STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STREAM DIVERSION WORKS PERMIT APPLICATION

For Official Use Only:

Instructions: Please print in ink or type and send one (1) completed hardcopy and one (1) digital copy of the application with attachments to the Commission on Water Resource Management, P.O. Box 621, Honolulu, Hawaii 96809. Applications must be accompanied by a non-refundable filing fee of **$25.00** payable to the Department of Land and Natural Resources. The Commission may not accept incomplete applications without the required signatures. For assistance, call the Stream Protection and Management Branch at **587-0234**. For further information and updates to this application form, visit http://dlnr.hawaii.gov/cwrm.

X Check here to allow Commission staff to communicate primarily via e-mail.
Legally required and other key correspondence will still be transmitted via postal mail.

PERMIT TYPE

1. Permit Status: **X** New ☐ After-The-Fact

2. Type of Construction: Installation X Modification ☐ Removal / Abandonment

APPLICANT INFORMATION

3. APPLICANT'S NAME / COMPANY	Applicant's Contact Person	Applicant's Phone
Ho'okua'āina	Michele Wilhelm, Exec. Dir	808-721-5948
Applicant's Mailing Address P.O. Box 342146 Kailua, HI 96734	Applicant's E-mail Address michele@hookuaaina.org	

☐ **Check here if project will impact multiple landowners.** *If project impacts multiple landowners, skip* ***Item 4*** below*, then complete and attach* ***Form LND-APP*** *to identify and verify landowner's approval of proposed stream diversion work.*

4. LANDOWNER'S NAME / COMPANY	Landowner's Contact Person	Landowner's Phone
HRT, LLC	Kirk Horiuchi	808-983-7110
Landowner's Mailing Address 3660 Waialae Avenue, Suite 400, Honolulu, HI 96816	Landowner's E-mail Address khoriuchi@hjweinberg.org	

5. CONSULTANT'S NAME / COMPANY	Consultant's Contact Person	Consultant's Phone
Interfluve	Mike McAllister	541-716-6870
Consultant's Mailing Address 501 Portway Avenue, Suite 101 Hood River, OR 97031	Consultant's E-mail Address mikem@interfluve.com	

6. CONTRACTOR'S NAME / COMPANY	Contractor's Contact Person	Contractor's Phone
n/a		
Contractor's Mailing Address	Contractor's E-mail Address	

STREAM INFORMATION

7. Island: *(Check only one)* ☐ Kauai **X** Oahu ☐ Molokai ☐ Lanai ☐ Maui ☐ Hawaii

8. Tax Map Key(s) *List all affected tax map key parcels.*
4-2-007:001

9. Stream / Gulch Name(s) *List all affected streams and/or gulches.*
Maunawili Stream

FOR OFFICIAL USE ONLY:	SWHU ID:	FILE ID:
LAT:	GWHU ID:	DOC ID:
LON:	REACH ID:	

GENERAL PROJECT INFORMATION

10. Diversion No: *(if already assigned)* **11. Diversion Name:** No number assigned or name to our knowledge

12. Project Site Location(s): *Provide site coordinates of downstream-most point of project in degrees, minutes, seconds (NAD83).*

Latitude: 21.368235 Longitude: 157.763965 Elevation: 46 ft. above mean sea level

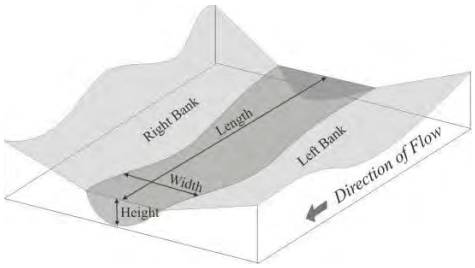
13. Diversion Structure Type: *(Check all that apply)*

☐ Unlined channel **X** Hand-built rock **X** Concrete masonry **X** Dam/weir **X** Pipe
☐ Metal ☐ Plastic ☐ Wood ☐ Pump **X** Direct use
☐ Other - Describe:

STREAM DIVERSION WORKS SPECIFICATIONS *(For Abandonments, skip to Legal Requirements section, Item #32.)*

14. Structure Dimensions: *(feet)*
Provide generalized dimensions for the entire project / structure area. If the project includes a pipe (e.g., culvert, drain, etc.), provide the pipe diameter.

Width: Riffle: 43'long, ~35' wide.
Height: Manhole: 4' dia, 5' high. Vault 6'x'6'x9'
Length: Pipe: 227'
Diameter: Pipe: 18"



15. Diversion Location:
Provide the general location of the diversion intake structure in relation to the streambank.

✔☐ Left bank *(downstream view)*
☐ Right bank *(downstream view)*
☐ Across entire stream channel

16. Intake Dimensions: *(feet)* Width:see responses to #14 Height: Length: Diameter: 18"

17. Average diversion amount: *(cubic feet per second)* 2.5 cfs @ low pool

18. Diversion is part of a system of diversions: ☐ Yes **X** No

19. Diverted flow can be controlled: **X** Yes ☐ No

Control Dimensions: *(feet)* Width: Height: Length: Diameter: 18"

20. Water will be pumped from the stream: ☐ Yes **X** No

If yes, identify pump capacity: *(gallons per minute)* **Daily average pumping time:** *(hours)*

21. Water will be impounded in the stream channel: ☐ Yes **X** No

22. Water diversion capacity will be measured daily: **X** Yes No working with Interfluve to explore accessible method to measure

23. Water will be returned to the stream: **X** Yes ☐ No

If yes, average amount of return flow: *(cubic feet per second)*
estimated at approximately 2cfs@ low pool

24. Water will be stored off-stream: ☐ Yes **X** No **Storage capacity:** *(gallons)*

Describe storage facility:

25. State Land Use Classification: *(Check all that apply)* **X** Agriculture ☐ Conservation ☐ Rural ☐ Urban

WATER USE INFORMATION

Check all water use categories below that are intended for the proposed diversion, then describe the proposed use in more detail.

X 26. Agriculture
☐ **27. Domestic**
☐ **28. Industrial**
X 29. Irrigation
☐ **30. Military**
☐ **31. Municipal**

Primarily lo'i kalo cultivation, with some other fruit and vegetable crops
Projected areas of cultivation is 16.9 acres

Restoration of a historic gravity fed 'auwai system will return water to the stream 'Auwai across field area in the middle of the parcel to be reconstructed and then pipe for inflow back into the stream as shown on the attached map that is part of our approved Soil Conservation Plan with the Windward Soil and Water Conservation District.

LEGAL REQUIREMENTS

If required, the permits or approvals below must be obtained before the Commission on Water Resource Management can legally issue a permit. Visit the Commission's Applications & Forms webpage (http://dlnr.hawaii.gov/cwrm/info/forms/) for links to agency websites/contact information.

32. Conservation District Use Permit (CDUP): *To find out if your stream diversion works is located in a Conservation District (CD), you may visit to the Land Use Commission (LUC) website at http://luc.hawaii.gov/maps to view Land Use District Boundary maps. If the stream diversion works will be located in a CD, contact the Department of Land and Natural Resources' Office of Conservation and Coastal Lands (OCCL) at (808) 587-0377 to determine is a CDUP is required.*

☐ Stream diversion works is in a Conservation District.
☐ Required. CDUP #: _____ Date CDUP approved: _____
☐ Not Required. *Attach documentation from Office of Conservation and Coastal Lands (OCCL), Department of Land and Natural Resources.*
☐ I have not checked with the OCCL about whether or not a CDUP is required.
X Stream diversion works is not in a Conservation District.

33. Special Management Area Permit (SMAP): *To determine if an SMAP is necessary, contact your County Planning Department.*

☐ Required. SMAP #: _____ Date SMAP approved: _____

X Not Required. *Attach documentation from applicable County agency.*

☐ I have not checked with the County about whether or not an SMA Permit is required.

34. State Historic Preservation Division (SHPD), Department of Land and Natural Resources: *If the parcel(s) affected by the stream alteration has been reviewed by the State Department of Land and Natural Resources Historic Preservation Division (SHPD or through an OEQC Environmental Review, Special Management Area Permit, etc.), check "yes" and attach any relevant documentation from SHDP. If the affected parcel(s) has not undergone SHDP review, attach a photograph of the affected area, a schematic diagram (showing the location, access road and infrastructure for the alteration), and a short description of the prior use(s) of the land on which the alteration resides.*

Please note: You are **strongly advised to contact the SHPD to obtain a pre-review of your project. In the event that you do not get an HP pre-review and if during the course of either review or the permit itself it is determined that you need SHPD's concurrence, your application or permit may be held in abeyance or denied until issues with HP are resolved. To contact SHPD, please call (808) 692-8015.*

☐ I have consulted the SHPD regarding potential impacts of stream channel alteration activities on historic sites. I have attached applicable documentation from the SHPD. **…**SEE NOTE re: CONSULTATION in ATTACHED DESCRIPTION OF PRIOR USES**

☐ I have not consulted with the SHPD regarding potential impacts of stream channel alteration activities on historic sites.

35. Chapter 343, Hawaii Revised Statutes, Hawaii Environmental Policy Act:

☐ An Environmental Assessment was completed, and

☐ An Environmental Impact Statement was required and has been accepted (attach letter of acceptance).

Publication date in The Environmental Notice: _____

☐ A Finding of No Significant Impact has been determined (attach letter).

Publication date in The Environmental Notice: _____

This project proposes:

☐ Use of state or county lands, or use of state or county funds
☐ Use within a state conservation district
☐ Use within a shoreline setback area
☐ Use within a national or Hawaii registered historic site
☐ Use within the Waikiki Special District
☐ The construction, expansion or modification of helicopter facility
☐ A wastewater treatment unit
☐ Waste-to-energy facility
☐ Landfill
☐ Oil refinery
☐ Power-generating facility
X None of the above 11 items

OTHER REGULATORY REQUIREMENTS

If the proposed stream channel alteration is subject to the following permits or approvals, indicate by checking the appropriate box below and submit either the approval letter from the appropriate agency or attach a copy of the application form. If the proposed stream channel alteration is not subject to the following permits or approvals, indicate by checking the "N/A" (Not Applicable) field.

	Attached	N/A
36. U.S. Army Corps of Engineers (Harbors and Rivers Act, Section 404, Clean Water Act)	☐	**X**
37. State Department of Health, Clean Water Branch (Section 401, Clean Water Act, Water Quality Certification, Best Management Practices Plan)	☐	**X**
38. Right-of-Entry or Right-of-Way Permit if the proposed stream channel alteration includes State lands. (Chapter 171, Hawaii Revised Statutes)	☐	**X**
39. Hawaii Environmental Policy Act (Chapter 343, Hawaii Revised Statutes; Title 11, Chapter 200, Hawaii Administrative Rules)	☐	**X**
40. Soil and Water Conservation District	☐	**X**
41. County Certification of "No-Rise"	☐	**X**
42. County Grading Permit	☐	**X**
43. County Discretionary Permit(s)	☐	**X**

CULTURAL IMPACTS

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. If there is not enough space available, please make a note in the field (e.g., "See attached") and attach all information with this application as requested.

44. Please provide the identity and scope of cultural, historical, and natural resources in which traditional and customary native Hawaiian rights are exercised in the area.

The ʻili and TMK for which Ho'okua'āina is the long-term steward is known as Pālāwai and was a regionally important and well-documented producer of kalo.

> *"Pālāwai was the place where taro was planted most and that was the taro that supplied the chiefs when they called for hoʻokupu."* Testimony of Hikaalani (wahine) before the Commissioner of Private Ways and Water Rights for the District of Koʻolaupoko, Island of Oʻahu. 1895.

The ʻāuwai at Pālāwai has been documented and recorded since the late 1800s; from those sources, we infer it has been in-place since prior to Western contact. Attached are images of maps recording the ʻāuwai (sometimes referred to as a "ditch") and related easements that currently remain in-place and on-title.

