Mitchell D. Roth
Mayor

Deanna S. Sako
Managing Director

Ramzi I. Mansour
Director

Brenda Iokepa-Moses
Deputy Director

County of Hawai'i

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

345 Kekūanāo'a Street, Suite 41 · Hilo, Hawai'i 96720 · cohdem@hawaiicounty.gov
Ph: (808) 961-8083 · Fax: (808) 961-8086

August 27, 2024

TO: Mary Alice Evans
Director, Office of Planning and Sustainable Development
Environmental Review Program

FROM: Ramzi Mansour, Director
County of Hawai'i Department of Environmental Management

SUBJECT: Nā'ālehu Large Capacity Cesspool Closure Project
Draft Environmental Information Document and Environmental Assessment
Anticipated Finding of No Significant Impact (DEA-AFONSI)

The County of Hawai'i Department of Environmental Management herewith transmits the subject Draft Environmental Information Document (EID) / Environmental Assessment (DEA) for which there is an Anticipated Finding of No Significant Impact (DEA-AFONSI). The DEA-AFONSI has been prepared pursuant to Chapter 343, Hawai'i Revised Statutes, and Chapter 11-200.1, Hawai'i Administrative Rules. Please publish notice of this DEA-AFONSI in the upcoming issue of *The Environmental Notice*.

Included in the DEA-AFONSI are a Draft Archaeological Inventory Survey, a Natural Resource Assessment, and copies of comments received during pre-assessment consultation along with the corresponding responses regarding the subject project.

Please contact our consultant Mr. Keola Cheng at (808) 946-2277 if you have any questions.

Sincerely,

Ramzi Mansour, Director
County of Hawai'i Department of Environmental Management

Cc: Mark Grant, Wastewater Division Acting Deputy Chief
Chris Sparber, Wastewater Division Acting Chief

From: webmaster@hawaii.gov
To: DBEDT OPSD Environmental Review Program
Subject: New online submission for The Environmental Notice
Date: Friday, August 30, 2024 11:54:51 AM

Action Name

Naalehu Large Capacity Cesspool Closure

Type of Document/Determination

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

HRS §343-5(a) Trigger(s)

- (1) Propose the use of state or county lands or the use of state or county funds

Judicial district

Kaʻū, Hawaiʻi

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

Portions of (3) 9-5-007, (3) 9-5-008, (3) 9-5-009, (3) 9-5-007, (3) 9-5-021, (3) 9-5-022, (3) 9-5-024, (3) 9-5-025, and (3) 9-5-026.

Action type

Agency

Other required permits and approvals

See EID / EA Section 5.3

Proposing/determining agency

County of Hawaii Department of Environmental Management

Agency contact name

Mark Grant

Agency contact email (for info about the action)

markj.grant@hawaiicounty.gov

Email address for receiving comments

publiccomment@wilsonokamoto.com

Agency contact phone

(808) 961-8083

Agency address

345 Kekūanāoʻa Street
Suite 41
Hilo, HI 96720
United States
Map It

Is there a consultant for this action?

Yes

Consultant

Wilson Okamoto Corporation

Consultant contact name

Harlee Meyers

Consultant contact email

hmeyers@wilsonokamoto.com

Consultant contact phone

(808) 946-2277

Consultant address

1907 South Beretania Street
Suite 400
Honolulu, HI 96826
United States
Map It

Action summary

This project involves the construction of new sewer collection systems or individual wastewater systems for treatment to serve portions of the existing community of Nāʻālehu in the Kaʻu District of the Island of Hawaiʻi. These improvements would allow for the closure of existing large capacity "gang" cesspools (LCC) currently serving these communities. The project will improve the longevity of the sewer systems in these communities as well as assure compliance with the EPA mandated conversion of LCCs.

Reasons supporting determination

See EID / EA Chapter 7

Attached documents (signed agency letter & EA/EIS)

- Draft-Naalehu-EID-EA.pdf
- 2024.08.27_Naalehu-Draft-EID-EA-Trans.-Letter-to-ERP.PDF

Action location map

- Naalehu-Project-Location.zip

Authorized individual

Harlee Meyers

Authorization

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

Draft Environmental Information Document
& Environmental Assessment

NĀʻĀLEHU LARGE CAPACITY CESSPOOL CLOSURE

Nāʻālehu, Hawaiʻi Island, Hawaiʻi

September 2024

Prepared For:
County of Hawaiʻi Department of Environmental Management

Prepared By:
Wilson Okamoto Corporation

WILSON OKAMOTO
CORPORATION

DRAFT ENVIRONMENTAL INFORMATION DOCUMENT
& ENVIRONMENTAL ASSESSMENT

NĀʻĀLEHU LARGE CAPACITY CESSPOOL CLOSURE

Nāʻālehu, Hawaiʻi Island, Hawaiʻi
Portions of TMK Plats: (3) 9-5-007, (3) 9-5-008, (3) 9-5-009, (3) 9-5-007, (3) 9-5-021,
(3) 9-5-022, (3) 9-5-024, (3) 9-5-025, and (3) 9-5-026.

Prepared For:

The County of Hawaiʻi
Department of Environmental Management (DEM)
East Hawaiʻi Office: 345 Kekūanāoʻa St., Suite 41
Hilo, Hawaii 96720

Prepared By:

Wilson Okamoto Corporation
1907 South Beretania Street, Suite 400
Honolulu, HI 96826

WOC Job No. 10345-05

September 2024

PREFACE

This Draft Environmental Information Document (EID) / Environmental Assessment (EA) Anticipated Finding of No Significant Impact (FONSI) has been prepared pursuant to Chapter 343, Hawaiʽi Revised Status (HRS), and Title 11, Chapter 200.1, Hawaiʽi Administrative Rules (HAR), Department of Health, State of Hawaiʽi.

The Hawaiʽi County (County) Department of Environmental Management (DEM) - Wastewater Division (WWD) is proposing to construct new sewer collection systems or individual wastewater systems for treatment to serve portions of the existing community of Nāʽālehu in the Kaʽu District of the Island of Hawaiʽi. These improvements would allow for the closure of existing large capacity "gang" cesspools (LCC) currently serving these communities. The Proposed Action will improve the longevity of the sewer systems in these communities as well as assure compliance with the EPA mandated conversion of LCCs.

The subject EID / EA is intended to be consistent with requirements of the National Environmental Policy Act (NEPA) 42 U.S.C. § et seq. and will also provide documentation of necessary compliance with Section 7 of the Endangered Species Act and Section 106 of the National Historic Preservation Act. Further, the document shall be prepared pursuant to Hawaiʻi Revised Statutes (HRS) §343-5 (1) which outlines requirements for environmental disclosure for actions that propose the use of state or county lands or the use of state or county funds. Pursuant to HRS §343-5(b), the Proposed Action is being considered an "agency action" for which the County DEM shall be responsible for determining if the Final EA can be filed as a FONSI.

This Draft EID / EA includes an assessment of the potential environmental, social, cultural, and economic impacts associated with the Proposed Project. This Draft EID / EA has also been prepared in consideration of the comments received in response to the Early Consultation Package mailed out on March 29, 2024, to the respective stakeholders listed in Chapter 8.1 of this Draft EID / EA.

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SUMMARY

Project Name:	Nāʽālehu Large Capacity Cesspool Closure
Project Applicant:	Hawaiʽi County Department of Environmental Management 345 Kekūanāoʽa Street, Suite 41 Hilo, HI 96720
Location:	Nāʽālehu, Hawaiʽi Island, Hawaiʽi
Tax Map Keys (TMKs):	There are no TMK numbers for the County roadways right-of-way for which improvements are planned. TMK plat numbers for the various parcels being serviced by the new sewer collection and treatment systems are identified below: (3) 9-5-007, (3) 9-5-008, (3) 9-5-009, (3) 9-5-007, (3) 9-5-021, (3) 9-5-022, (3) 9-5-024, (3) 9-5-025, and (3) 9-5-026.
Recorded Fee Owner:	The sewer collection system improvements planned within Nāʽālehu would predominantly occur within the rights-of-way of existing County roadways. However, there are some segments of the collection system that would run through portions of privately-owned property. The IWS improvements planned to treat the wastewater would occur within privately-owned property or portions of such property. Easements for the sewer collection system would be obtained from the landowners of the private properties affected. Easements or acquisition of property needed for the wastewater treatment sites would also be obtained.
Existing Use:	Residential, Commercial, and undeveloped lands
State Land Use Classification:	Urban and Agricultural
County Zoning Designation:	Single-Family Residential District (RS-7.5, RS-10, and RS-15) Village Commercial District (CV-10) Limited Industrial District (ML-20) Multiple-Family Residential District (RM-3) Agricultural District (A-20) Open District
Flood Hazard Zone:	Zone X

Proposed Action: This project involves the construction of new sewer collection systems or individual wastewater systems for treatment to serve portions of the existing community of Nāʽālehu in the Kaʽu District of the Island of Hawaiʽi. These improvements would allow for the closure of existing large capacity "gang" cesspools (LCC) currently serving these communities. The project will improve the longevity of the sewer systems in these communities as well as assure compliance with the EPA mandated conversion of LCCs.

Impacts: Short-term construction-related impacts to surrounding areas include fugitive dust, noise, and construction-related traffic. Impacts on air quality and noise levels will be mitigated through implementation of best management practices (BMPs) and adherence to federal, state, and county rules and regulations. Traffic impacts will be mitigated through traffic control measures developed during the design phase that will avoid or minimize disruptions to surrounding operations. Short-term construction-related impacts are anticipated to be negligible with mitigation. In the long-term, no significant impacts are anticipated as a result of the construction or operation of the proposed action.

Anticipated Determination: Finding of No Significant Impact (FONSI)

Parties Consulted During Early Consultation:

Federal Agencies

US Army Corps of Engineers, Honolulu District
US Department of Agriculture Natural Resources Conservation Service
US Environmental Protection Agency
US Fish and Wildlife Service
National Oceanic and Atmospheric Administration
US Department of Transportation Federal Aviation Administration

State Agencies

Department of Agriculture
Department of Accounting and General Services
Department of Business, Economic Development & Tourism (DBED&T)
DBED&T Land Use Commission
DBED&T Office of Planning and Sustainable Development
DBED&T State Energy Office
Department of Hawaiian Home Lands (DHHL)
    DHHL – East Hawaiʽi District Office
Department of Health (DOH)
DOH – Clean Water Branch

DOH - Environmental Management Office
DOH – Hazard Evaluation and Emergency Response
DOH – Safe Drinking Water Branch
DOH – Wastewater Branch
Department of Land and Natural Resources (DLNR)
DLNR State Historic Preservation Division
DLNR Land Division
Department of Transportation
Office of Hawaiian Affairs
University of Hawai'i

<u>County of Hawai'i</u>
Fire Department
Police Department
Planning Department
Research and Development
Department of Public Works
Department of Parks and Recreation
Department of Water Supply
Environmental Management Commission
Office of the Corporation Council
Office of Housing and Community Development

<u>Elected Officials</u>
State Senator Dru Mamo Kanuha, Senate District 3
Representative Jeanne Kapela, House District 5
Councilmember Michelle Galimba, Council District 6

<u>Public Utilities</u>
Hawaiian Electric Company
Hawaiian Telcom
Spectrum Hawai'i
Hawai'i Gas

<u>Other Parties</u>
Hawai'i State Library
Nā'ālehu Public Library
Hawaiian Civic Club of Ka'ū
Ka'ū CDP Action Committee
Ka'ū Calendar
'O Ka'ū Kākou

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CHAPTER 1: INTRODUCTION

1.1 Background

The Hawaiʻi County (County) Department of Environmental Management (DEM) - Wastewater Division (WWD) is proposing to construct new sewer collection systems or individual wastewater systems for treatment (hereafter referred to as Proposed Action) to serve portions of the existing Nāʻālehu Community (Project Area) on the island of Hawaiʻi. The Proposed Action would allow for the closure of existing large capacity "gang" cesspools (LCC) currently serving the Project Area and is anticipated to improve the longevity of the sewer systems in Nāʻālehu as well as assure compliance with the mandated conversion of LCCs.

This Draft Environmental Information Document (EID) / Environmental Assessment (EA) is intended to address State and Federal Environmental Review Requirements of the Proposed Action. The Amended Administrative Order of Consent (Amended AOC) (Docket No. SDWA-UIC-AOC-2017-0002, effective February 14, 2024) Large Capacity Cesspool (LCC) Closure for Nāʻālehu outlines that an EID must be prepared by the County DEM for US Environmental Protection Agency (EPA) approval by July 30, 2024, to meet Federal Environmental Review Requirements.

