of this study.** **Yes No**
2. **If a photograph is taken during the interview, you consent to the photograph being included in this study.** **Yes No**

I, WILBERT TAI HOOK **, agree to the procedures**

(Please print your name here)

outlined above and, by my signature, give my consent and release of this interview and/or photograph to be used as specified.

Wilbert Tai Hook 26 Sept 20

(Signature) **(Date)**

Nohopapa Hawai'i, LLC nohopapa.hawaii@gmail.com