- (p113 of *Kailua*) "Water from Maunawili Stream, Was transported to the Rice fields and mill from a small, rock-dam reservoir by a large water-diversion ditch. In 1895, Kailihauna, resident of Kailua From the 1830s, recalled that the dam and the ʻauwai were watering the taro patches along the edge of Kamakalepo in ancient times."
- (p110 of *Kailua*) January 1904 Survey map by MD Monsarrat notes a "Reservoir" in the location of the dam and shows the ʻāuwai running the length of Pālāwai.
- (p115 of *Kailua*) The area was also surveyed by A.C. Alexander in 1911 and showed "The ancient dam on Maunawili stream that fed the ʻauwai to the rice mill is between Pālāwai and Puanea..."
- An easement for this "ditch" in favor of the subject parcel is recorded in the deeds of the neighboring properties

Many poi and rice mills surrounded Pālāwai, which are further evidence of the areaʻs incredibly productive, agricultural wetlands. Though the property, at one point owned by Kaneohe Ranch, went into cattle for a while, And then sat follow while another previous owner tried to upzone it for development, the ʻauwai and dam are easily located and major aspects of it are in-tact. In itʻs long-term stewardship and formal ownership of the property, Ho'okua'āina Will be returning much of this site to traditional and customary Native Hawaiian agricultural practices.

45. Identify the extent to which those resources, including traditional and customary Native Hawaiian rights, will be affected or impaired by the proposed action.

The stream diversion would have a beneficial impact to traditional and customary native Hawaiian rights because it restores water flow to the historic ʻauwai and lo'i through traditional means. Ho'okua'āina is a Native Hawaiian and non-profit organization with 18 years of experience in connecting the most vulnerable students in our community to ʻāina and experiences growing food in traditional Native Hawaiian approach. This year we delivered over 30,000 pounds of kalo and poi To our local communities, grown and harvested on a nearby parcel that we steward, which has 3 acres of spring-fed lo'i kalo.

We intend to return the land on the subject TMK to active food production and traditional lo'i kalo by repairing the existing ʻauwai That were originally built by pre-contact native Hawaiians and have been documented in many oral histories, legal testimonies, and surveys since the early 1900s.

46. What feasible action, if any, could be taken by the Commission on Water Resource Management in regards to your application to reasonably protect Native Hawaiian rights?

By approving this application, the Commission will help protect native Hawaiian rights by restoring and perpetuating the traditional agricultural use of this land. Ho'okua'āina is a respected Native Hawaiian Organization and engaged community resource that hosts thousands each year through its School visit program, youth mentorship and workforce development programs, and community workdays. The organization is also a major grower and supplier of traditional Hawaiian foods, namely kalo and poi, but also ʻulu; About 20% of his harvest are donated to nearby Kupuna feeding programs in Waimānalo and Kalihi where recipients are largely of Native Hawaiian or Pacific Islander descent.

PROJECT DESCRIPTION

Please complete the following sections by providing detailed information on the project components identified below. If there is not enough space available, please make a note in the field (e.g., "See attached") and attach all information with this application as requested.

47. Describe the overall project scope and objectives.

The Pālāwai property (116 acres) and ʻāuwai restoration project is located in Maunawili and is part of an intact traditional hydrological system where the Kawainui watershed (covering 9,400 acres) feeds the Maunawili kahawai (stream) system. Maunawili is the longest stream in the Koʻolaupoko region at 22 miles long with a median flow of 9.6 mgd (USGS gauge 16260500). Maunawili's tributaries originate high in the peaks of the Koʻolau mountains (Kōnāhuanui and Awaawaloa) and flow in a northerly direction until five of the six branches converge on our Pālāwai property to form the main stem of Maunawili Stream. The stream then flows along the base of Olomana, under Kalanianaole Highway, and is joined by Kahana Iki Stream just as the two streams flow into Kawainui fishpond and wetland, then out to Kailua Bay.

Hoʻōkuaʻāianʻs overall plan for Pālāwai includes:

- Restore Maunawili Stream and its riparian areas by leading with indigenous knowledge and practices
- Develop a major hub of agriculture and community resilience for Windward, Oahu
- Support access to fresh, healthy, culturally relevant food using innovative and culturally grounded ag practices - primarily loʻi kalo and indigenous agroforestry and community stewardship.
- Train multiple young farmers, hailing from and impacting underserved areas
- Strengthen community health and well-being through agriculture, program engagement

The critical step to implementing the overall vision for Pālāwai is to rehabilitate the ʻāuwai that connects Maunawili Stream with the former loʻi areas of Pālāwai.

Hoʻokuaʻāina would like to repair the existing ʻauwai, including the former dam at the beginning of the ʻauwai. The original niho stones that held the dam in place, and concrete footings which were likely a result of more recent maintenance on the structure, are still visible in the stream and on its bank. Hoʻokuaʻāina will retain the damʻs existing footprint, while rebuilding its vertical sections and shoring up its footing and overall construction using a mix of traditional and imported materials. For the former dam, we will utilize some of the former stones supplemented with and native materials found on site and imported boulders as needed. Installation will be by small excavator and hand labor For the beginning of the ʻauwai, we intend to bury 20 feet of 20 inch diameter (18" ID) PVC pipe with a 90 degree elbow at the streambank for inlet control. This pipe will connect to a 4 ft diameter manhole for pipe direction change and debris cleanout. From the manhole, flow will enter an 18" HDPE dual wall (smooth) pipe to a 6'x6' concrete vault placed in the former ʻāuwai (located outside of the floodplain). The vault will have a canal gate valve for flow control and closure. This piped configuration will allow flood flows to overtop the floodplain but limit the influences of scour and fill that would otherwise require ʻāuwai maintenance. The entire re-construction would take place in an area around 230 feet long by 10 feet wide. For erosion control at the location of the hoʻi, an overhanging pipe or other erosion control measures as needed.Upon completion of the construction efforts, the site will be fully revegetated with native plants. However, we are open to discussion, comments and guidance from CWRM or other experts on ways to improve this design plan.

48. Describe existing stream channel dimensions and median streamflow conditions at the site of the proposed stream diversion works.

At the point of diversion, the stream width varies from 40 to 60 feet wide at bankful stage. The stream bed consists of gravel and cobble materials. Mean daily streamflow as described in the State of Hawaiʻiʻs Instream flow Standard Assessment Report is calculated to be 11.4 cubic feet per second.

49. Identify and describe the project components outlined below

A. Materials

Flow conveyance materials:

- 207 feet of 18” HDPE dual wall (smooth) pipe.
- 20 feet of 20” (18” ID) PVC pipe, SDR 21*
- One 20” PVC 90° elbow, SDR 21*
- One 4 feet diameter manhole, 5 feet high
- One 6’x6’ concrete vault, 9 feet high, with fiber reinforced plastic grating
- One 18” C-20 canal gate with stem riser
- 120 cubic yards gravel backfill for drains
- Biodegradable erosion control blanket, 8 feet wide, ~220 feet (2 rolls)
- 250 wooden stakes, 12”

*Schedule 40 is an acceptable substitute for SDR 21, but it has a thinner wall and may break more readily.

Riffle materials:

- 85 cubic yards of riprap, 7-11”, angular
- 85 cubic yards salvaged stream gravels, 6”-minus
- ~12 boulders

B. Quantities

Listed with materials in 49A.

C. Excavation

Excavation for the construction of the new pipeline, manhole and vault will entail trenching and excavation of materials from some flood prone areas as well as areas not subject to flooding. With placement of the pipe and manhole/vault excavated materials will be replaced in excavated areas and ground surfaces returned to prior elevations

D. Fill

The existing riffle immediately downstream of the proposed point of diversion inlet will receive some 7” to 11” angular stone to armor the existing stream bed. This armoring is intended to prevent erosion and loss of the pool level. The former niho stones will be restored to their former locations to assist fine tuning of backwater conditions as practiced in the past.

E. Disposal

All excavated materials not used as backfill to restore existing grades will be disposed of on site above flood water elevations. All disturbed areas will be reseeded or planted with native plant materials.

F. Construction methods

Construction methods will entail a mix of hand labor and tracked excavator to install the features shown on the plans.

G. Temporary facilities

Some temporary dewatering may be required during excavation to ease construction and reduce turbidity impacts to stream flow.

H. Expected period of time required for construction

Initial construction of the proposed features is anticipated to require 2-3 weeks. Followup revegetation and plantings are anticipated to require 2-3 months to become established.

I. Liability during construction

Liability is limited as the property is under one ownership. We anticipate using a licensed and bonded heavy equipment operator for some excavation/backfill. Hoʻokuʻāina carries liability insurance for itʻs activities.

50. Describe the project's consistency with county zoning and development plans.

The subject parcel is zoned Agricultural, AG – 2. The stream diversion permit will enable traditional agricultural methods to be used on this land that are consistent with its zoning.

51. Identify potential alternatives (sources of water) to the project and describe the relative costs and benefits of each alternative.

Maunawili Stream is the only source of water for the upper portion of this site, other than rainfall. The upper portion of this site is most suited for lo'i kalo due to its proximity to the existing historic 'auwai.

Although this TMK is serviced by a three-quarter inch Board of Water Supply meter at the lower, makai end of this site, that meter is located across the Loop Road (which services Royal Hawaiian Golf Course). It is over 3,000 feet downhill from where the 'auwai begins and from the area most suitable for establishing lo'i kalo, which can otherwise be naturally irrigated with the 'auwai. Also, without significant additional and expensive piping and pumping equipment, the size of the meter is not substantial enough to effectively convey water to the higher elevations at the area of the site that we intend to irrigate via this stream diversion and traditional 'auwai system. This would be cost prohibitive for the low-margin activities such as agriculture and environmental restoration that are planned for Pālāwai.

SUBMITTALS

Please submit the following plans, maps, or drawings in legible form, preferably on 8.5" by 11" sheets.

52. Location Map: Provide a location map of the proposed project relative to major roadways.

53. Plans / Elevations / Sections: Provide a plan view of the proposed stream diversion works structure in relation to the stream channel and property boundaries. Elevation and section views of the diversion structure in relation to the stream channel should also be provided if available.

SIGNATURES

Signing below indicates that the signatories understand and swear that the information provided is accurate and true to the best of their knowledge. Further, the signatories understand that if the permit requested is granted by the Commission on Water Resource Management (Commission), the permit shall be subject to the following conditions:

1) The proposed work is to be completed within two (2) years from the date of permit approval.
2) The permittee shall notify the Commission, by letter, of the actual dates of project initiation and completion.
3) The permittee shall submit a set of as-built plans and photographs to the Commission upon completion of the project.
4) The permit may be revoked if work is not started within six (6) months after the date of approval or if work is suspended or abandoned for six (6) months.
5) If the commencement or completion date is not met, the Commission may revoke the permit after giving the permittee notice of the proposed action and an opportunity to be heard.

54. APPLICANT

Print Name:	Signature:	Date:
Michele Wilhelm, Exec. Dir.	Michele Wilhelm	2/17/25

55. CONSULTANT

Print Name:	Signature:	Date:
Mike McAllister, Interfluve	Mike R McAllister	02/20/2025

56. CONTRACTOR

Print Name:	Signature:	Date:

57. LANDOWNER *(If multiple landowners, skip **Section 53**, then complete and attach **Form SCAP-LND** with appropriate landowner signatures.)*

Print Name:	Signature:	Date:
Kirk Horiuchi, HRT LLC		2/17/2025

CHECKLIST FOR A COMPLETE APPLICATION and ITEM DESCRIPTIONS (ITEMS 1 - 31)

- □ Fill in the most recent application form (check **http://dlnr.hawaii.gov/cwrm** or call 587-0234 for updates).
- □ Fill in every line which includes Items 1-57, as indicated (total 7 pages).
- □ Enclose a check for $25 payable to the Department of Land and Natural Resources.
- □ Mark the proposed diversion location on: the appropriate USGS quad map, TMK map, photo and schematic, and attach to the application.
- □ Attach Form LND-APP to identify and obtain authorizations for the project if multiple landowners will be impacted.
- □ Attach a grading plan and cross section profiles showing existing and finish grades, if available.
- □ Attach documentation from CDUP, SMAP, SHPD when applicable regarding Items 32-34.
- □ Attach letters from U.S. Army Corps of Engineers, Hawaii Department of Health, Office of Conservation and Coastal Lands, and appropriate county agencies regarding Items 35-43.
- □ Provide digital copies on CD-ROM or via e-mail, if available.
- □ Obtain the necessary signatures for the application form.