The Amended AOC §31.a. requires evaluation of four feasible options:

1. A package plant and new collection system (Alternative 1)
2. A package plant connected to the existing collection system (Alternative 2)
3. A maintenance contract model Individual Wastewater System (IWS) program (Alternative 3)
4. A County issued voucher program with an operating permit model IWS program (Alternative 4)

In addition, to meet the requirements of the EPA, this EID will include:

5. A No Action Alternative.

In June 2017, the EPA and County entered into an AOC which required the WWTP to provide secondary treatment of the sewage. Secondary treatment was no longer required under the previous Revised AOC (effective date August 22, 2022) and is consistent with the Amended AOC. As such, the IWS alternatives provide a method to close the three LCCs without providing a secondary treatment process. The package plant discussed below will provide the secondary treatment WWTP.

This Draft EID / DEA was prepared in accordance with the National Environmental Policy Act (NEPA), EPA and Council on Environmental Quality NEPA regulations as well as the Hawaiʻi Environmental Policy Act (HEPA-Hawaiʻi Revised Statutes, Chapter 343) and implementing rules Hawaiʻi Administrative Rules (HAR), Title 11, State of Hawaiʻi Department of Health Chapter 200, Environmental Impact Statement Rules. The Proposed Action will also provide documentation of necessary compliance with Section 7 of the Endangered Species Act and Section 106 of the National Historic Preservation Act.

Supporting studies included herein within the subject EID / EA, encompass Archaeological and Cultural documentation, Botanical / Faunal Surveys and regulatory coordination. The County will seek to coordinate with the State of Hawai'i Department of Health (DOH) to ensure timely review and concurrence by the State of Hawai'i State Historic Preservation Division (SHPD) and the US Fish and Wildlife Service (FWS).

Within 60 days of receiving written approval of the Final EID, the County shall submit an implementation plan for EPA approval. The Nāʻālehu Implementation Plan shall include a schedule and completion dates for each step required to implement the selected alternative, provide wastewater services for 194 properties, and to close the Nāʻālehu Community Cesspools no later than December 31, 2027.

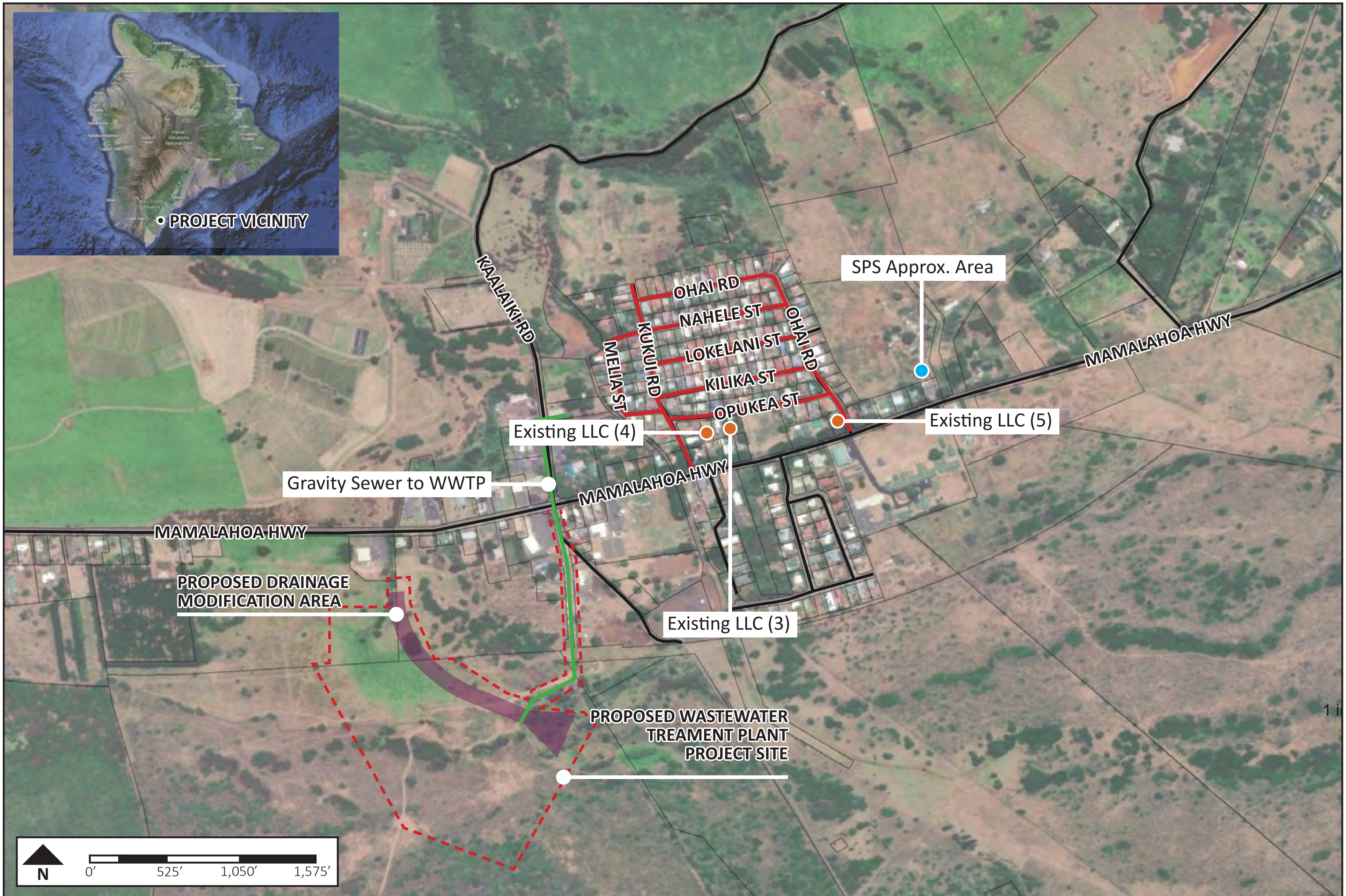
1.2 Project Location

The community of Nāʻālehu is located about 64 miles southwest of Hilo in the Kaʻū District. Māmalahoa Highway (State Route 11) runs through the community from east to west. The Nāʻālehu community was established as a result of the sugar operations of the C. Brewer Company (C. Brewer). Even though Kaʻū was one of the originally settled areas in the Hawaiian Islands, it remains a vast remote area. Only a fraction of a percent of the Kaʻū District has been developed with residential properties, and the remainder is largely used for agricultural purposes or is undeveloped. The Kaʻū District covers about 922 square miles (approximately 590,000 acres), with over 80 miles of virtually undeveloped coastline. Nearly two-thirds of its total land area is in the Conservation District. The Kaʻū District consists of several communities, including the Nāʻālehu community, which has a population of approximately 890 persons according to the US Census Bureau American Community Survey, 2022. The distance to the communities of Hilo and Kailua-Kona means that the Kaʻū District is relatively isolated from the major infrastructure systems found in those communities, including wastewater treatment and disposal facilities. The community of Nāʻālehu is about 2.06 miles from the shoreline. Most of the community lies approximately 740 feet above mean sea level.

The existing sewer system that services the community was privately owned and operated by the C. Brewer, which merged with Hawaiian Agriculture Company (HAC) in 1972. The sewer system is currently owned by the County DEM. The sewer system discharges wastewater into large capacity cesspools (LCCs). In total, 164 properties in the Nāʻālehu community are connected to LCCs.

The Project Area includes approximately 204 parcels (in whole or in part) and portions of multiple County streets in Nāʻālehu (Figure 1-3). The Proposed WWTP Site is located adjacent Māmalahoa Highway within a 14.9-acre portion of the Tax Map Key (TMK): (3) 9-5-007-016. The Proposed Wastewater Pump Station will be located on a portion of TMK (3) 9-5-008:048. The Proposed Collection System Area will include portions of Kaalaiki Road, Naalehu Spur Road, Melia Street, Opukea Street, Ohai Road, Lokelani Street, Kilika Street, Kukui Road, and Milo Road.

Two of the LCCs slated for closure are located within TMK parcels (3) 9-5-024:011 (por.) and 9-6-024:001 (por.). The third LCC slated for closure is situated between TMK parcels (3) 9-5-024:010 and 9-5-024:009 (See Figure 1-1).



PROJECT LOCATION MAP

NA'ALEHU WASTEWATER TREATMENT PLANT

FIGURE
1-1

1.3 Purpose and Need

A portion of the Nāʽālehu community is serviced by a sewer system that was privately built, owned, and operated by the C. Brewer. The C. Brewer built sewer system discharges sewage into three (3) LCCs. Around 2006, C. Brewer requested that the County construct and maintain a new and improved community sewer system. A County Council Resolution approved the C. Brewer request. In anticipation of C. Brewer's dissolution, C. Brewer proposed, and the County agreed, to enter into a formal agreement to not only construct and maintain a new and improved community sewer system but to assume ownership of the existing system including the LCCs by April 30, 2010.

As part of this agreement, for the majority of Nāʽālehu properties connected to the LCCs, C. Brewer committed to complete the line (called a lateral) between the residences and the property line at the edge of the public right-of-way adjacent to the new collection system. It was agreed, if the County did not complete its portion of the work by April 30, 2010, the County would assume pending and unfinished obligations to connect the new laterals installed by C. Brewer to the residences and new collection system when complete. Thus, because that date has passed and the County has not completed installation of the new collection system, this project includes connecting these C. Brewer laterals, which may now need to be replaced, or installing private laterals for currently connected properties if authorized by the property owner and approved by County Council.

In 1998, the U.S. Environmental Protection Agency (USEPA), promulgated regulations, 40 Code of Federal Regulations (CFR) 144.14, that require the elimination of LCCs. In 1999, EPA issued regulations under the Safe Drinking Water Act's (SDWA) Underground Injection Control (UIC) Program which prohibited the construction of new LCCs as of April 2000 and required the closure of all existing LCCs by April 5, 2005 (40 C.F.R. § 144.88). Under federal regulations, an LCC is a cesspool which serves multiple dwellings, or for non-residential facilities has the capacity to serve 20 or more persons per day. For the purpose of complying with EPA regulations, the existing LCC's within the Project Area must be upgraded.

In June 2017, EPA and the County entered into an Administrative Order on Consent (AOC) to close the LCCs serving the Pāhala community by April 2022. Options considered by the County to close the LCCs include construction of a new sewer collection system located within public right-of-way (ROW) and replacement of the existing LCCs with a wastewater treatment plant (WWTP) to address the wastewater treatment and disposal needs of the Nāʻālehu community. The recently Amended AOC that was proposed as of February 14, 2024, requires the LCCs to be closed no later than December 31, 2027.

The County and the EPA voluntarily entered into the initial AOC for the purpose of bringing the County into compliance with the requirements of the Safe Drinking Water Act (SDWA), 42 U.S.C. § 300f, et seq.

EPA has determined that the County, as the current owner and/or operator of three (3) LCCs that serve approximately 164 private residences in the community of Nāʽālehu, violated and continues

to violate the SDWA and its Underground Injection Control program requirements for existing LCCs.
A "cesspool" is a "drywell," which in turn is a "well," as those terms are defined in 40 C.F.R. § 144.3. LCCs include "multiple dwelling, community or regional cesspools, or other devices that receive sanitary wastes, containing human excreta, which have an open bottom and sometimes perforated sides.

Based on the above, the County has outlined that the purpose and need for the Proposed Action is to comply with the requirements and mandates of the SDWA and Amended AOC, and to ultimately close the three LCCs that serve Nāʽālehu. Thus, the core purpose of this exercise is to evaluate, gather community input, and make an informed decision on selecting an option or alternative that will allow the County to close the LCCs, and provide a new, SDWA compliant solution for handling wastewater generated by the Nāʽālehu Community. Closure of the LCCs will eliminate the disposal of untreated sewage into the subsurface which will serve County's mission to protect underground drinking water sources.

In summary, the goals and objectives of the Proposed Action are to:

- Improve the longevity of the sewer systems in Nāʽālehu;
- Construct new sewer collections systems or individual wastewater systems to serve portion of Nāʽālehu;
- Close the three existing LCCs currently serving the community in compliance with the SDWA; and
- Meet the compliance requirements of the Amended AOC and the applicable portions of the Clean Water Act by assessing four alternatives (further discussed in Section 2.1 of the EID-EA).

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CHAPTER 2: PROJECT DESCRIPTION

2.1 Proposed Action

The County DEM WWD is proposing to construct new facilities for wastewater treatment to serve portions of Nāʽālehu as described in Section 1.1 of the EID-EA. The Proposed Action will allow the County to close the three existing LCCs in the Project Area, and thereby meet the compliance requirements of the Amended AOC and the applicable portions of the Clean Water Act. The Proposed Action would be achieved by any of the four alternatives set forth in the Amended AOC, further described below.