Send the application and maps, copies, and the filing fee to:
Commission on Water Resource Management
P.O. Box 621
Honolulu, HI 96809

PERMIT TYPE

1. **Permit Status:** Indicate whether this application is for a new stream diversion works project (including medication or abandonment) or if the project has already been completed and an after-the-fact permit is being applied for.
2. **Type of Construction:** Is the permit application for the installation of a new diversion works or modification / abandonment of an existing diversion works.

APPLICANT INFORMATION

3. **Applicant's Information:** Fill in the information for the applicant. This should be the entity that will be responsible for operation and maintenance of the stream diversion works and for reporting water use when the project is completed.
4. **Landowner's Information:** Fill in the information for the landowner of the property where the diversion intake will be located.
5. **Consultant's Information:** Fill in the information for the consultant who will assist with plan and design preparation for the subject project.
6. **Contractor's Information:** Fill in the information for the contractor who will perform the work on the subject stream diversion works.

STREAM INFORMATION

7. **Island:** The island name where the stream diversion will be located.
8. **TMK:** Tax Map Key number (generally there is no lot number, but where a parcel is divided into two lots, fill in the lot number)
9. **Stream / Gulch Name:** Name of the stream or gulch where the stream diversion will be located.

GENERAL PROJECT INFORMATION

10. **Diversion Number:** If you already have a state diversion number assigned, please fill it out here. Otherwise, leave it blank and a diversion number will be assigned by CWRM.
11. **Diversion Name:** Give the diversion a short concise name that will differentiate it from other diversions.
12. **Project Site Location(s):** Fill in diversion location coordinates taken from a GPS unit at the project site. Units are Degrees, Minutes and Seconds (seconds should be filled out to at least one decimal place; e.g. 19°59'32.8"N, 155°14'51.5"W). If more than one site, attach separate sheet. Elevations should be provided in feet above mean sea level.
13. **Diversion Structure Type:** What materials will the diversion works structure consist of and how will it divert water from the stream.

DIVERSION SPECIFICATIONS *(For Abandonment applications, skip this section and proceed to the Legal Requirements section, Item #32.)*

14. **Structure Dimensions:** What are the physical dimensions of the stream diversion works structure that will be located in the stream channel?
15. **Diversion Location:** Will the diversion intake be located on the right or left bank (facing downstream) or across the entire stream channel?
16. **Intake Dimensions:** What are the physical dimensions for the stream diversion intake (gate, pipe, etc.)?
17. **Average Diversion Amount:** The average amount of water that the diversion is calculated / estimated to divert from the stream.
18. **Diversion is part of a system of diversions:** Is the diversion part of a larger system including multiple stream diversions?
19. **Diverted flow can be controlled:** Will a control structure be located on the intake that can be used to regulate the diversion (gate, valve, etc.)?
20. **Water will be pumped from the stream:** Will a pump be used to remove water from the stream, and if so, what is the pumpage rate?
21. **Water diversion will be impounded in the stream channel:** Will the diversion structure on the stream channel require impoundment?
22. **Water diversion capacity will be measured daily:** Will a meter or other measurement device be installed and recorded on a daily basis?
23. **Water will be returned to the stream:** Will a portion of the diverted water be returned to the stream, and if so, how much?
24. **Water will be stored off-stream:** Will the diverted water be stored in an off-stream facility (reservoir, basin, tank, etc.)? Describe.
25. **State Land Use Classification:** Identify the current State Land Use Classification.

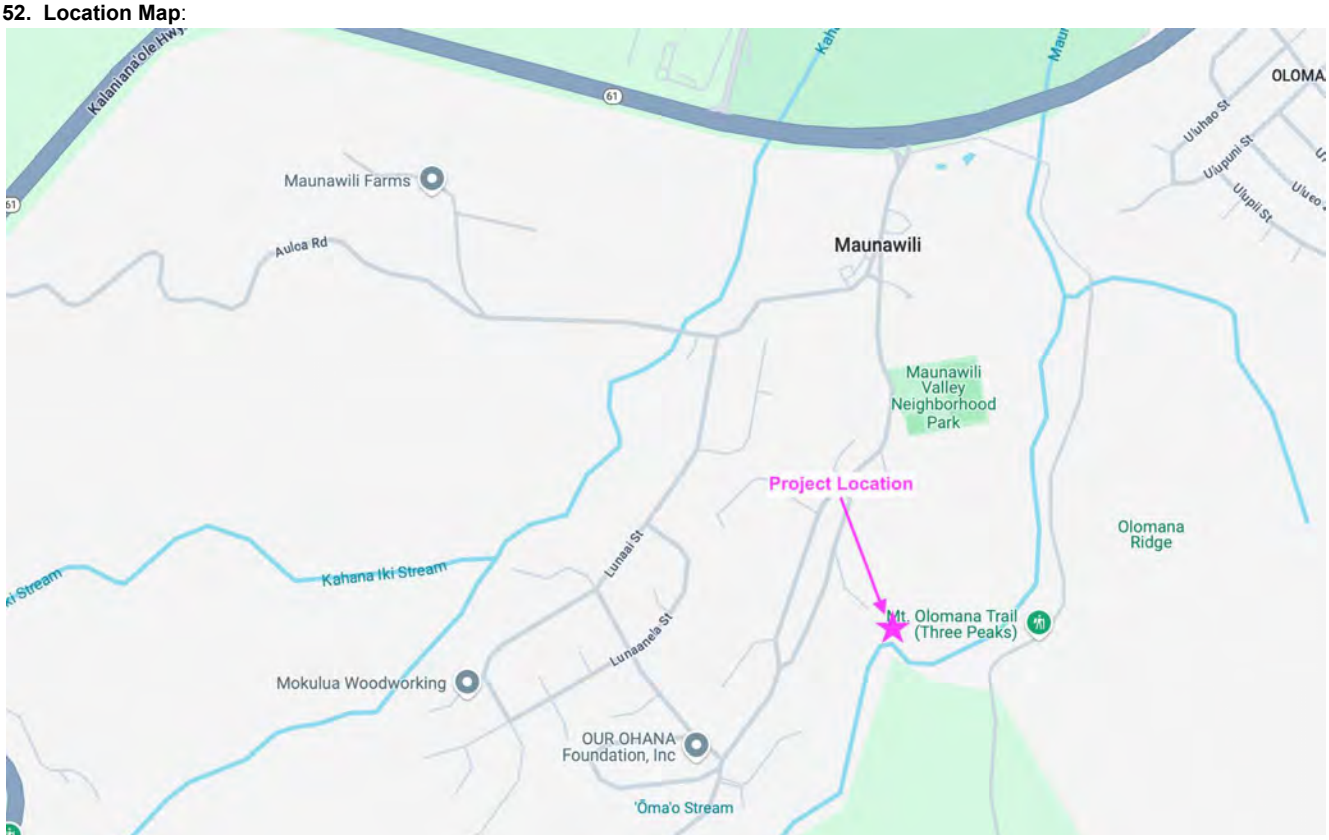
WATER USE INFORMATION

26. **Agriculture:** Water used for aquaculture, crop irrigation and processing, livestock, ornamental and nursery plants, and taro.
27. **Domestic:** Water used for single- and multi-family households, non-municipal commercial businesses, hospitals, churches, hotels, and schools.
28. **Industrial:** Water used for fire protection, mining, dust control, geothermal, power development, and hydroelectric power.
29. **Irrigation:** Water used for golf courses, hotels, landscape and water features, parks, schools, and habitat maintenance.
30. **Military:** Water is used by the military for military-operated water supply systems.
31. **Municipal:** Water is State, county, or private agency-operated to service multiple uses.

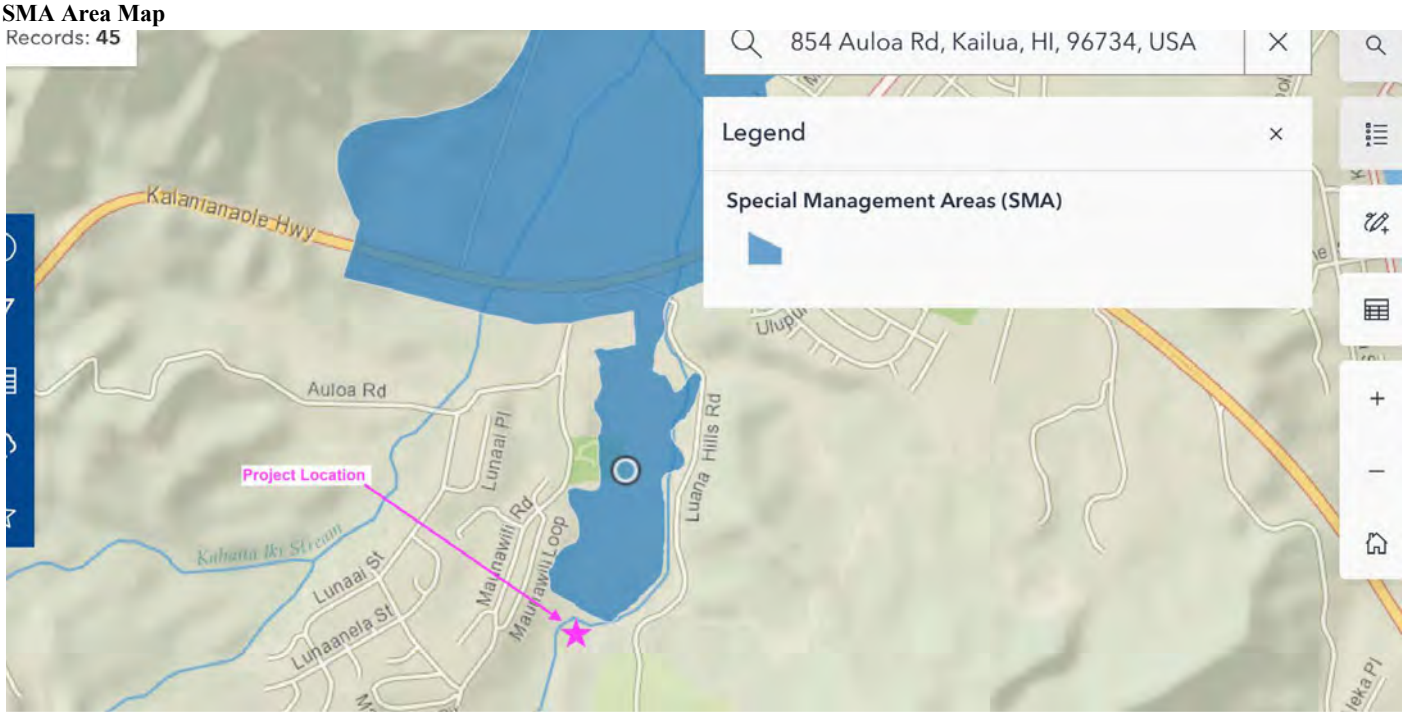
Please see header descriptions for remaining Sections in completing Items 32 to 57.