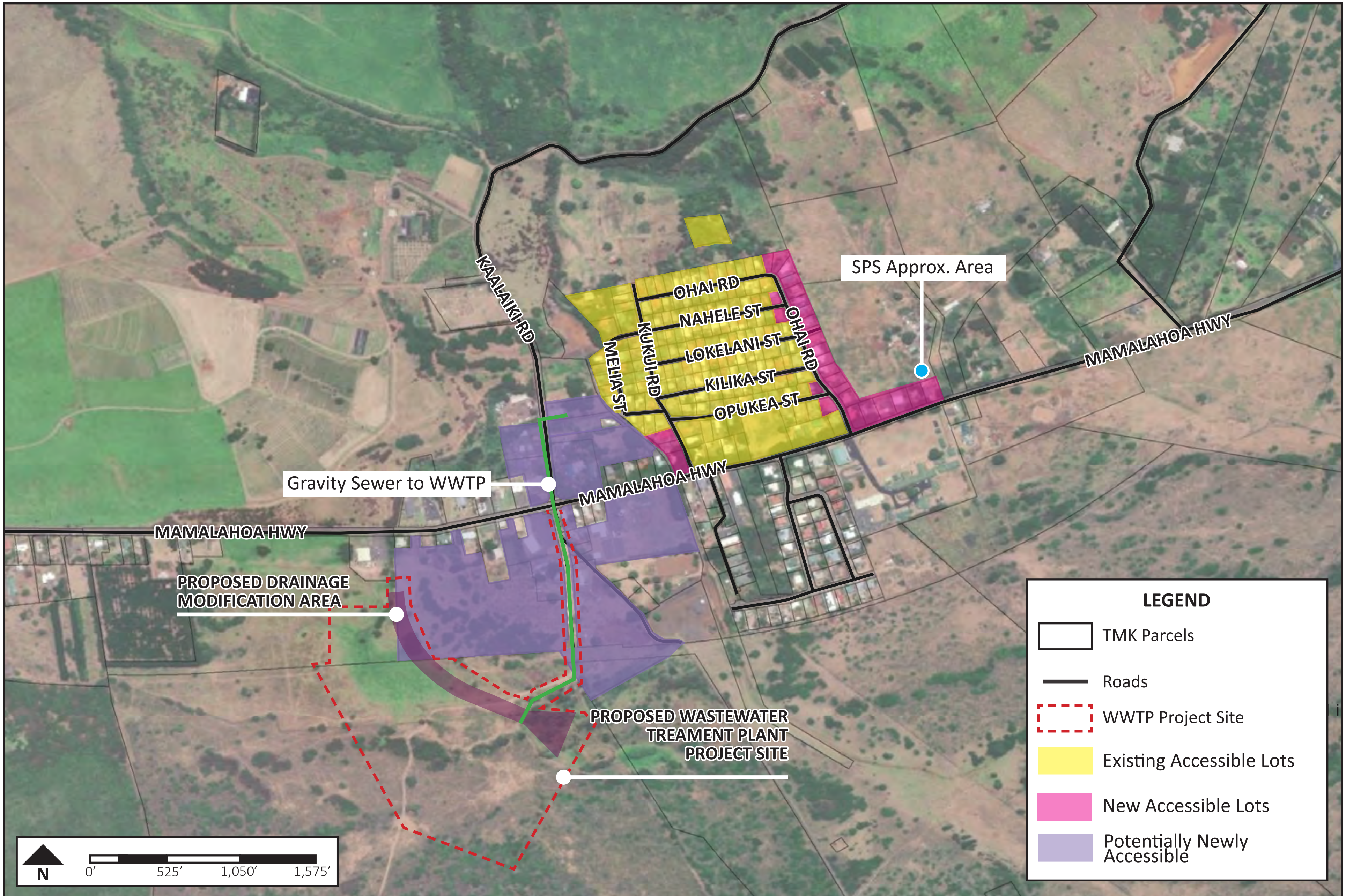
2.1.1 Alternative 1: Package Plant New Collection System

Under Alternative 1, the County would construct a new sewer collection system in the Project Area to replace the existing system of gravity lines that convey sewage to the three LCCs and connect it to the proposed wastewater treatment and disposal facility. The WWTP would serve the former Brewer lots as well as newly accessible parcels for future connection to the WWTP (See Figure 2-1). The potential connection of additional parcels may be further assessed by the County in the future.

Alternative 1 involves utilizing the existing collection system within the Brewer Company house lots and constructing new gravity sewers, wastewater pump station, and force main to transport sewage from the LCCs to the new WWTP (See Figure 2-2). Alternative 1 also involves the installation of gravity sewers to replace the existing collection system (See Figure 2-3). Construction may be conducted as one or multiple phases, and the County shall ensure that residential units can maintain access to the sewer system at all times.

Under this alternative, the County would perform the following actions:

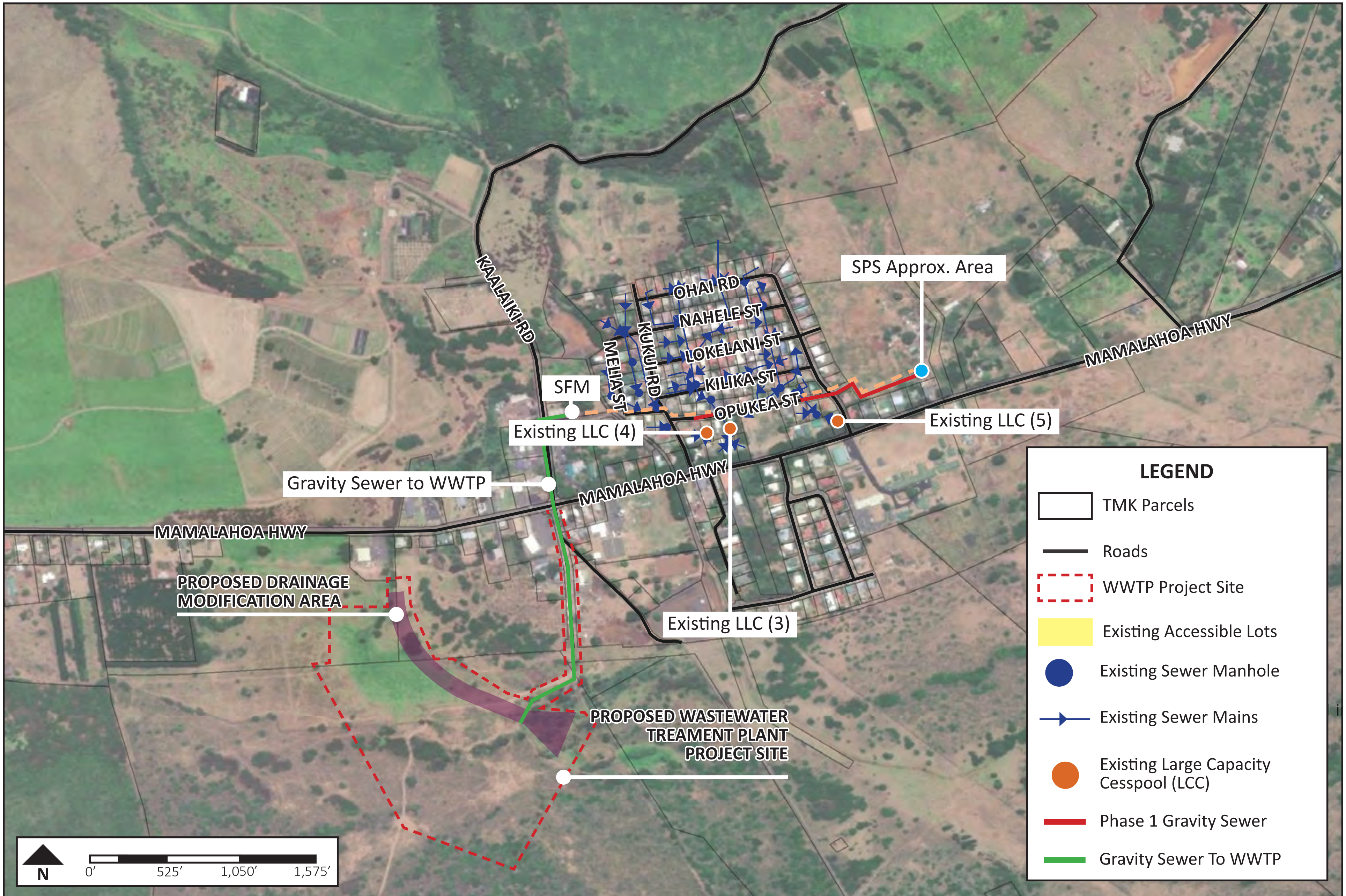
1. Construct a new gravity sewer on Kaalaiki Road and Nāʽālehu Spur Road to the WWTP located on a portion of Tax Map Key (TMK) (3) 9-5-007:016, as the current proposed approach to bring sewer to the WWTP location
2. Implement drainage improvements within the vicinity of the WWTP within TMKs (3) 9-5-007:016 and (3) 9-5-021:015.
3. Construct a new pump station located on a portion of TMK (3) 9-5-008:048, and construct a new force main, which crosses an existing storm drainage channel at Melia Street, to connect to the Kaalaiki Road gravity sewer.
4. Construct a new gravity sewer on Opukea Street and Ohai Road to intercept existing flows entering the LCCs and divert sewage to the wastewater pump station (WWPS) and transport flows to the gravity sewer along Kaalaiki Road.
5. Install gravity sewers within the streets to replace the existing collection system.
6. Close and abandon the three LCCs.
7. Accomodate future expansion of subsurface effluent disposal located within a portion of TMK (3) 9-5-022:001.



ALTERNATIVE 1- SERVICE AREAS

NA'ALEHU WASTEWATER TREATMENT PLANT

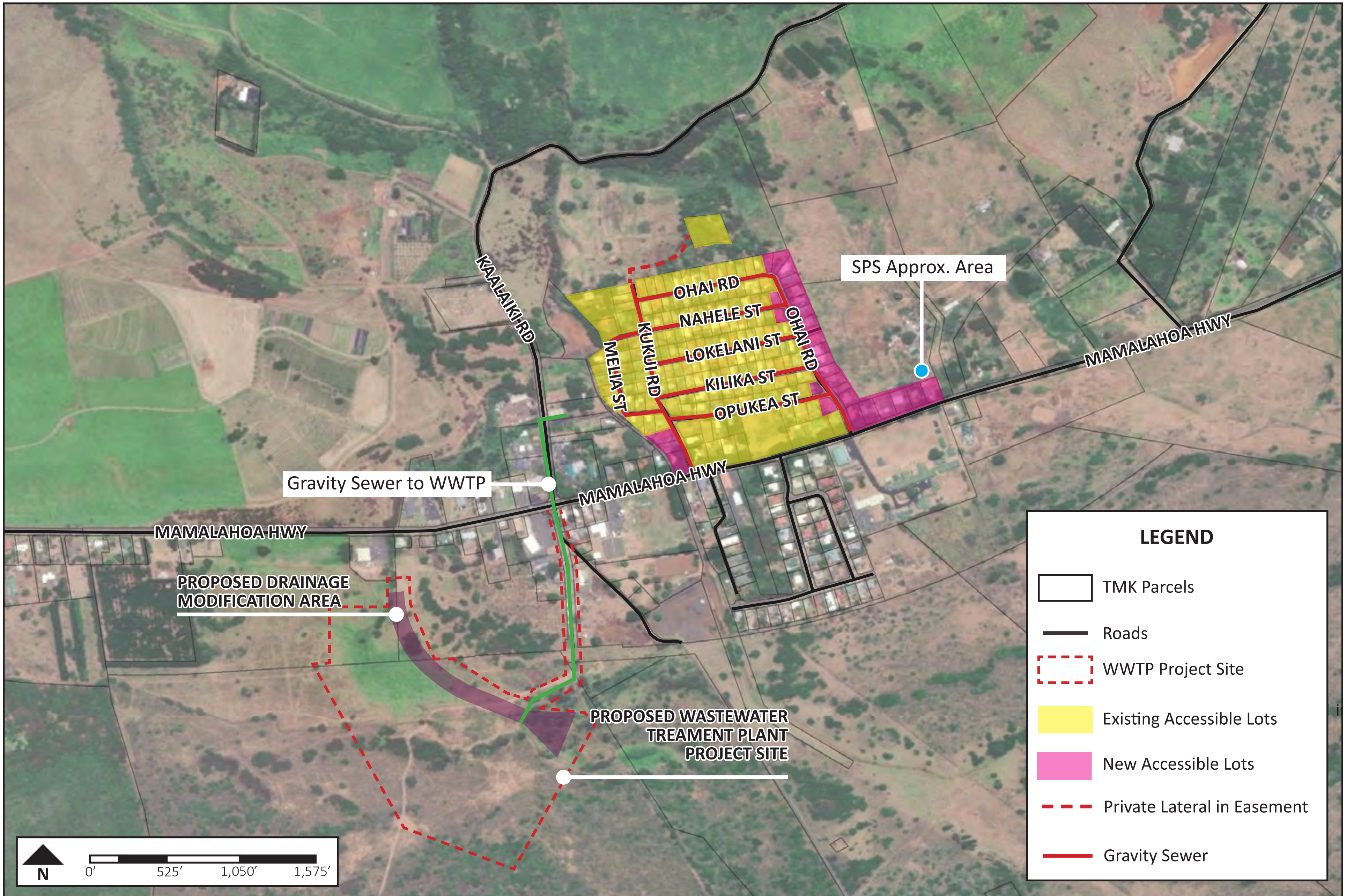
FIGURE 2-1



ALTERNATIVE 1- NEW COLLECTION SYSTEM LAYOUT

NA'ALEHU WASTEWATER TREATMENT PLANT

FIGURE 2-2



ALTERNATIVE 1- REPLACEMENT OF EXISTING COLLECTION SYSTEM LAYOUT

NA'ALEHU WASTEWATER TREATMENT PLANT

FIGURE
2-3

Package Plant

The Amended AOC allows for construction of a Package Plant to treat sewage currently being disposed in the 3 LCCs. In addition, after treatment of the incoming sewage flows, disposal of the treated effluent would occur using a subsurface irrigation system. The following sections describe the components and facilities which would comprise the package plant to treat the sewage and dispose the treated effluent which would be applicable to Alternative 1 and Alternative 2.