NOTE: Please be aware that some information on this form asks for information in cubic feet per second (CFS). Conversion factors for other commonly used water flow rates are as follows:
1.0 million gallons per day (MGD) equals 1.547 cubic feet per second (CFS)
1.0 gallon per minute (GPM) equals 0.002228 cubic feet per second (CFS)

52. Location Map:



SMA Area Map



34. State Historic Preservation Division (SHPD), Department of Land and Natural Resources - add'l information

* Note on consultation with SHPD and other historic/archeological information:
This parcel and surround areas were included in a 2002 study *Kula and Kahawai: Geoarchaeological and Historical investigations in Middle Maunawili Valley, Kailua Ko'olau Poko, O'ahu*, prepared by AMEC Earth and Environmental for the previous owner, HRT, Ltd. The study lists the sites associated with the ara of this parcel where the alteration will occur as:
On the ʻili of Pālāwai: "Site 15-2003 Feature 1 (a rice ditch) may cross a portion of Palawai, as well as Kalaekoa; and Site 15-2240 (Kuelepu'u island), portions of Sites 11-2243 and 11-2245 (a field complex and gardens}, and probably Sites 15-2241 and 15-2242 (charcoal kiln and facing) are located in Palawai. (p87)"
(The other ʻili which this parcel partially includes is known as "Kapalai" and is located at the opposite end of the parcel and area where the alternation will occur.)

On January 28, 2025, we had a call with Lehua Soares, Oahu Archeologist and Archeology Administrator for ʻOahu. Ms. Soares explained that formal consultation with SHPD requires a "trigger" and in the case of this Stream Diversion permit application, CWRM would have to notify SHPD to trigger the consultation.

Photograph of the affected area: See attached for aerial and on-the ground photographs

Description of the prior use(s) of the land on which the alteration resides:
This area was a regionally important and well-documented producer of kalo since pre-contact times.

> "Pālāwai was the place where taro was planted most and that was the taro that supplied the chiefs when they called for hoʻokupu." Testimony of Hikaalani (wahine) before the Commissioner of Private Ways and Water Rights for the District of Koʻolaupoko, Island of Oʻahu. 1895.

This ʻāuwai has been documented and recorded since the late 1800s; from those sources, we infer it has been in-place since prior to Western contact. Attached are images of maps recording the ʻāuwai (sometimes referred to as a "ditch") and related easements that currently remain in-place and on-title.

- (fr p 113 of *Kailua***) "Water from Maunawili Stream, Was transported to the Rice fields and mill from a small, rock-dam reservoir by a large water-diversion ditch. In 1895, Kailihauna, resident of Kailua From the 1830s, recalled that the dam and the ʻauwai were watering the taro patches along the edge of Kamakalepo in ancient times."
- (fr p 110 of *Kailua*) January 1904 Survey map by MD Monsarrat notes a "Reservoir" in the location of the dam and shows the ʻāuwai running the length of Pālāwai.
- (fr p 115 of *Kailua*) The area was also surveyed by A.C. Alexander in 1911 and showed "The ancient dam on Maunawili stream that fed the ʻauwai to the rice mill is between Pālāwai and Puanea..."
- An easement for this "ditch" in favor of the subject parcel is recorded in the deeds of the neighboring properties

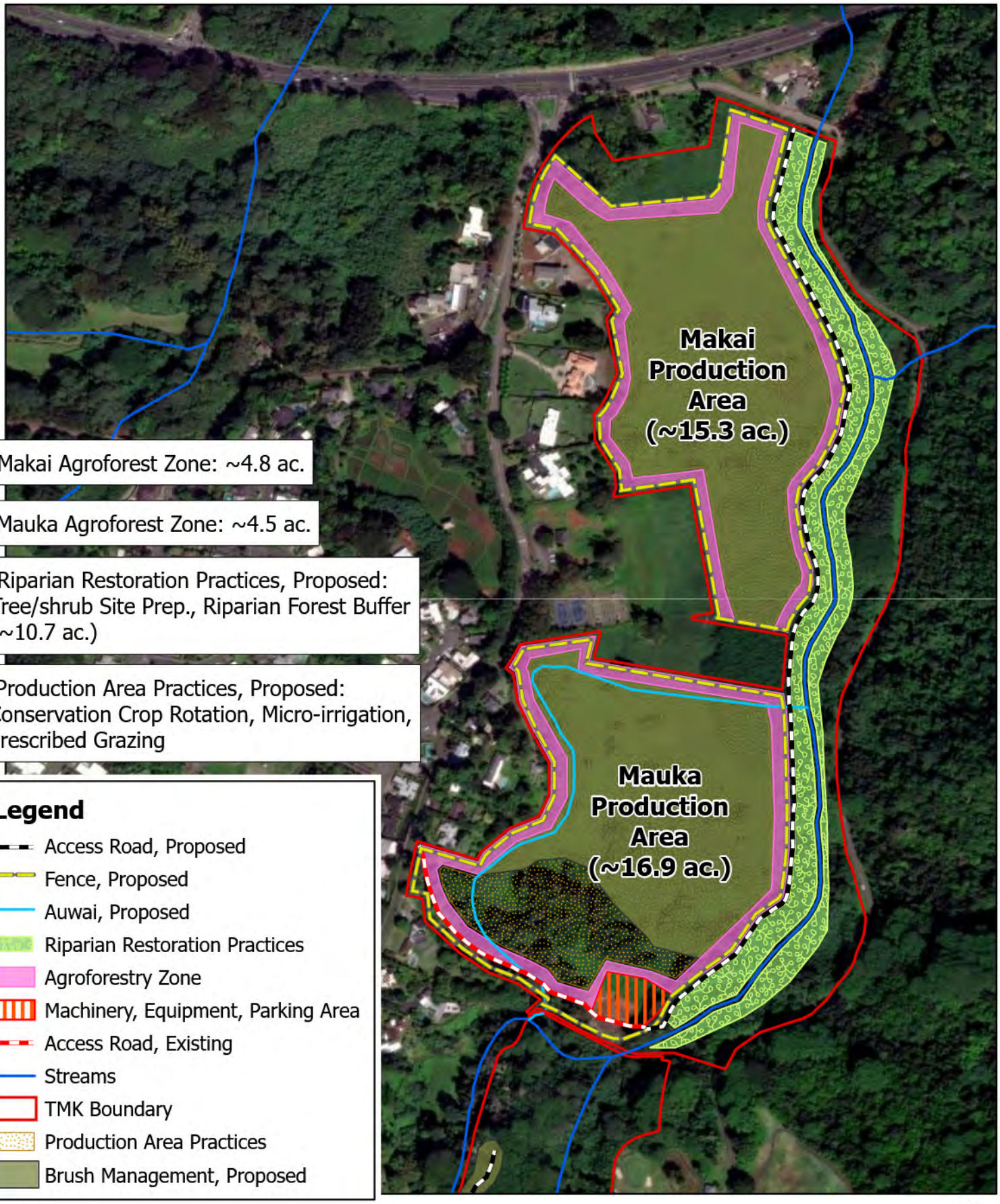
In the 1880's farmers in the area, including Hawaiians, started growing rice alongside kalo. Both rice and poi mills were prevalent in the areas surrounding our parcel. Later on, after the turn of the century as Kaneohe Ranch grew, cattle were introduced on the parcel. We assume that with the introduction of cattle, kalo, rice and production of other crops on this parcel decreased, though the ʻauwai may have still been in-use, as no other sources of water were available. In the 1980's the parcel changed hands and was at threat for medium density residential development. However, that development never materialized and the parcel and others nearby totalling over 1,000 acres, remained fallow. The threat of development rose once again recently and Hoʻokuaʻāina along with other community partners began working with Trust for Public Lands to prevent residential development. In 2016, Ho'okuaʻāina began the process to purchase this and one other adjoining parcel (TMK 4-2-008:001; 1250 Maunawili Rd.) from the Weinberg Foundation, operating as HRT LLC.

* Various contributors, Kailua Historical Society, *Kailua*, Kailua Historical Society, 2009.

District: Windward SWCD
Cooperator: Hoʻokuaʻāina
TMKs: 42007001, 42008001
Area: 114.7 ac.

Pālāwai Map

Created by: O'ahu RC&D
Assisted by: M. Gonsalves
Date: February 2025



- Makai Agroforest Zone: ~4.8 ac.
- Mauka Agroforest Zone: ~4.5 ac.
- Riparian Restoration Practices, Proposed: Tree/shrub Site Prep., Riparian Forest Buffer (~10.7 ac.)
- Production Area Practices, Proposed: Conservation Crop Rotation, Micro-irrigation, Prescribed Grazing

Legend

- Access Road, Proposed
- Fence, Proposed
- Auwai, Proposed
- Riparian Restoration Practices
- Agroforestry Zone
- Machinery, Equipment, Parking Area
- Access Road, Existing
- Streams
- TMK Boundary
- Production Area Practices
- Brush Management, Proposed

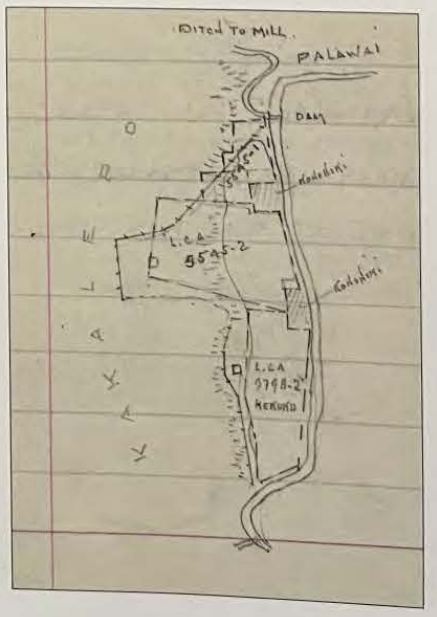
0 0.06 0.13 0.25 0.38 0.5 Miles

N

WONG LEONG
RICE PLANTATION
KAILUA-KOOLAUPOKO
OAHU
Scale 200 Ft. = 1 inch
M. D. Monsarrat. Surveyor
January 1904.
KAPALOA
L.C.A 8799
Kekanukameli
KAPIA.
R.P. 4553 Ap.1.
Kolawaiaka
MAKALII.
4 A.
KAMAKALEPO.
MANULELE
KAAIHEE.
Kailiwai.
Lalapa
Kuahine.
Grant 2891
W. E. Pii.
Maile
Grant 2891
W. E. Pii.
HAIMILO.
Kamakalepo.
Hanaunau
WAIPAAKIKI.
TRUE
L.C.A. 6806
Nakanelua
Maile Ap.1.
MAKALII.
10 A.
PEHIALII
Grant 2891.
11 A.
Ap. 2
W. E. Pii.
MOOPILAU.
15. B.
10. B.
11. B.
Nakanelua
Kanakalii
KAPALAI.
R.P. 5566
13 A.
Keawe.
11. B.
17. B.
L.C.A. 7150 B.
15 A.
Wong Sei Ho.
Kapena
Ap.1.
KAANOKAMA.
Grant 2737.
KAHOA
Keliiopunui
Grant 2737
Kakawaolaa
L.C.A. 9276.
14 A.
Kapela Ap.1.
15 A.
KAHOOWAHAHAU
KAPALAI.
Grant 2736.
Louise Whitfield.
PALAWAI.
HUALEA.
21. B.
Pelelou
Ap. 2.
Napuawa Ap.1. 16 A.
15 A.
WAIMAAUEA.
Grant 2737.
Wana
Kekoahaleole
Kaaikaio
Kaaikaio
L.C.A. 9275 B.
Ap. 2.
Napuawa.
Government Road
Grant 2735
KAMAKALEPO.
Road Approx.
MALAMALAMA.
Grant. 219
Kaeu
Maluihi
Keku
Bridge
Leoik.
Grant. 219
Reservoir
Kahue
L.C.A. 5611
Kikuku
Stream
Government Road
KAHANAIKI.
Areas of Rice Land.
Kaneohe Ranch | Fee Wong Leong | Wong Leong Lease | Say Kan
1. A. 1.70 A | 2. A. 1.59 A | 4. A. .899 A | 20 B. .57 A.
9. A. .92 | 3. A. 2.90 | 8. A. 1.61 |
10. A. 1.17 | 5. A. 4.92 | 12. A. 1.68 | Wong Ananu
16. A. 19.45 | 7. A. 2.295 | 14. A. 2.70 | 24. B. .61 A.
16. A. 1.526 | 9. A. 1.188 | 17. A. .712 | 25. B. .33
21. A. 2.80 | 11. A. 3.88 | 20. A. 2.65 | 27. B. .04
5. B. 8.16 | 13. A. 2.98 | 3. B. 1.53 | 28. B. 1.45
11. B. 3.15 | 17. A. .67 | 4. B. .64 | 29. B. 1.19
12. B. 4.25 | 18. A. .67 | 6. B. .125 | 30. B. .37
15. B. 12.05 | 2. B. 1.09 | 7. B. .176 | 32. B. .42
16. B. 1.60 | Wong Leong occupied. | 10. B. 2.23 | 4.43 A.
21. B. 5.50 | 1. B. .38 A | 13. B. .07 |
22. B. .56 | 5. B. .256 | 14. B. .18 |
26. B. .59 | 9. B. 1.07 | 17. B. 1.65 |
31. B. .21 | | 18. B. .61 |
| | | 19. B. .25 |
63.146 A | Fee Wong Leong 1.09; Fee 21.823; Occup. 1.706 | 20. B. .50 |
| 23.959 A | 19.907 A. |
| 43.766 A. | |
Note.
Say Kan has 21 B. = .36 A.
Wong Ananu [illegible] B. = .90
Wong Sei Ho. 12 B. = 4.35
Total Area = 111.912 Acres.