A Preliminary Engineering Report (PER), prepared by Brown and Caldwell in August 2023, provides technical information related to the analysis used by the County to select the package plant to be used to treat incoming sewage flows and a method to be used for disposal of effluent from the wastewater treatment plant (WWTP). As described in the PER, the package plant and effluent disposal method would be configured and developed within the 28.739-acre Project Area located makai of Māmalahoa Highway. Final design and configuration may differ from overall site plan depicted in the PER. For more information, see Appendix A.

The PER indicated accurately quantifying flow projections for the Nāʽālehu community is necessary to design an appropriately sized wastewater treatment and disposal facility. The WWTP design will need to provide sufficient capacity for the existing parcels within the service area, including newly accessible parcels reflecting currently developed portions of the Nāʽālehu community. This will allow the County to close the LCCS. The design will provide sufficient area within the WWTP site for future expansion of the package plant.

HAR Section 11-62-24(b) requires Counties to use their adopted wastewater flow standards to develop flow projections for WWTPs. Counties are to use the City and County of Honolulu (CCH) flow standards if they have not adopted their own standards. The County has not adopted its own flow standards, so wastewater flow projections were developed using the current CCH (2017) wastewater standards. However, flow projections based the current wastewater standards based on urban Honolulu are likely overly conservative for rural communities like Nāʽālehu.

The PER indicates the amount of wastewater generated within a residence will not exceed the amount of potable water used by the occupants. Therefore, potable water use records can be used to estimate wastewater generation rates within existing communities where no combined sewers are present. The County Department of Water Supply (DWS) provided potable water use records from November 2017 through October 2022 for the parcels located within the service area. Analysis of the potable water use records indicates that an 80,000 gallons per day (gpd) monthly wastewater generation rate would reflect the current needs of the service area. Using a 2.5 peaking factor to estimate the maximum wastewater flow into the collection system results in a maximum wastewater flow of 200,000 gpd.

As stated in the PER, groundwater can infiltrate into wastewater collection systems during dry weather, increasing flows to the WWTP. The 2017 CCH standards specify a dry weather infiltration and inflow (I/I) allowance of 35 gallons per capita per day (gpcd). The previous CCH standards (dated 1993) specified a dry weather I/I allowance of 5 gpcd for properties located above the groundwater table. Through the County's experience at the Honokaa WWTP evaluating dry weather, I/I for a rural collection system located in Hawaiʽi Island's well-drained geology, at elevations hundreds of feet above sea level and a significant distance from the shoreline, continued use of the 1993 standard for dry weather I/I is appropriate for Nāʿālehu and using the 2017 standard would be overly-conservative.

The 2017 CCH standards specify a wet weather I/I allowance of 3,000 gallons per acre per day (gpad) were used for all wet weather I/I calculations. Evaluation has determined that a peak day wet weather peaking factor of 3.5 is recommended for the Nāʿālehu WWTP design.

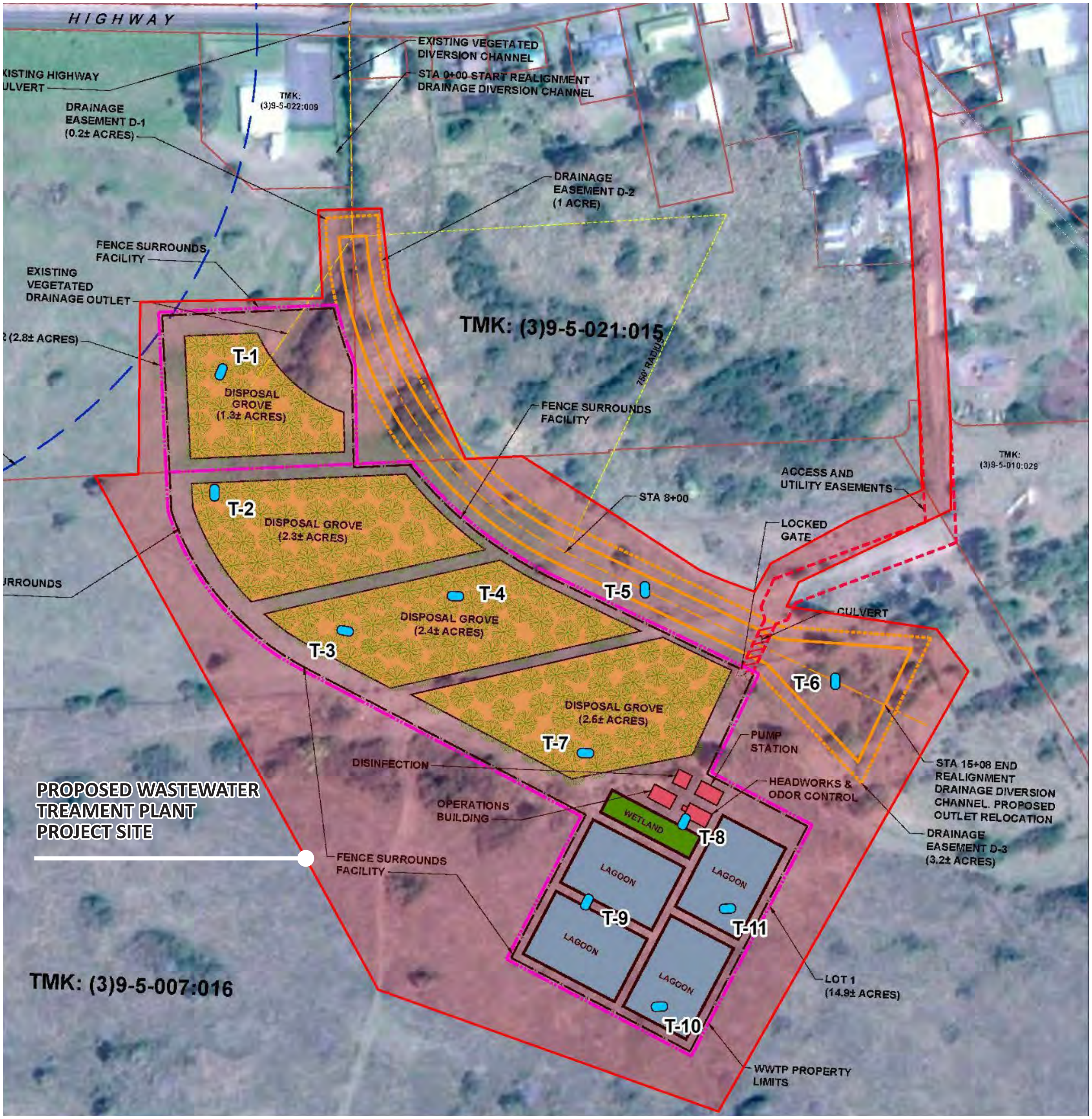
HAR 11-62-23.1(i) requires the initiation of a facility planning process when the actual wastewater flows reach 75 percent of the design capacity of the WWTP, and implementation of the facility plan must be initiated when actual wastewater flows reach 90 percent of the design capacity. In anticipation of future development within the Nāʻālehu community, the PER recommend the WWTP design be rated to treat an average dry weather flow of 125,000 gpd to avoid the potential of having to initiate a facility plan shortly after the project is constructed. Note, the biological processes in the mechanical WWTP will need to be sized to treat the peak day dry weather flow of 212,000 gpd, not the average dry weather flow.

If the County pursues a WWTP approach to close the LCCs then a DOH variance from HAR 11-62 requirements will be needed. The variance will need to be renewed every 5 years. The WWTP capacity needs should be re-evaluated upon application for the variance renewal.

The PER provides a description of the package treatment plant that is recommended to be implemented at Nāʻālehu. Note, package plants typically consist of pre-manufactured treatment facilities/components that may be configured to treat wastewater in small communities or on individual properties. The Nāʿālehu WWTP would be configured within a 28.739-acre portion of TMK (3) 9-5-007:016. Pending final design, lands within this 28.739-acre Project Area which are not utilized to construct the package plant and related facilities or subsurface disposal of treated effluent shall be converted back to conservation land. A security fence would surround the site. The security fence would not include barbed wire stringers. Figure 2-4 shows the site plan for the WWTP.

The package plant includes the headworks, grit drying bed, potable water tank, utility or operations building which includes a blower room, an emergency generator room, electrical room with a monitor control center, a maintenance and storage room, and restroom, an above ground fuel storage tank, and an irrigation control tank. Figure 2-5 shows the operations building floor plan.

The Nāʿālehu package plant will include preliminary treatment, odor control and secondary treatment, and disposal of treated effluent. The preliminary treatment system will include influent flow measurement, influent sampling, screening, and grit removal. The narrative description of the proposed improvements contained herein mirrors the recommendations set forth in the subject PER, however, the CoH-DEM reserves the right / flexibility to utilize its discretion to utilize and implement alternative methods / technologies / processes that it deems superior / equivalent in regards to meeting the purpose and need of the Proposed Action. As the design phase progresses, modifications to the current conceptual site plan and operations building floor plan may occur. While the overall size of the structures is not anticipated to change significantly, adjustments to the site configuration could occur within the identified parcels.

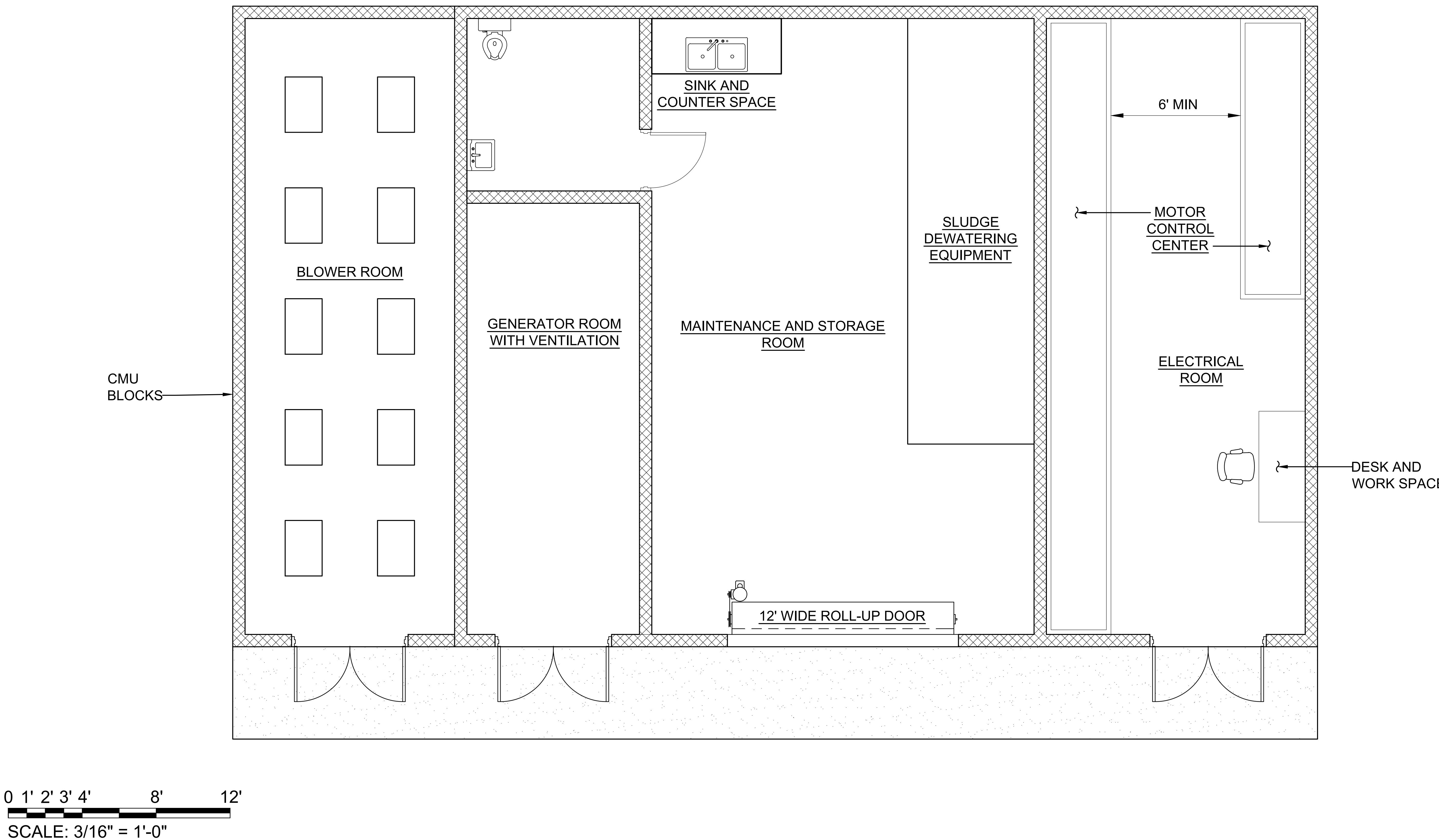


PROPOSED WWTP SITE PLAN

NA'ALEHU WASTEWATER TREATMENT PLANT

* Subject to change*

FIGURE 2-4



Brown AND Caldwell

SCALE: 3/16" = 1'-0"