The expanse of grassland shown here includes the ʻili of Waipaʻakikī, Kapalai, and Pālāwai. In these ʻili, Maunawili Stream was diverted by a system of ʻauwai that irrigated extensive loʻi kalo and then returned the water to the stream. According to Mahoe (1895), many of the Kailua natives who survived the measles and smallpox epidemics lived in these ʻili at the base of Olomana.

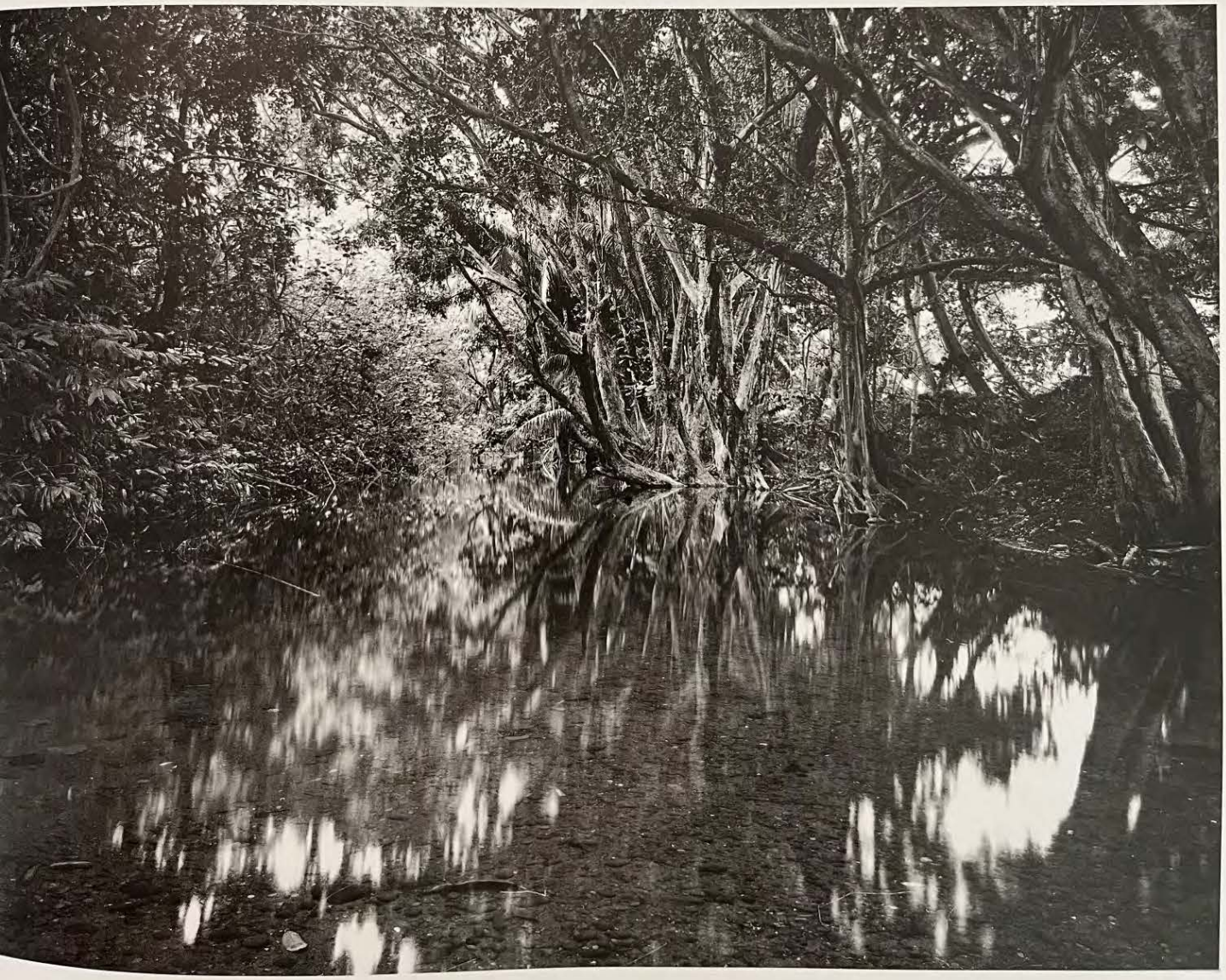
In the late nineteenth century, taro land was converted to rice land and the old ʻauwai continued to be used. Wong Leong Rice Mill was located across from today's Trinity Church. The ʻauwai that led to the rice mill followed the base of the long hill upon which today's Maunawili Park is located. After the rice mill closed in 1929, taro was grown on a smaller scale by Chinese and later Filipino farmers, who supplied the poi factory near the junction of Maunawili and Auloa roads. When the poi factory closed in the 1950s, the land was used for grazing and also to grow feed for dairy cattle. Today, the land is owned by the Harry and Jeanette Weinberg Foundation. (Piliāmoʻo)

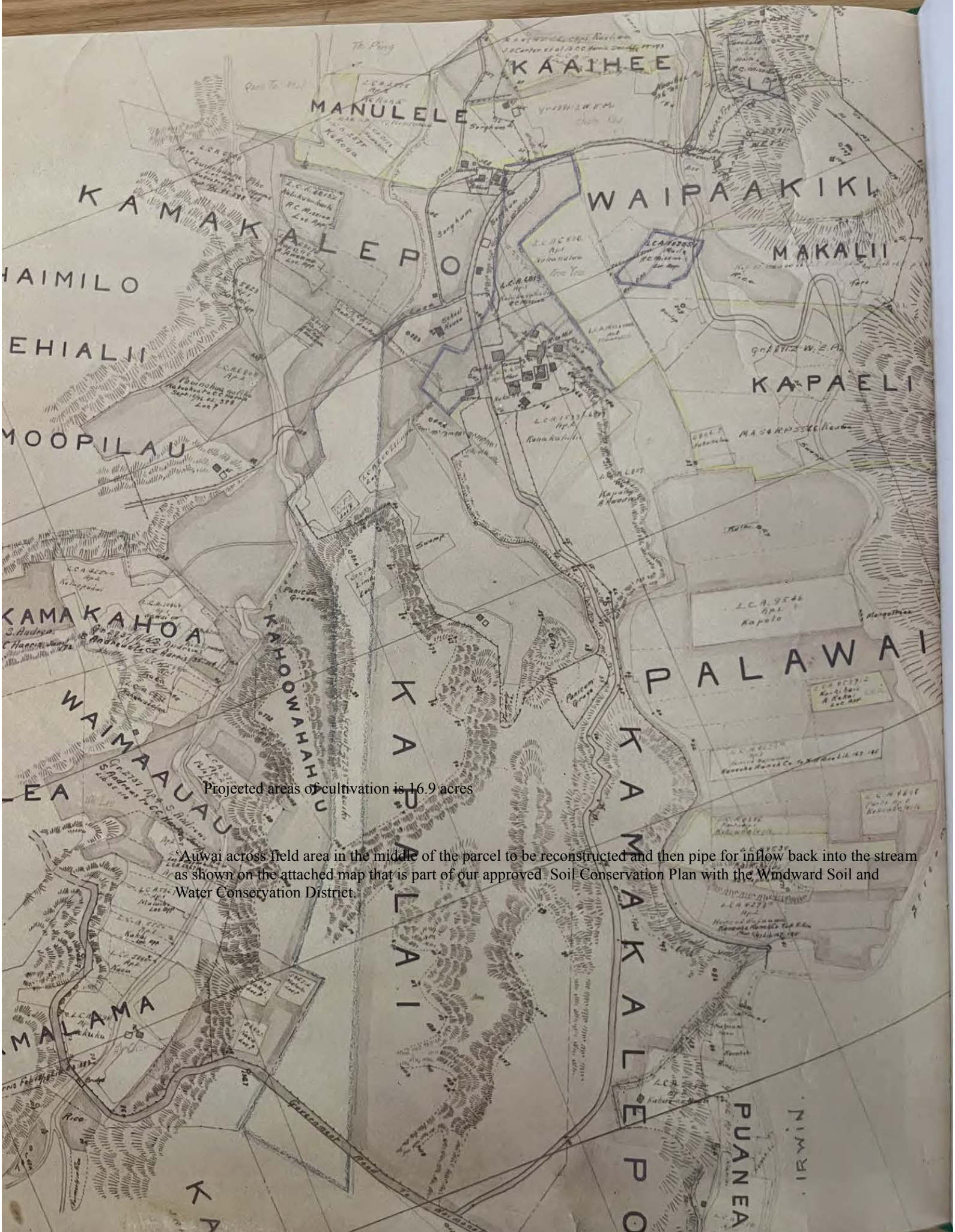


Sketch map of Maunawili Stream, the ancient dam, and related ʻauwai at the ma uka boundary of the ʻili of Pālāwai, below the kula land of the ʻili of Kamakalepo. (Nannie Rice ledger p. 90, Kaneohe Ranch Co.)

Ancient dam. Water from Maunawili Stream was transported to the rice fields and mill from a small, rock-dam reservoir by a large water-diversion ditch. In 1895, Kailihauna, a resident of Kailua from the 1830s, recalled that the dam and 'auwai were watering the taro patches along the edge of Kamakalepo in ancient times.

Long after the mill ceased operations around 1929, the small rock-dam and pool remained a popular Maunawili swimming pond. After subdivisions were built in the 1960s, diminished farming activity, lack of maintenance, and altered stream flow caused the dam to be washed away. A grinding stone from ancient times remains. (Piliāmo'o)





Projected areas of cultivation is 16.9 acres

'Auwai across field area in the middle of the parcel to be reconstructed and then pipe for inflow back into the stream as shown on the attached map that is part of our approved Soil Conservation Plan with the Windward Soil and Water Conservation District.

THE EARLY CENTER OF TOWN

Paul Brennan

In 1900, Kailua's bustling community was concentrated between the base of Olomana and the ma uka end of Kawainui, along old Auloa Road. This community had formed largely around its three rice mills, which were in close walking distance. The Wong Leong rice mill was located in a central location across the road from the present site of Trinity Presbyterian Church, and other businesses were clustered close by. In the census of 1900, Hawai'i's population stood at 154,000—30,000 Hawaiians, 27,000 Caucasians, and the largest sector, identified as "Orientals," made up of 26,000 Chinese and 61,000 Japanese. There was no census done of Kailua, but it must have had several hundred residents, most of whom were Chinese. From ethno-historical interviews we are able to paint a picture of commerce, industry, and social interaction, all integrated into a dynamic society, in the first half of the twentieth century.