JOB NO: 153740

NAALEHU WASTEWATER TREATMENT PLANT

OPERATIONS BUILDING PRELIMINARY FLOOR PLAN

Subject to change

FIGURE 2-5

Path: C:\bcpw\d3083617
File Name: 150440-FIG-OpsBldg Plot Date: July 13, 2023 12:53 PM Cadd User: Richard Sellona

Preliminary Treatment

Influent flow measurement is recommended in the PER to allow assessment of flows and loads to the biological treatment process, and to assess the biological treatment process performance. A Parshall flume will be provided upstream of the screening system to continuously record influent flow rates. Parshall flumes work well for influent measurement because the flume can operate in an open-channel configuration, can accommodate wide ranges of flows, and is self-cleaning. A straight approach length of at least 20 times the flume throat width will be provided upstream of the flume to provide favorable hydraulic conditions.

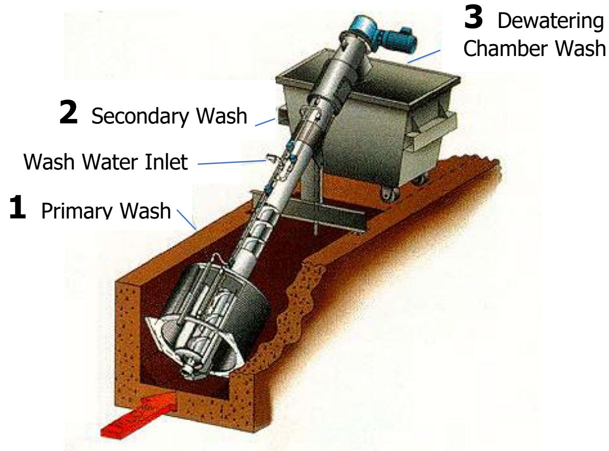
An automatic refrigerated composite sampler is recommended to allow influent composite samples to be collected. Influent composite samples, when combined with influent flow measurement, can be used to calculate influent mass loading rates to the WWTP to assess the treatment performance and optimization of aeration rates in the biological treatment process. Periodic influent sampling is also recommended to monitor for changes in the influent characteristics.

Screening is recommended to protect the downstream system operation from large objects, debris, wipes, and rags that can be present in wastewater. The industry trend is towards finer screening systems that remove greater amounts of debris from the waste stream; screens with 6-millimeter (mm) (¼-inch) openings are frequently used for activated sludge treatment systems. Finer screens are used upstream of membrane bioreactors to remove hair that can foul the membranes. The screenings volume at the Nāʽālehu WWTP is expected to be small, subsequently screenings disposal is expected to be infrequent; weekly at most. Therefore, the screenings must be washed of organic debris to prevent the accumulation of nuisance odors and flies in the screenings barrel or bag between screening disposals events.

The PER recommended an in-channel cylindrical screen for this installation. The in-channel cylindrical screen combines screening, screenings washing, dewatering, compacting, and bagging/disposal within a single unit as shown in Figure 2-6. For this installation, the headworks will include one in-channel cylindrical screen, plus a bypass channel with manually cleaned bar rack. This system is recommended as it minimizes additional screenings handling and odor potential. The screening mechanisms provided in the final design of the Proposed Action may differ from what has been recommended by the PER depending on the selected manufacturer.

According to the PER, grit removal is crucial to help prevent wear to downstream equipment, costly service interruptions and repair. Grit is comprised of particles that are heavier than the organic biodegradable matter in wastewater. Grit particles can consist of sand, gravel, pebbles, silt, cinders, ground bone, eggshells, coffee grounds, and other materials. Grit in the wastewater collection and treatment system causes abrasive wear to mechanical equipment, piping, and appurtenances. Grit can also form deposits in pipelines, channels, and tanks, which reduces hydraulic capacity and can damage equipment.

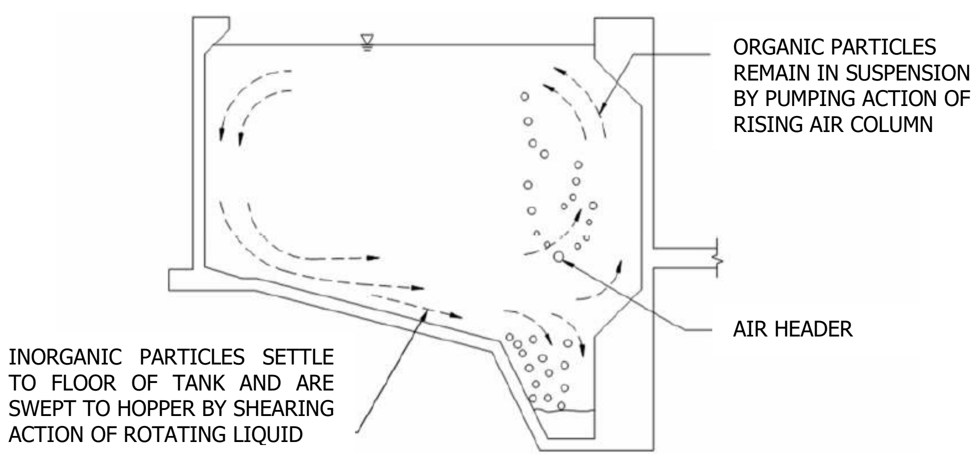
Figure 2-6 In-Channel Cylindrical Screen



The PER recommended the sue of an aerated grit chamber for the Nāʻālehu WWTP. Aerated grit chambers are tanks that function specifically to remove inorganic solids from the wastewater stream as shown in Figure 2-7. Aerated grit tanks are designed to induce sufficient vertical velocity to separate organic and inorganic solids. In theory, inorganic solids have a higher specific gravity than organic solids, and therefore require higher vertical velocities to keep them in suspension. Air diffusers placed near one longitudinal tank wall induce a roll in the contents of the grit tank. This roll creates maximum velocities near the walls and lower velocities at the surface and bottom of the tank. The lower transverse horizontal velocities allow inorganic particles to settle out and be transported to the grit hopper by shear-induced currents. Grit removal mechanisms provided in the final design of the Proposed Action may differ from what has been recommended by the PER depending on the selected manufacturer.

The aerated grit chamber design is based on providing sufficient hydraulic detention time during peak wet weather flow conditions. The PER stated it is necessary to provide at least 10 minutes of detention time to achieve satisfactory grit removal.

Figure 2-7 Aerated Grit Removal Schematic



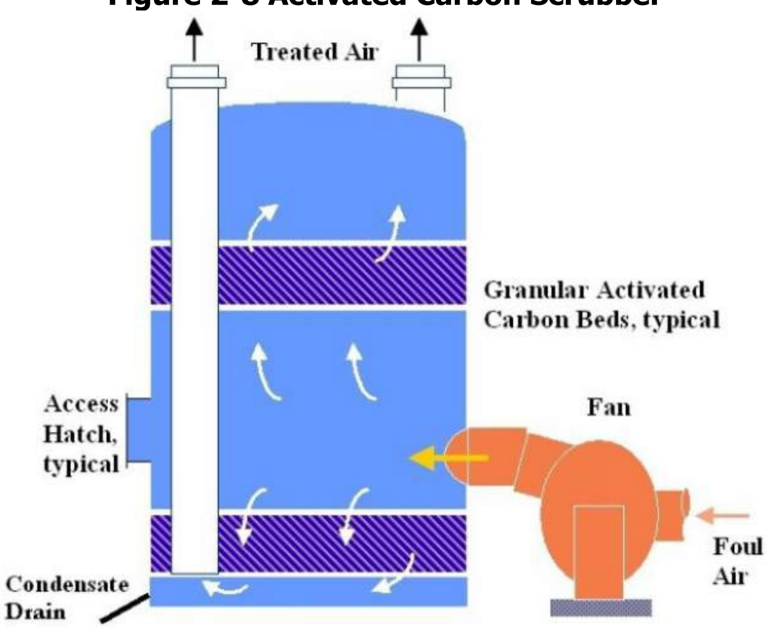
Aerated grit tanks can provide excellent grit removal with minimal head loss, but the chambers themselves require a larger footprint than induced vortex systems. Proper operation of aerated grit tanks can be difficult under varying hydraulic loads due to the need to make fine adjustments to the air diffusers.

Odor Control

The headworks of a wastewater treatment plant is a typical location for foul odor. The odor is caused by hydrogen sulfide (H2S), which is formed under anaerobic conditions found in the wastewater collection system. Due to H2S low solubility in wastewater, when there is an excessive concentration of H2S or if there is turbulence, H2S gas escapes into the atmosphere. This release produces a distinct rotten egg smell. In addition to H2S, there are other foul odorous compounds that can be released from wastewater, such as ammonia, amines, diamines, mercaptans, skatole, and organic sulfides.

In order to control odors associated with the package plant, the PER recommends that covered channels with foul air collection and a granular activated carbon (GAC) scrubber be used at the Nāʻālehu headworks as shown in Figure 2-8. A GAC scrubber passes odorous air through a bed of activated carbon, which absorbs the odorous constituents within the pore spaces of the carbon. Chemical oxidation or reduction of some compounds can also occur. As pore spaces become occupied, efficiency degrades, and the carbon must be replaced or regenerated. Carbon is most effective on higher molecular weight molecules such as the organic sulfur compounds, which makes it the technology of choice. Package GAC scrubbers are available for small headworks and vessels can be situated vertically, horizontally or radially to optimize footprints and reduce structure elevation profiles. The County currently operates GAC scrubbers at other facilities and purchases the GAC media in bulk, which could reduce costs to the County. Odor control measures incorporated in the final design of the Proposed Action may differ from the PER recommendations depending on the selected manufacturer.

Figure 2-8 Activated Carbon Scrubber



Secondary Treatment

Secondary treatment process provides 5-day biochemical oxygen demand (BOD5), total suspended solids (TSS) and nutrient removal via biological treatment. The PER provided descriptions of various secondary treatment options including advantages, disadvantages and applicability to the Nāʻālehu WWTP. Further, the treatment options were screened to identify technologies for further evaluation. Based on the analysis, the PER selected a membrane bioreactor (MBR), activated sludge with anoxic selector, and recirculating gravel filter for further consideration for use at Nāʻālehu. The PER evaluated these three alternatives based on cost considerations and non-economic criteria including level of service measures, regulatory considerations, operation and maintenance factors, and island factors.

According to the PER's evaluation of these alternatives, the costs of the three alternatives are nearly equivalent at the level of analysis provide through the PER; however, the MBR package plant had the highest non-economic score and is recommended for implementation if the County proceeds with a centralized sewer system and WWTP for the community; however, the secondary treatment process incorporated in the final design of the Proposed Action may differ from the PER recommendations depending on the selected manufacturer.

A membrane bioreactor (MBR) has the smallest footprint of the various biological treatment systems available and provides the highest quality effluent. An MBR basically combines an aeration basin with membrane filtration, eliminating the need for tertiary treatment if a very high-quality effluent is desired for water reuse purposes.

Membranes provide an absolute barrier to large particles; total suspended solids (TSS) concentrations of the effluent (also known as "filtrate") are typically less than 1 mg/L. Effluent from an MBR process can meet stringent water recycling turbidity requirements without an additional filtration process.

The main difference between MBRs and other biological treatment technologies is the method of separating the bacteria from the clean water. MBRs have thin membranes with many thousands of micro-perforations. Depending on the manufacturer, these perforations are 0.04 to 0.2 microns (4 to 20 hundred-thousandths of a millimeter) in diameter, too small for the passage of most microorganisms or other particles present in the wastewater, but large enough to allow the passage of water molecules.