The population in the Maunawili area was largely Chinese. Mary Wong Takahashi, whose uncle ran the Wong Leong rice mill, reminisced in an interview about her grandmother's store (Wong Store), where she worked, and the neighborhood. Mary lived in her grandmother's house beside the store. Her house was across the street from the mill and adjacent to a major gate across the road; she reported "earn[ing] a few pennies" by opening that gate when "big shots" (people like Arthur Rice, a real estate agent and stockbroker, and John Waterhouse, president of Bishop Bank) came in their "big cars" en route to Makapu'u to hunt pheasants. She attended the nearby Kailua Uka School through the fourth grade.

"Map of Wong Leong Lands, Kailua, Koolaupoko, Oahu" (detail). Surveyed by A. C. Alexander, August 1911. The cluster of buildings includes the rice mill, schoolhouse, and Wong store on the promontory in lower Maunawili. The ancient dam on Maunawili Stream that fed the 'auwai to the rice mill is between Pālāwai and Puanea at lower right. Makali'i spring and lo'i are at upper right. (Kaneohe Ranch Co.)

The Wong Store, started in the 1890s, was the first of three Chinese stores in the area, and sold rice, candy, charcoal, and groceries. Mary recalled that before World War I, a hundred-pound bag of rice sold for $16.00. The charcoal was made from guava wood and supplied by the Chang family, who lived alongside Makawao Stream; they had a dome-roofed, earth-walled kiln in upper Maunawili. Shortly before 1920, the store had a telephone installed. It was a novelty, and available for public use, making the Wong Store a popular gathering place; Honolulu was a long-distance call.

Two other stores—the Lee Store and the Akam Store—catered to the area's largely Chinese population. According to Mary's grandmother, the Lee Store was across the street, adjacent to the rice mill, and sold groceries, poultry feed, and livestock equipment. The Lee and Wong stores closed in 1929, when Wong Leong Rice Mill went out of business. The Akam Store, located at today's traffic light leading into Maunawili, was larger than the other two, and sold mostly food supplies, utensils, and some clothing. Mr. Wong, the proprietor, often imported large wooden crates of supplies from China. Wong was also a pig farmer, and adjacent to the store his wife operated a pool hall, which was popular with the young laborers. Local resident Joe Kaniaupio remembered it as a social gathering place as late as the 1930s.

The best known and remembered of early Kailua stores was run by the Matsuda family. The Matsuda Store was begun by Kenzō Matsuda, who took out a lease from Kaneohe Ranch in 1912 for 7.99 acres at the rate of $80 annually, setting up the store on the marsh side of old Auloa Road, below the current site of Castle Medical Center. Later, Chiyoko Matsuda Miike, Kenzō's niece and her husband, Hachirō, operated the store. Chiyoko, who attended first and second grade at Kailua Uka School, remembered her neighbor and teacher Akuni Ahau taking her to school in his horse-drawn wagon. "He was very kind to me," she said. English was difficult for her all of her life, she said. When she was seven, she and her

0 200 400

SCALE IN FEET

NO.	BY	DATE	REVISION DESCRIPTION

MM	MM	NJ
DRAWN	DESIGNED	CHECKED
GK	07-01-2024	
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OVERVIEW

SHEET
X OF X

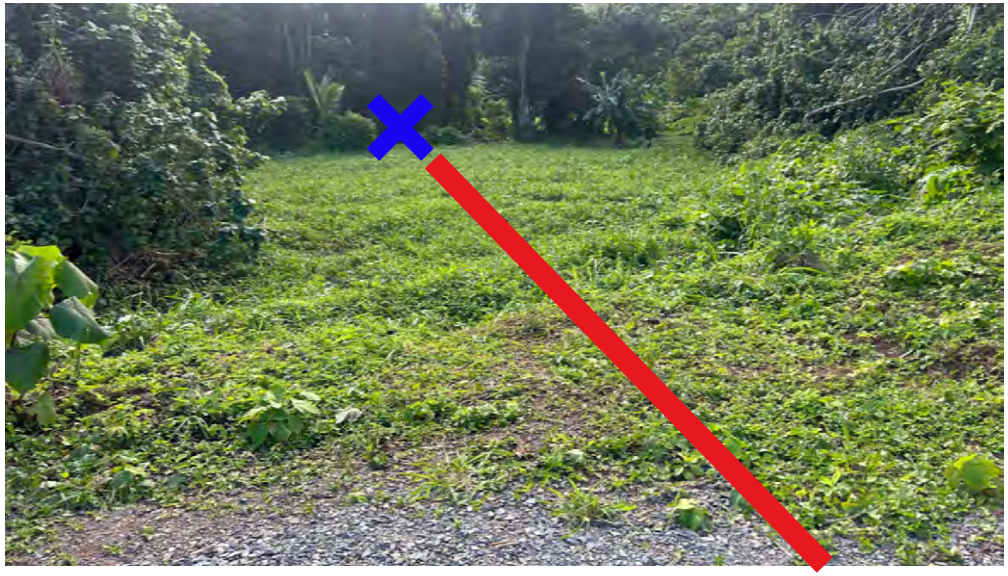
Stream Dam

Pipe

Vault

Ancient ‘Auwai

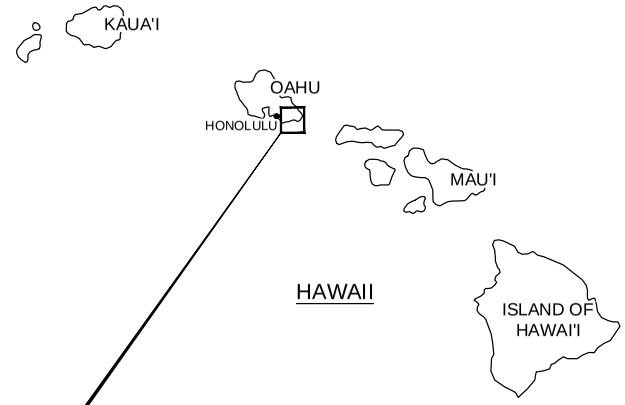
*Angle 2 of Maunawili stream side pipe and dam

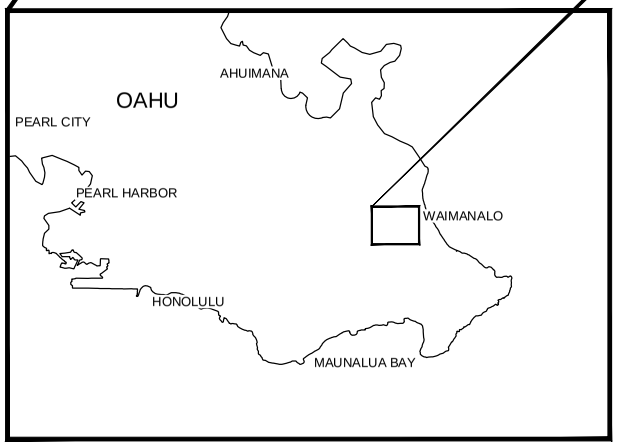


PALAWAI - MAUNAWILI STREAM RESTORATION
STREAM DIVERSION

PRELIMINARY DESIGN

JANUARY 2025





VICINITY MAP
NOT TO SCALE

LOCATION MAP
1" = 1/4 MILE

COORDINATES:
LATITUDE
LONGITUDE

SECTION X, TOWNSHIP XN, RANGE XE

WATERBODY: MAUNAWILI STREAM
TRIBUTARY OF: PACIFIC OCEAN

DRAWING INDEX

Preliminary
Not for Construction

NO.	BY	DATE	REVISION DESCRIPTION

MM	MM	NJ
DRAWN	DESIGNED	CHECKED
GK	JAN 4, 2025	
APPROVED	DATE	PROJECT

PALAWAI
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COVER SHEET, LOCATION MAPS, SHEET INDEX

SHEET
1 OF 7

EARTHWORK

1. SUBMITTALS
   a. SUBMIT PRODUCT DATA INCLUDING SOURCE LOCATION, NAME OF SUPPLIER, AND MATERIAL GRADATION (BY SIZE) FOR THE PRODUCTS LISTED BELOW. GAIN ACCEPTANCE OF SUBMITTED MATERIALS FROM THE ENGINEER PRIOR TO IMPORTING MATERIALS TO THE SITE.
2. PRODUCTS
   a. STREAMBED STONE

   i. STREAMBED STONE SHALL MEET THE FOLLOWING REQUIREMENTS:
   a. STREAMBED STONE SHALL BE HARD, DURABLE, RESISTANT TO WEATHERING AND TO WATER ACTION, AND BE FREE FROM OVERBURDEN, SPOIL, SHALE, STRUCTURAL DEFECTS AND ORGANIC MATERIAL. THE LEAST DIMENSION OF ANY PIECE OF STONE SHALL NOT BE LESS THAN ONE-THIRD ITS GREATEST DIMENSION. THE FOLLOWING QUALITY REQUIREMENTS SHALL BE MET:

TEST AND METHOD	SPECIFICATION LIMITS
APPARENT SPECIFIC GRAVITY, ASSHTO T 85, MIN	2.65
ABSORPTION, ASSHTO 85, % MAX	3.0
ARASION, ASSHTO T 96, % MAX/500 REV	35

   b. STREAMBED STONE WHEN INSTALLED IN PLACE WILL SHALL CONSIST OF MATERIAL MEETING THE FOLLOWING GRADATION (VOLUME BASIS). MULTIPLE MATERIALS MAY NEED TO BE MIXED TO ACHIEVE THE SPECIFIED GRADATION:

Diameter (in)	Percent Passing
11.0	100
8.0	84
7.0	50
5.5	30
0.5	16
0.04	5

   b. BOULDERS
   i. BOULDERS SHALL HAVE A DRY BULK DENSITY NO LESS THAN 160 POUNDS PER CUBIC FOOT. THE LEAST DIMENSION OF ANY ONE PIECE SHALL NOT BE LESS THAN ONE-THIRD THE GREATEST DIMENSION. BOULDERS SHALL HAVE A B-AXIS DIAMETER BETWEEN 2.5 AND 3.5 FEET.

3. EXECUTION: EARTHWORK EXCAVATION
   ii. PERFORM SITE EXCAVATION AND GRADING TO THE LINES AND GRADES INDICATED ON THE DRAWINGS.
   ij. EXCAVATIONS PERFORMED SHALL BE CONTAINED WITHIN THE DEWATERED WORK AREA.
   ik. REMOVAL OF OBSTRUCTIONS AND UNDESIRABLE MATERIALS IN EXCAVATION INCLUDES, BUT IS NOT NECESSARILY LIMITED TO, LOGS, RIPRAP, DELETERIOUS MATERIAL, URBAN DEBRIS, AND ANY OTHER MATERIALS WHICH MAY BE CONCEALED BENEATH THE WATERLINE OR PRESENT GRADE, AS REQUIRED TO PERFORM THE WORK. IF UNDESIRABLE MATERIAL OR OBSTRUCTIONS ARE ENCOUNTERED DURING EXCAVATION, REMOVE MATERIAL, AND REPLACE WITH STREAMBED STONE OR AS OTHERWISE INDICATED BY THE ENGINEER.
   il. DO NOT CARRY EXCAVATIONS BEYOND THAT SHOWN. NO EXTRA COMPENSATION WILL BE MADE TO THE CONTRACTOR FOR EXCAVATION BEYOND THE GRADES SHOWN WITHOUT PRIOR APPROVAL BY MM.
   im. SHORING: SHORE, SHEET PILE, SLOPE, OR BRACE EXCAVATIONS AS REQUIRED TO PREVENT THEM FROM COLLAPSING. REMOVE SHORING AS BACKFILLING PROGRESSES BUT ONLY WHEN BANKS ARE STABLE AND SAFE FROM CAVING OR COLLAPSE.
   in. PREPARE SUBGRADE SURFACES AS NEEDED TO CONSTRUCT THE WORK. SUBGRADE SURFACES SHALL BE FREE OF EXPOSED ROOTS OR DELETERIOUS MATERIALS. REESTABLISH GRADE WHERE SETTLEMENT OR EROSION OCCURS. SUBGRADE SURFACES SHALL BE COMPACTED AS NECESSARY TO SUPPORT OVERLYING TREATMENTS. OVER-EXCAVATING AND BACKFILLING TO ATTAIN PROPER SUBGRADE WILL NOT BE ACCEPTABLE. SUBGRADE SURFACES SHALL BE REVIEWED BY THE ENGINEER PRIOR TO STONE INSTALLATION.
   io. IN THE EVENT SUBGRADE SURFACES CANNOT BE ATTAINED DUE TO SOFT SOILS OR INADEQUATE DRAINAGE, A FILTER GRAVEL AMENDMENT MAY BE ADDED TO LOCALIZED PROBLEMATIC AREAS.

4. EXECUTION: STONE PLACEMENT
   a. GEOSYNTHETIC FILTER FABRIC MAY NOT BE USED FOR SEPARATION OF ROCK AND UNDERLYING NATIVE SOILS.
   b. OBTAIN ACCEPTANCE FROM THE ENGINEER WITH REGARD TO SUITABILITY OF SUBGRADE PRIOR TO STONE PLACEMENT.
   c. STREAMBED STONE MATERIAL MAY BE DELIVERED MIXED TO THE SITE OR MIXED IN-SITU. IF INITIAL MIXING OCCURS OUTSIDE OF THE CHANNEL, MATERIALS SHALL BE RE-MIXED PRIOR TO PLACEMENT TO CREATE A UNIFORM GRADATION OF STONE MATERIALS PER SPECIFICATION AND TO THE SATISFACTION OF THE ENGINEER.
   d. PLACE STONE MATERIALS CAREFULLY TO AVOID DISTURBING THE UNDERLYING MATERIAL IN ACCORDANCE WITH THE FOLLOWING METHODS:
   i. GRADE SUBGRADE.
   ii. INSTALL BOULDERS IN THE LOCAL WORK AREA PRIOR TO INSTALLING STREAMBED STONE.
   iii. MIX STREAMBED STONE MATERIALS TO ACHIEVE THE SPECIFIED GRADATION PRIOR TO INSTALLATION. THE FINAL MIX GRADATION SHALL BE VISUALLY REVIEWED BY THE ENGINEER PRIOR TO INSTALLATION. ACCEPTANCE OF RAW MATERIALS DOES NOT IMPLY APPROVAL OF THE FINAL MIX GRADATION.
   iv. PLACE A LIFT OF THE STREAMBED STONE MIX TO A THICKNESS EQUAL TO THE D100 OF THE GRADATION. PACK STREAMBED STONE MATERIALS AROUND BOULDERS TO MINIMIZE VOIDS.
   v. HYDRAULIC WASHING OF THE PLACED STONE MIXTURE IS REQUIRED. A PUMP DISCHARGE OF SUFFICIENT VOLUME AND FORCE SHALL BE USED IN COMBINATION WITH HEAVY EQUIPMENT TAMPING TO COMPACT AND SETTLE THE FINE FRACTION. RECYCLED WATER COLLECTED WITHIN THE WORK AREA MAY BE USED. THE METHOD AND DURATION OF WATER APPLICATION SHALL BE SUFFICIENT TO ENSURE THAT THE FINER MATERIALS PENETRATE TO THE FULL DEPTH OF THE VOIDS IN THE COARSE MATERIAL FRACTION. FINAL COMPACTION SHALL BE ACCEPTED BY THE ENGINEER.
   vi. PLACE ADDITIONAL LIFTS OF THE STREAMBED STONE TO A THICKNESS EQUAL TO THE D100 OF THE REQUIRED GRADATION, AND ALTERNATE WASHING OF THE PLACED MATERIALS WITH EACH SUCCESSIVE LIFT.
   vii. CONTINUE PLACING MATERIALS IN LIFTS UNTIL DESIGN LINES AND GRADES ARE ACHIEVED

   e. STONE MATERIAL SHALL BE PLACED SO AS TO SECURE A CONSOLIDATED ROCK MASS OF THE THICKNESS, HEIGHT, AND LENGTHS INDICATED ON THE DRAWINGS, WITH MINIMUM VOIDS, TO ENSURE SURFACE FLOW AT ALL STREAM FLOWS.
   f. TOLERANCES FOR THE AVERAGE PLANE OF THE FINAL GRADES OF PLACED STREAMBED STONE MATERIALS ARE +/- 0.25 FEET. COMPLETED FILL SHALL CORRESPOND TO THE SHAPE OF CROSS SECTIONS PROVIDED AND CONTOURS INDICATED.

NO.	BY	DATE	REVISION DESCRIPTION

DRAWN	DESIGNED	CHECKED
MM	MM	NJ
APPROVED	DATE	PROJECT
GK	12-08-2024	

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SCALE IN FEET

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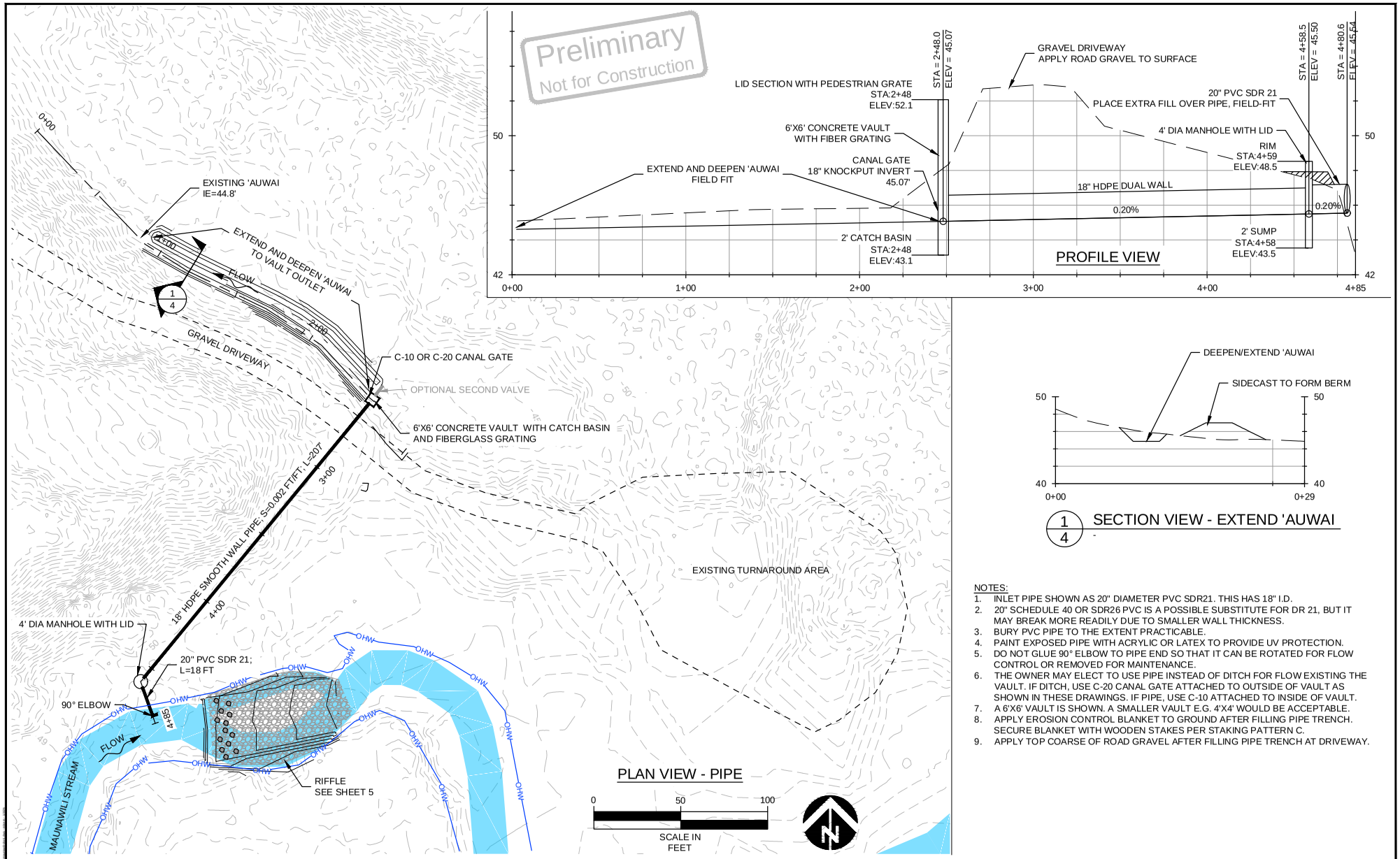
DRAWN	DESIGNED	CHECKED
GK	12-08-2024	
APPROVED	DATE	PROJECT

PALAWAI
MAUNAWILI STREAM RESTORATION
STREAM DIVERSION DESIGN

interfluve
501 Portway Avenue, Suite 101
Hood River, OR 97031
541.386.9003
www.interfluve.com

OVERVIEW

SHEET
3 OF 7



NOTES:

1. INLET PIPE SHOWN AS 20" DIAMETER PVC SDR21. THIS HAS 18" I.D.
2. 20" SCHEDULE 40 OR SDR26 PVC IS A POSSIBLE SUBSTITUTE FOR DR 21, BUT IT MAY BREAK MORE READILY DUE TO SMALLER WALL THICKNESS.
3. BURY PVC PIPE TO THE EXTENT PRACTICABLE.
4. PAINT EXPOSED PIPE WITH ACRYLIC OR LATEX TO PROVIDE UV PROTECTION.
5. DO NOT GLUE 90° ELBOW TO PIPE END SO THAT IT CAN BE ROTATED FOR FLOW CONTROL OR REMOVED FOR MAINTENANCE.
6. THE OWNER MAY ELECT TO USE PIPE INSTEAD OF DITCH FOR FLOW EXISTING THE VAULT. IF DITCH, USE C-20 CANAL GATE ATTACHED TO OUTSIDE OF VAULT AS SHOWN IN THESE DRAWINGS. IF PIPE, USE C-10 ATTACHED TO INSIDE OF VAULT.
7. A 6'X6' VAULT IS SHOWN. A SMALLER VAULT E.G. 4'X4' WOULD BE ACCEPTABLE.
8. APPLY EROSION CONTROL BLANKET TO GROUND AFTER FILLING PIPE TRENCH. SECURE BLANKET WITH WOODEN STAKES PER STAKING PATTERN C.
9. APPLY TOP COARSE OF ROAD GRAVEL AFTER FILLING PIPE TRENCH AT DRIVEWAY.