Disposal / Disinfection

Subsurface drip irrigation system is the recommended method of effluent disposal for the Nāʻālehu WWTP. Subsurface drip will incur lower capital cost and require less attention from WWTP operators with respect to vegetation maintenance than slow rate land treatment. Subsurface drip requires periodic maintenance chlorination to eliminate biofouling in the drip lines. The disposal system would be sized to handle the peak day wet weather flow of 322,000 gpd. An irrigation equalization and control tank are proposed to equalize higher peak flows and to allow discrete dosing of the irrigation zones.

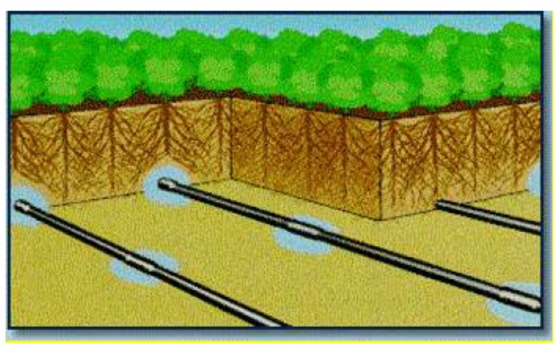
During high flow conditions the irrigation control system would open multiple irrigation zones to accommodate the disposal needs. Additional drip lines will need to be added when the WWTP capacity is expanded. The minimum spacing between drip lines is 2 feet, so there will be sufficient space between the initial drip lines to add additional drip lines as part of future expansion project(s).

HAR 11-62 requires a fully redundant subsurface disposal system. The design criteria listed in provided in the PER are based on providing a subsurface drip system that is two times larger than needed in order to satisfy the HAR 11-62 requirement for redundancy. The drip system would be divided into two separate systems so that the peak day wet weather flow can be disposed on the site using one system while the second system is out of service for maintenance.

The subsurface drip irrigation concept would retain the existing site topography along with the existing vegetation and use subsurface drip irrigation technology to apply the effluent within the effluent disposal area. The use of subsurface drip irrigation technology to disperse effluent at the site will allow the County to significantly reduce the amount of clearing, grubbing, and grading required to construct the facility, as compared to slow rate land treatment.

Drip irrigation technology has evolved to the point where non-clog emitters are available for subsurface applications of effluent. Non-clog subsurface emitters decrease the potential for the irrigation components to be clogged by roots. Drip tubing with integral emitters is buried 6 to 9 inches below ground. Effluent emitters are typically designed to operate at a flow rate of 1 gallon per hour (gph) and are typically spaced every 2 feet along a drip line. Pressure compensating drip systems typically operate under pressures ranging from 10 to 45 pounds per square inch (psi). Figure 2-9 illustrates the subsurface drip concept.

Figure 2-9 Subsurface Drip Irrigation Concept



Courtesy of Geoflow, Inc,

Subsurface drip irrigation technology incurs greater operation and maintenance cost than a surface irrigation system. The County will need to periodically flush the drip lines to remove debris. As described below, a significant number of drip lines will be necessary to accommodate peak flow rates. In addition, periodic chlorination will be required to remove biological growth from the drip lines. These operations and maintenance tasks will need to be completed on a regular schedule, because the drip system will be buried and not readily accessible or observable. During periods of dry soil conditions, the County will need to inspect the orchard for patches of wet soil that would indicate a localized failure that requires repair. Flow and pressure monitoring will also be useful tools for validating the status of the subsurface drip system. The land treatment area would be divided into multiple irrigation zones, allowing a zone to be taken out of service for maintenance purposes. A fence will be constructed around the site to deter entry by humans and ungulates.

New Collection System
Under Alternative 1, the County would construct a new sewer collection system in the Nāʻālehu community to replace the existing system of gravity lines that convey sewage to the three LCCs and connect it to the proposed wastewater treatment and disposal facility. The WWTP would serve the former Brewer lots as well as newly accessible parcels for future connection to the WWTP (See Figure 2-10). The potential connection of additional parcels may be further assessed by the County in the future. The new system would be constructed within County streets to meet the County sewer standards and to allow the collection system to be owned and operated by the County. In addition, two backyard easements would be used to connect four properties to the collection system.

All accessible properties would be required to connect to the new wastewater collection system in accordance with Hawai'i County Code, HCC, § 21-5. The new collection system would be subject to HCC 21 (Sewers). Specifically, HCC § 21-5 states the following:

> *"(a) Owners of all dwellings, buildings, or properties used for human occupancy, employment, recreation, or other purposes, which are accessible to a sewer are required at their expense to connect directly with the public sewer within 180 days after date of official notice.*
> *(b) If, due to rock, wastewater collection system depth, or other construction problems, a building cannot be practically served, the owner shall install, operate and maintain a residential pumping station.*
> *(c) The director may grant a variance/exemption of the foregoing connection requirements to owners of single-family dwellings existing at the time of installation of the public wastewater system, if the following is found:*
>> *(1) There are special or unusual circumstances applying to the subject real property which exist that render the ability to connect to a wastewater system an extreme physical or financial hardship; and*
>> *(2) There are no other reasonable alternatives; and*
>> *(3) The variance is consistent with the general purpose of the chapter and will not be materially detrimental to public health, safety, or welfare."*

Accordingly, additional newly accessible lots in Nāʽālehu would be required to connect to the new wastewater collection system after it becomes operational. These other lots are near the existing service area and are presently connected to individual wastewater systems or cesspools. The design of the new collection system would include stub-outs to accommodate the eventual connection of these newly accessible lots. However, the respective lot owners would be responsible for the design and completion of these connections and for the proper closure of their individual wastewater systems.

2.1.2 Alternative 2: Package Plant Existing Collection System

Under Alternative 2, the County would perform the same actions as described under Alternative 1; however, gravity sewers would not be installed within the streets to replace the existing system. Instead, the new wastewater treatment and disposal facility and pump station would be connected to the existing 80-year old collection system.

Existing Collection System

In 2004, C. Brewer contracted M&E Pacific to conduct a sewer system evaluation for the town of Nāʻālehu. The results of this investigation determined that the existing sewer lines and manholes do not conform to County sewer design standards. The existing sewer system was not constructed in the streets, but instead runs through easements located on private properties, with many collection lines running adjacent to or beneath the houses. The results of a smoke test performed during the 2004 sewer system evaluation identified at least 13 locations of line breaks and/or pipe defects and 12 household units with defective sewer vents. In addition, the existing sewer system is over 80 years old. Long surpassing its expected lifespan and will require extensive repair and rehabilitation if chosen to be reused.

Nearly 20 years have passed since the 2004 study was completed. In order to reuse the existing collection system into the future, an updated condition assessment is recommended to better identify system deficiencies. Substantial improvements will likely be necessary due to the age of the system. Reusing the existing collection system would require the construction of new gravity sewers, wastewater pump station, and force main to transport sewage from the LCCs to the new WWTP.

Although reusing the existing appears to incur lower life cycle costs than constructing a new collection system, it is not recommended by the PER. Due to the advanced age of the existing collection system, the option would incur substantial financial, public health, and environmental risks to the County including:

- The piping is at the end of its useful service life; catastrophic failures are likely to increase in frequency, resulting in greater risks to public health and the environment,
- Most of the system is located in backyard easements, making it difficult to access and maintain,
- System expansion to accommodate sewering additional areas of the town (in accordance with the Kau CDP) would not be feasible.
- The option does not address the AOC requirement to connect additional properties that are not currently connected to the collection system to the WWTP.

The County would construct the collection system in two phases to ensure residential units can maintain access to the sewer system at all times. Phase 1 involves utilizing the existing collection system within the Brewer Company house lots and constructing new gravity sewers, wastewater pump station, and force main to transport sewage from the LCCs to the new WWTP. Specifically,

2.1.3 Alternative 3: Individual Wastewater System (IWS) – Maintenance Contract Model

In Hawaiʻi, an Individual Wastewater System (IWS) is defined by the Department of Health (DOH) as a wastewater system for an individual property that receives less than 1,000 gallons per day of wastewater flow or serves five bedrooms or less. An IWS can be a cesspool, a traditional septic system, an aerobic treatment unit (ATU), or other means of treatment achieving National Sanitation Foundation (NSF) 40 quality effluent.

As stated in the August 2023 PER, the State DOH Wastewater Branch is responsible for regulating IWS systems. The Amended AOC sets forth that the County Hawaiʽi must administer a more active management strategy than is typically found in Hawai'i IWS. Further, the Amended AOC states that either a Model 2 (Maintenance Contract) or a Model 3 (Operating Permit) must be used IWS systems at Nāʽālehu.

Under Alternative 3, the County is to:

- Fund design and manage project construction of the IWS systems;
- Administer ad manage a maintenance program for IWS;
- Develop a maintenance program which would entail establishing rules and regulations for monthly fees/penalties, County monitoring and reporting, and IWS educational information for homeowners;
- Operate the system and conduct routine maintenance, and response to any related trouble calls; and
- Prepare and submit related notices and reports.

Figure 2-10 show the properties where the IWS systems would be constructed.

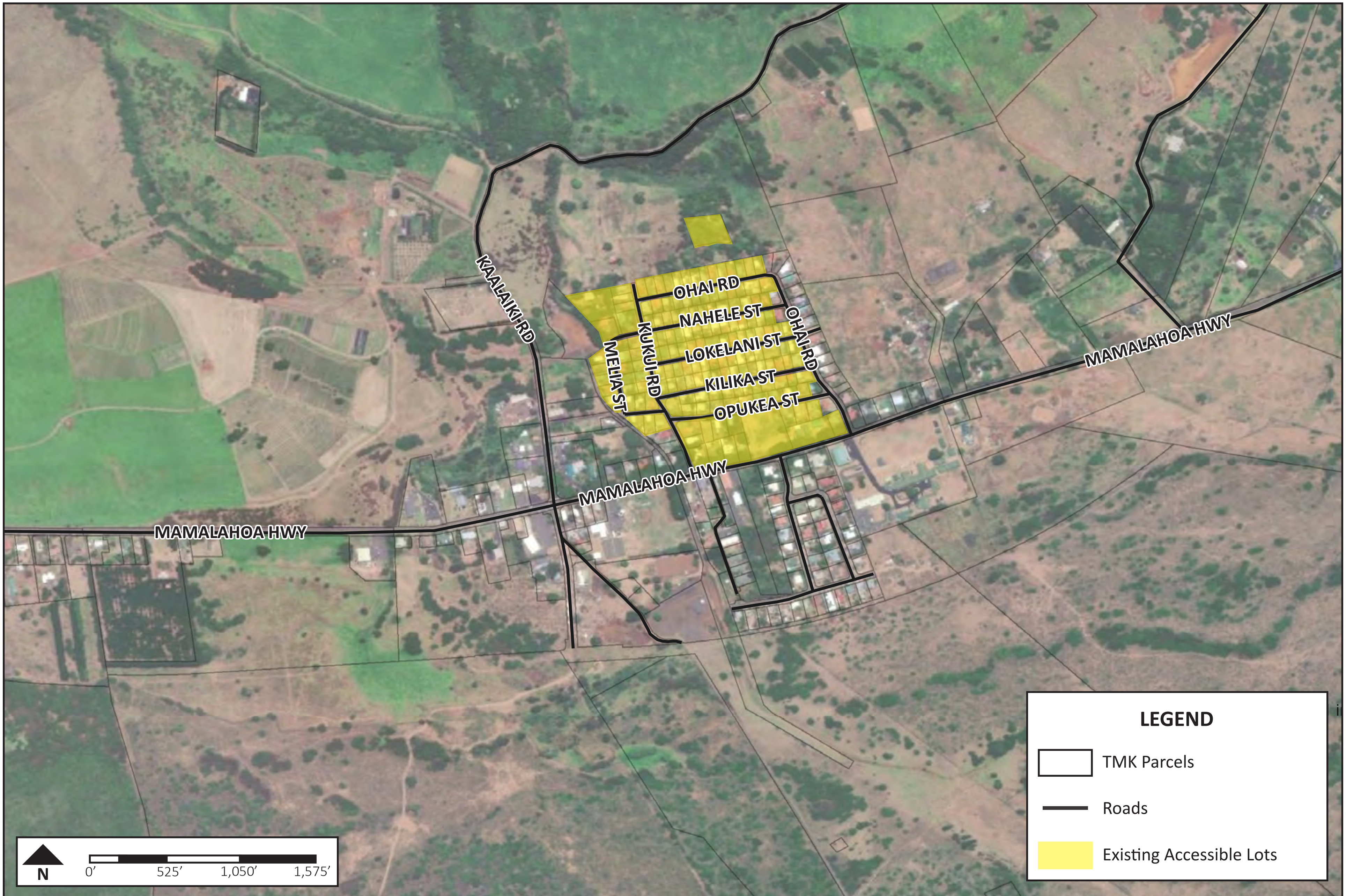
Lots to be served in the Nāʽālehu community vary in size from 0.12 to 1.94 acres with a median size of 0.16 acres. HAR 11-62-3.1 (2)(A) states 10,000 square feet (0.23 acres) of usable land must be available for each IWS. Of the 174 properties to be served in this project, 81 have less than 10,000 square feet of total area. Space available for IWS installation on these properties is further limited by the presence of existing structures.

The actual location of treatment and disposal infrastructure is further limited by setback requirements. DOH-required setbacks are presented below (Table 2-1). From a system design perspective, it is recommended that systems should also be a minimum of 20 feet from any cut-face slopes present on a site to avoid surfacing of treated effluent. This is a particular constriction to heavily sloped sites.

Table 2-1 DOH Required Setbacks for Wastewater Systems

Features	Treatment Unit (ft)	Seepage Pit (ft)	Soil Absorption System (ft)
Structure Wall Line	5	5	5
Property Line	5	9	5
Surface Water Body	50	50	50
Large Trees	5	10	10
Treatment Unit	5	5	5
Seepage Pit	5	12	5
Soil Absorption System	5	5	5
Municipal Water Supply Well	500	1000	1000

Sites in Nāʽālehu have slopes that vary from 6-10%. This is likely to affect the constructability of absorption beds as a method of wastewater disposal. Per HAR 11-62-34, absorption beds shall not be installed on land with a slope gradient greater than 8%, while absorption trenches are



IWS ALTERNATIVE

NA'ALEHU WASTEWATER TREATMENT PLANT

FIGURE 2-10

permitted on a slope of up to 12%. In case this slope requirement cannot be fulfilled, the DOH would allow a seepage pit to be installed instead of an absorption bed.

It is generally not good practice to install an IWS under a trafficked or otherwise concreted area. The presence of concrete or traffic compresses the soil in distribution systems and affects the accessibility of the system for maintenance. However, it is sometimes unavoidable on particularly spatially constrained properties. In this event, a system may be installed underneath a driveway or vehicle path of travel provided the system is designed to that end and traffic rated treatment components are used. These may include products such as concrete septic tanks and/or H-20 traffic related chambered disposal beds.

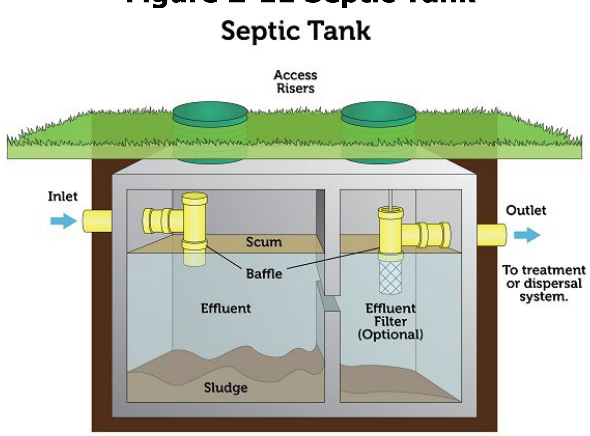
Septic Tanks

The PER stated septic tanks are the most common conversion treatment technology installed in Hawai'i. A septic tank is an underground chamber made of concrete, fiberglass reinforced polyester, or plastic, and used for treating and disposing of household wastewater. The tank contains a mixture of untreated sewage and anaerobic bacteria, which break down the waste and separate it into three layers: a top layer of scum, a middle layer of liquid effluent, and a bottom layer of sludge. Septic tanks operate without the need for electrical power. Contractors are familiar with the process of installing IWS systems, which minimizes potential installation mistakes.

The septic tank can have two chambers with sewage flowing from the home flowing into the first chamber where the heavy solids will settle to the bottom as sludge and the remaining liquid and lighter solids floating to the top as scum. The floating liquid will flow to the second chamber through an opening in the wall where any remaining solids will settle to the bottom and then effluent will flow to disposal system. Access to the tank will be sealed to retain the anerobic conditions which will help to control odor.

The liquid effluent flows out of the tank and into a means of disposal, where it is further treated and dispersed into the soil. According to the PER, the sludge and scum remain in the tank and must be periodically pumped out by a professional septic service approximately once every three to five years, depending on usage. Figure 2-11 shows a typical septic tank.

Figure 2-11 Septic Tank



Please note: The number of compartments in a septic tank vary by State and region.
Source: U.S. Environmental Protection Agency

The August 2023 PER stated there are several types of septic tanks from suppliers in Hawai‘i (See Figure 2-12). The tanks can be made from concrete, plastic, and reinforced fiberglass polyester which come at of a variety of price points, each with a set of advantages and disadvantages and materials. Where a septic tank is located beneath a vehicular traffic area, a traffic rated concrete septic tank can be used or a structural concrete slab designed for H-20 loading spanning a non-traffic tank may be used.

Concrete tanks are durable and less susceptible to collapse. However, concrete tanks can be more expensive than plastic or reinforced fiberglass tanks and typically require a crane for installation and can corrode from the effects of acidic sewer gases.

Plastic or polyethylene tanks are less expensive than concrete; resistant to corrosion and may not require a crane for installation. However, plastic tanks may deform and, if not properly installed, can float if flooded.

Fiberglass reinforced polyester (FRP) tanks are less expensive than precast concrete tanks, primarily due to lower shipping and installation costs, typically resistant to corrosion, more rigid than plastic tanks, and may not require use of a crane for installation.

The August PER indicated the choice of septic tank material will depend on availability, budget, and site constraints. At a minimum, septic tanks in Hawai‘i must comply with International Association of Plumbing and Mechanical Officials (IAPMO) material and property standards for septic tanks. Further, sizing and installation criteria are regulated by HAR 11-62-33. The minimum septic tank capacity is 1,000 gallons for a household of 4 bedrooms or less and 1,250 gallons minimum for households of 5 bedrooms. Septic tanks serving households greater than 5 bedrooms will require a variance from the DOH.

The PER discusses two commonly used IWS effluent disposal methods found in Hawai‘i, absorption bed and absorption trench. Absorption beds are the most common form of IWS disposal method installed in Hawai‘i today. The absorption bed will require excavation of 6 to 7 feet below grade to accommodate the network of perforated pipes, each a maximum of 100 feet long and laid in trenches 1.5-3 feet below the finished grade 4-6 feet apart. Each line is laid level to allow the gravity dispersal of the treated effluent through the length of the pipe before it filters out and percolates down into the soil. A minimum of 6 inches of gravel is provided below each pipe. If the percolation rate is faster than one minute per inch, a 3-foot soil replacement layer is installed under the entire absorption bed. The soil replacement is to be washed #4 sand or cinder-soil mix with a percolation rate not faster than one minute per inch. The excavated material from the absorption bed will need to be removed off the site.

These systems are easy to maintain when connected to an effective treatment system and will rely on microorganisms in the soil for an added degree of treatment to the effluent as it filters through the upper toxic layers of the soil matrix. However, absorption beds have a significant space requirement with current Hawaiian regulations requiring a minimum of 350 square feet for a 4-bedroom home. This space requirement increases with decreasing hydraulic conductivity of the soil. Additionally, absorption beds can only be installed on a grade of less than 8 percent.

Figure 2-12 Common Septic Tanks in Hawai'i

Rectangular, Concrete Tank	Oval, Concrete Tank	Cylindrical, Concrete Tank
		
Rectangular, Plastic Tank	Fiberglass, Oval Tank	Steel, Horizontal, Cylindrical Tank
		

Source: Carollo, 2021

An absorption trench is a type of subsurface wastewater disposal system that utilizes a trench filled with gravel or other porous material to filter and distribute wastewater effluent into the ground. Wastewater is distributed into the trench through a network of pipes, typically made of PVC or other durable materials. The gravel in the trench acts as a natural filter, allowing the water to slowly seep into the surrounding soil while also removing impurities with adsorbed beneficial bacteria. The trench may be lined with a layer of filter fabric to prevent the gravel from becoming clogged with soil or other debris. Figure 2-13 shows a typical IWS site plan with an absorption bed.

The PER indicated, although not as common as an absorption bed or trench, use of a seepage pit should be considered for use in Nāʽālehu . Seepage pits are a vertical means of achieving the percolation area requirements for a disposal system. These systems typically consist of a 15-30-foot-deep pit lined with stacked precast perforated concrete rings or CMUs, to an internal diameter of 6-8 ft. Seepage pits are both less land area intensive and less expensive than absorption beds. Figure 2-14 shows a typical IWS site plan with seepage pit.

A seepage pit must include a cover which extends at least 12 inches beyond the seepage pit excavation or over a provided concrete lining. An access hatch must be provided in the concrete cover to allow inspection and maintenance of the pit. The seepage pit may be designed to be traffic rated by providing the sufficient strength required in the design of the concrete lining and cover.

The effective area of the seepage pit is equal to the vertical wall area corresponding to the effective depth of the pit. Slow percolation rates translate to a larger required absorption area or deeper pit.
While seepage pits are an approved means of disposal in Hawai'i, they are often only permitted when it can be demonstrated that an alternative means of disposal was not possible , i.e. insufficient land area, steep terrain (greater than 12 percent) or very slow percolation rates (less than 60 min/inch). Where slow percolation rates present, seepage pits will need to be dug through the basalt rock layer to reach more porous soils or a variance will be required from HAR 11-62-34 d(1)b:

Seepage pits shall not be constructed in soils having a percolation rate slower than ten minutes per inch (weighted average) or where rapid percolation through such soils may result in contamination of water-bearing formations or surface water.

2.1.4 Alternative 4: Individual Wastewater System (IWS) – Operating Permit Model

Under Alternative 4, the County is to:

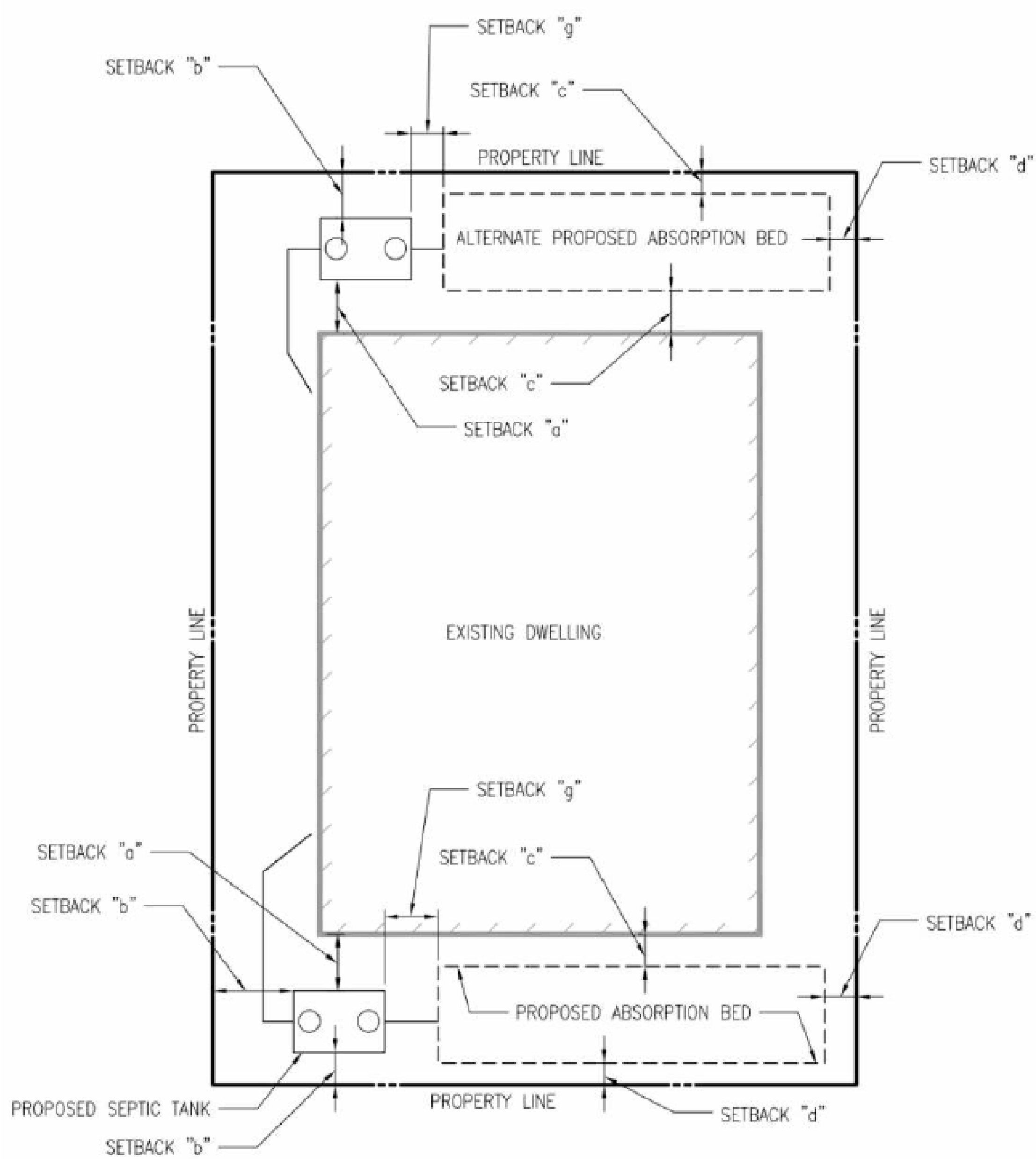
- Fund design and construction of the IWS systems;
- Administer an operating permit program for the IWS system to the homeowners;
- Issues maintenance notice to the homeowner.