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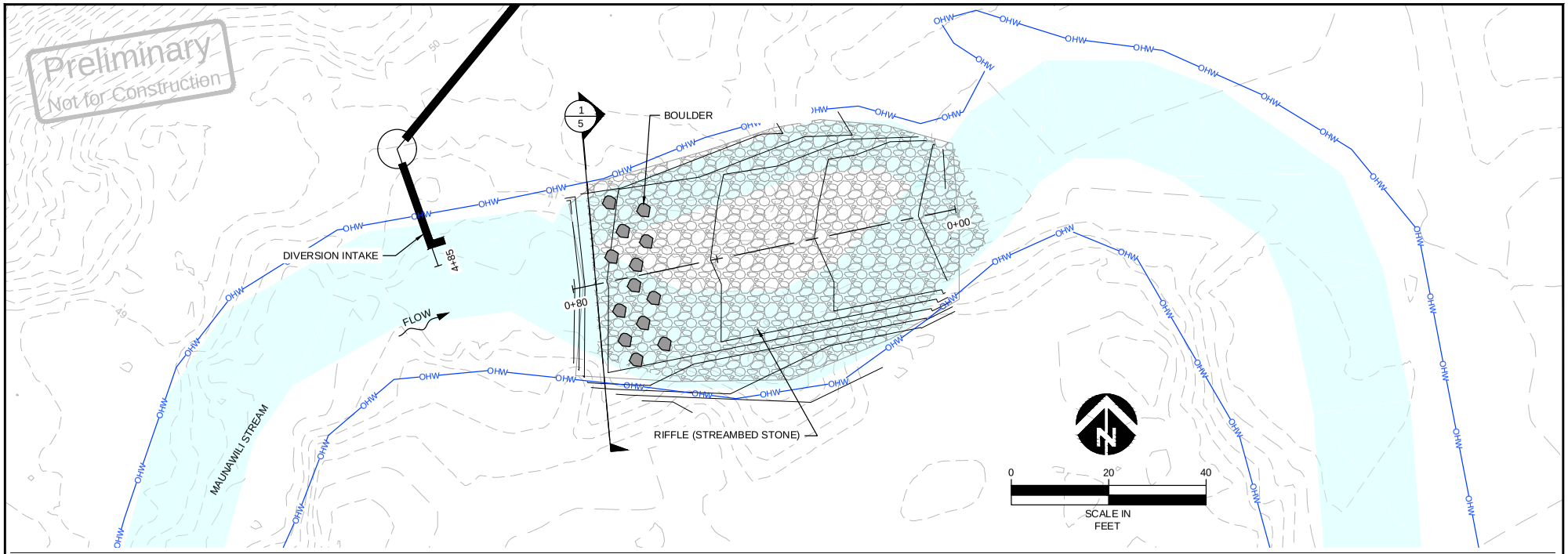
PROPOSED DIVERSION

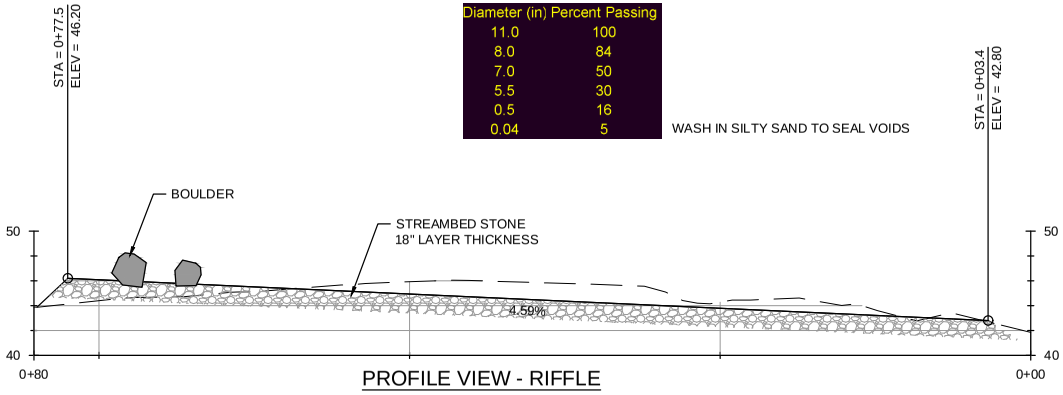
SHEET
4 OF 7



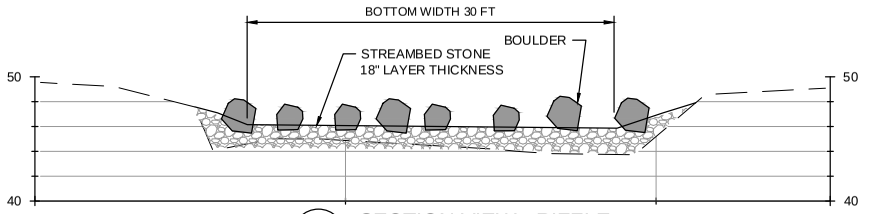
STREAMBED STONE MIX

Diameter (in)	Percent Passing
11.0	100
8.0	84
7.0	50
5.5	30
0.5	16
0.04	5

WASH IN SILTY SAND TO SEAL VOIDS



PROFILE VIEW - RIFFLE



1/5 SECTION VIEW - RIFFLE
STA 0+75

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GRADE CONTROL RIFFLE

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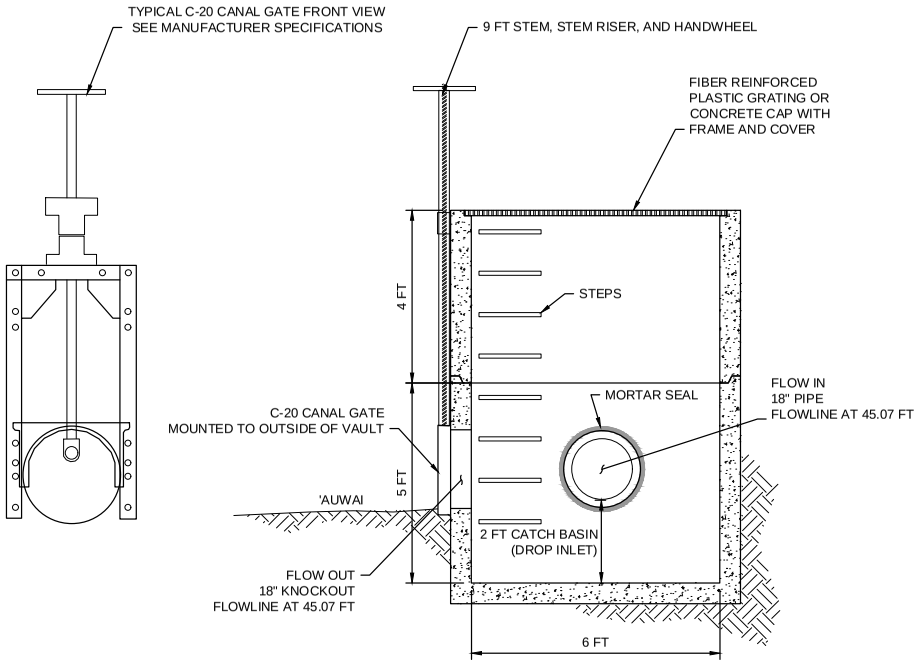
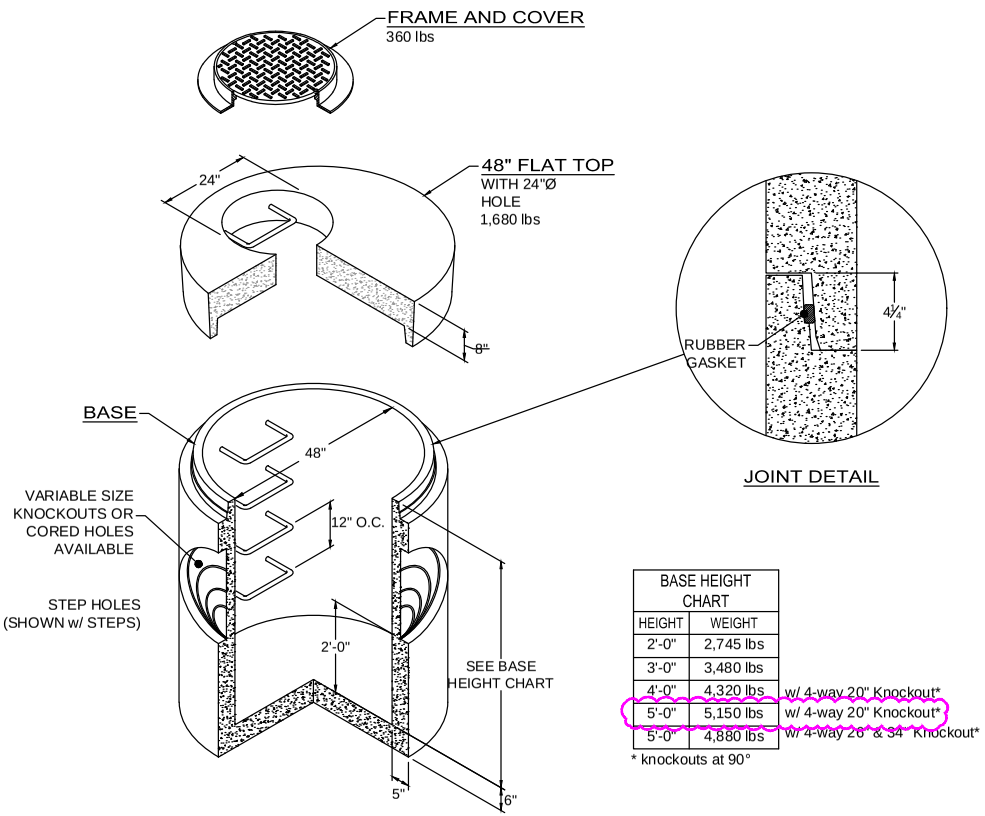
5 OF 7



1/6 DETAIL VIEW - TYPICAL 6'X6' VAULT WITH CATCH BASIN
NO SCALE



BASE HEIGHT CHART		
HEIGHT	WEIGHT	
2'-0"	2,745 lbs	
3'-0"	3,480 lbs	
4'-0"	4,320 lbs	w/ 4-way 20" Knockout*
5'-0"	5,150 lbs	w/ 4-way 20" Knockout*
5'-0"	4,880 lbs	w/ 4-way 26" & 34" Knockout*

* knockouts at 90°

2/6 DETAIL VIEW - TYPICAL 48" TYPE 2 CATCH BASIN (MANHOLE)
NO SCALE

NOTES:
- HS-20 Wheel Load, 16.0 kip
- Manhole meets ASTM C478 and all WSDOT/APWA Standard Specifications
- Rubber gasket joint meets ASTM C443
- Polypropylene steps and ladders meet ASTM D4101
- Reinforcement area meets minimum ASTM C478 requirements:
  Flat Top = 0.15 in.²/linear ft. in both directions, w/ 0.20 in.² @ 90° around opening
  3' tall Cone = 3 hoops of 0.375 in. dia. reinforcing bars
  Sections = 0.15 in.²/vertical ft.
  Bases = 0.15 in.²/linear ft. in both directions (slab), 0.15 in.²/vertical ft. (wall)
- Knockout sizes and locations available to meet job requirements
- Maximum hole size 36"
- Minimum distance between holes 8"

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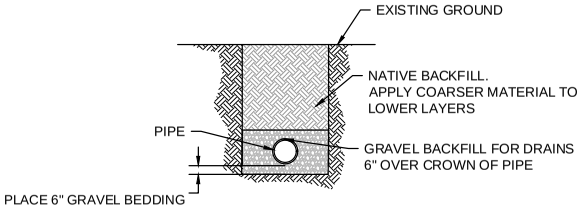
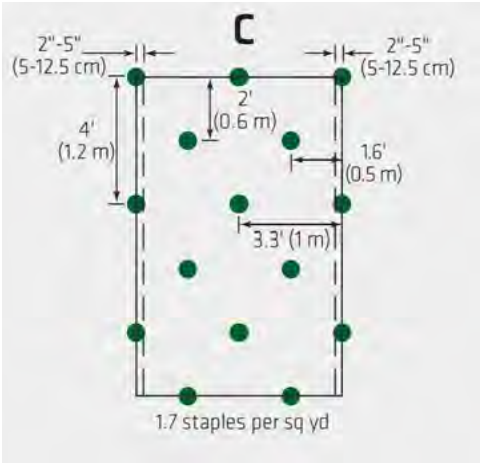
MANHOLE DETAILS

SHEET
6 OF 7



1/7 DETAIL VIEW - PIPE BEDDING & BACKFILL

-



2/7 DETAIL VIEW - EROSOIN CONTROL BLANKET STAKING PATTERN

-

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DETAILS

SHEET
7 OF 7

Photos of po’owai at Maunawili Stream, Pālāwai parcel.
Taken by Ho’okua’āina, 3/31/25

Po’owai 1

Po’owai 2

Po’owai 3

Ho’iwai 1

Ho’iwai 2