Under Alternative 4, the homeowners would be responsible for maintenance scheduling, contracting and paying for a service provider to conduct the necessary maintenance and/or responding to trouble calls, monitoring and record keeping of maintenance.

Under Alternative 4, the County is evaluating the possibility of completing the project as a conventional Design/Bid/Build process or under a voucher program. The voucher program grant homeowners with funds to hire Professional Engineer to design new IWS and, then hire a Contractor to construct IWS. Under the voucher program homeowners will be responsible to hire and coordinate with a professional engineer for overall design and placement of the IWS.

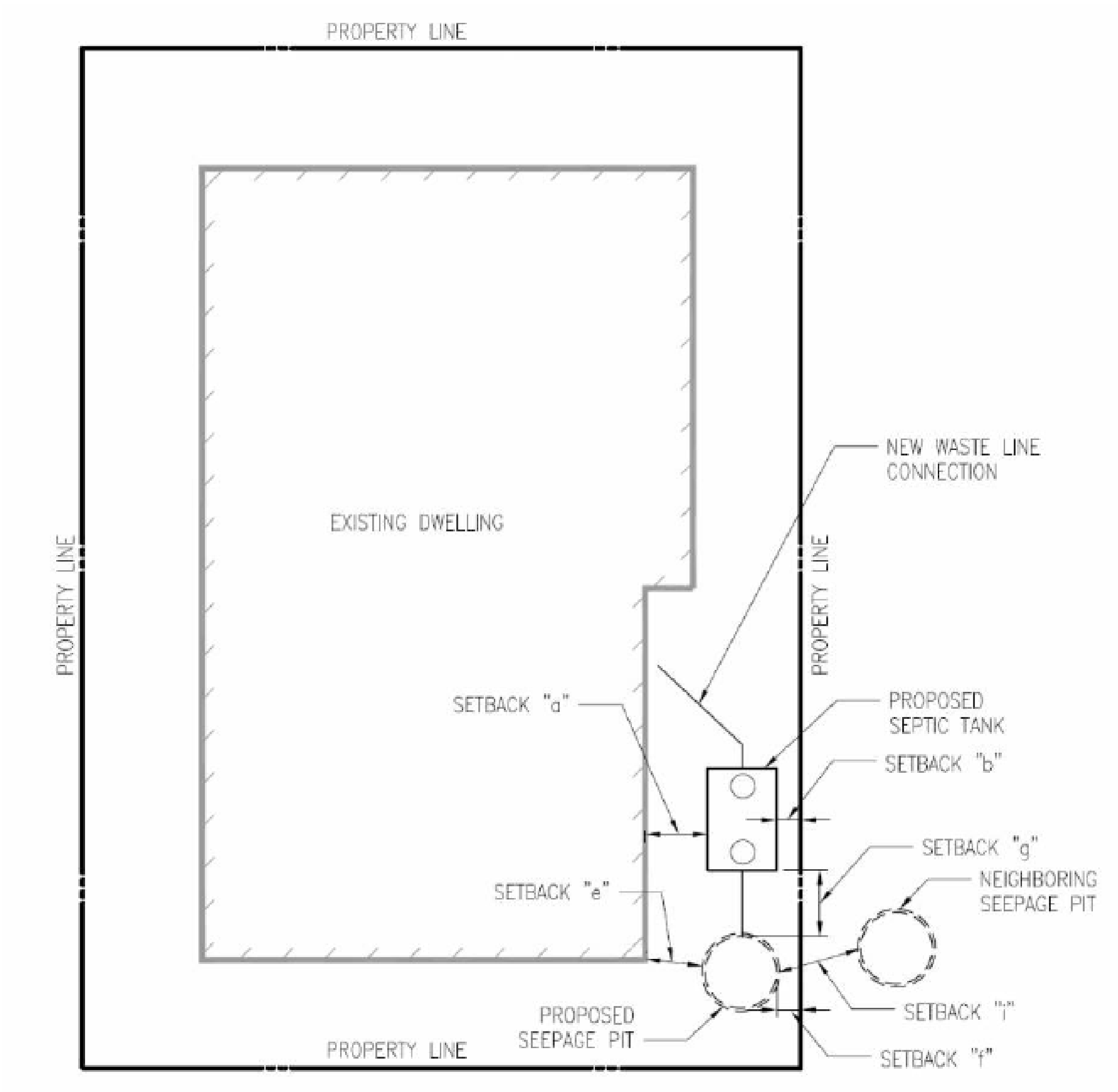
Based on the above, regardless of the maintenance responsibility, the County will fund the design of the IWS systems for Nā'ālehu. The PER identifies two key considerations to ensure the IWS functions as intended;(1) system size, including the number of bedrooms or flow rate and (2) site considerations including soil type, slope, drainage patterns and accessibility to the IWS site.

Figure 2-13 Typical IWS with Absorption Bed



Source: Engineering Partners PER, August 2023

Figure 2-14 Typical IWS with Seepage Pit



Source: Engineering Partners PER, August 2023

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CHAPTER 3: CUMULATIVE EFFECTS

The Proposed Action (construction of a new wastewater treatment and disposal facility and a new collection system, closure of three existing large capacity cesspools (LCCs), and connection of newly accessible properties to the sewer system), in combination with other past, present, or reasonably foreseeable actions at or near Nāʻālehu, could contribute to cumulative improvements and impacts on certain environmental resources. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

3.1 Scope of Analysis

This section identifies the other past, present, or reasonably foreseeable actions at or near Nāʻālehu that were considered and evaluated in a cumulative improvements and impacts analysis as related to Alternative 1 and Alternative 2. Since Alternative 3 and Alternative 4 would affect the individual parcels, these two alternatives are not included in the analysis.

3.1.1 Geographic Scope of Analysis

The extent of the cumulative effects analysis is generally limited to the geographic/natural boundaries of the affected resource areas. The Council on Environmental Quality (CEQ) handbook on Considering Cumulative Effects Under the National Environmental Policy Act indicates that the geographic extent for this analysis should be defined on a case-by-case basis and is dependent on the affected resources (CEQ, 1997).

In defining the geographic scope for consideration of cumulative effects, the DOH and County considered the resources that would be affected by the Proposed Action (i.e., within the project impact zone); the type and intensity of those effects; and whether those affected resources extend beyond the project impact zone. The effects of the Proposed Action would generally be limited to the immediate vicinity of the WWTP project site and related improvements plus minor transportation-related impacts during construction; the Proposed Action would not adversely affect protected species; it would not adversely affect surface waters that are part of a larger watershed (other than potential for temporary, minor construction-related runoff impacts that would be mitigated by adherence to BMPs). Historic or cultural resources identified in the area shall be maintained and preserved to the fullest extent feasible as the County considers ongoing communication and coordination with identified stakeholders. Based on these considerations, the County limited this cumulative effects assessment to include past, present, and reasonably foreseeable actions located within the Nāʻālehu community or within 1 mile of the proposed location of the wastewater treatment and disposal facility and related improvements. This scope is expected to more than fully encompass the full extent of resource areas that would potentially experience discernable effects from the Proposed Action and is commensurate with the type and intensity of the effects of the Proposed Action.

Located approximately 13 miles to the northwest, the Pāhala Large Capacity Cesspools Closure Project (Pāhala Project) is similar in concept to the Proposed Action in that it proposes the closure of existing LCCs and the construction of a new system for a similarly sized community. The County has analyzed whether this and other similar projects throughout the Kaʻū District would have the potential to affect the same resources as the Proposed Action. A typical, similar construction project would be expected to result in temporary, localized impacts during construction including impacts from the use of construction-related vehicles and equipment (e.g., changes in traffic patterns and increases in noise and air emissions), disturbance of soil and vegetation, and generation of construction and demolition debris' and potential long-term, localized impacts including changes in stormwater runoff and infiltration, removal of vegetation, and changes in visual resources. These direct and indirect effects, if managed in accordance with applicable environmental regulations, would not be expected to extend beyond the vicinity of the project construction sites and local communities; therefore, the Proposed Action is not expected to have any cumulative impacts with the Pāhala Project. The National Environmental Policy Act (NEPA) does not require consideration of socioeconomic impacts that are unrelated to an impact on the physical environment (30 CFR § 1508.14). The cumulative effects of the Proposed Action combined with the Pāhala Project on the County-wide economy, tax base, and borrowing capacity are not analyzed in this assessment.

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CHAPTER 4: EXISTING ENVIRONMENT, IMPACTS AND MITIGATION MEASURES

4.1 Climate

Climate on the Island of Hawaiʻi and more broadly throughout the State can be characterized as having low day-to-day and month-to-month variability. Differences in the climate of various areas are generally attributed to local differences in geology and topography that create microclimates with different temperature, humidity, wind, and rainfall, and associated local ecosystems (Giambelluca et al. 2014). Hawaiʻi Island is characterized by a relatively uniform semi-tropical climate year-round with mild temperatures, moderate humidity, and relatively consistent northeasterly trade winds.

The climate of Nāʻālehu communities is typical of the Kaʻū District which is pre-dominantly dry. The National Ocean and Atmospheric Administration (NOAA) designates Kaʻū areas as a Humid Tropical Zone with transitional lowland areas in locations between windward and leeward regions. The Kaʻū area receives less orographic rainfall since it is not oriented to typical trade wind flow and exhibits a distinctive dry summer season.

Temperatures in the Kaʻū District generally range from approximately 70 to 80 degrees Fahrenheit during daylight hours and 60 to 70 degrees Fahrenheit during night hours.

Prevailing trade winds in the Kaʻū District area are from the southeast and usually dominate from April to November. Wind speeds average about 10 miles per hour and vary between approximately 10 - 15 miles per hour in Nāʻālehu. Winds from the southwest occur less frequently, mainly during the winter associated with "Kona" storms (Giambelluca et al. 2014).

Climate conditions in the Kaʻū District are most likely to change in the coming decades. Average annual precipitation is also likely to change, but climate models are uncertain regarding projections for Hawaiʻi. Cased on ensemble model projections available through the U.S. Environmental Protection Agency's (EPA's) Climate Resilience Evaluation and Awareness Tool (CREAT) Climate Scenarios Projection Map, projections for the area surrounding the Nāʻālehu range from a minor decrease in annual precipitation up to considerable increases in annual precipitation by 2060, depending on the model scenario (hot/dry vs. warm/wet). Other climate concerns include sea level rise to coastal areas.

Impacts and Mitigation Measures:

Alternatives 1 and 2 – Package Plant:

Under these alternatives, the construction phase may result in temporary greenhouse gas emissions due to heavy equipment operations and the transportation of supplies to the WWTP project site and along the streets for the new collection system. However, these emissions will be temporary during the construction period. Upon completion of the construction, emissions and greenhouse gases should return to current conditions.

In the long-term, the project's wastewater treatment and disposal facility does not discharge to surface water sources, therefore, it is unlikely to significantly impact local temperature or precipitation patterns. Climate models suggest variability in precipitation; however, this is not expected to be substantially impacted by the project.

The project's design takes into consideration the potential for increased storm intensity due to climate change. Drainage improvements will be implemented within the WWTP project site to manage stormwater during intense weather events, ensuring the facility's resilience to changing storm patterns.

Alternatives 3 and 4 – Individual Wastewater System Program:
Alternatives 3 and 4 involve the implementation of an IWS Maintenance Contract Model or Operating Permit model. This alternative would require construction activities on individual parcels including measures to contain storm water runoff during storm events. The climate impacts are like those in Alternative 1 and 2, with the project not significantly affecting local climate conditions. The design includes measures to address potential changes in storm intensity, ensuring the facility's resilience.

No Action Alternative:
Under the No-Action Alternative, the existing LCCs continue to operate without any modifications. These LCCs are at risk of impacts due to climate change, specifically changes in precipitation patterns, increased storm intensity, and potential sea level rise. Climate change related impacts on the existing LCCs could result in risks to groundwater and surface water quality. Increased storm intensity and altered precipitation patterns may exacerbate the challenges of managing wastewater in these LCCs, potentially leading to overflows or groundwater contamination.

4.2 Physiography

4.2.1 Topography

The Nāʻālehu community is situated on the slope of Mauna Loa. Sites in Nāʻālehu have slopes that vary from 6-10% and ranging in elevation from 780 ft to 645 ft above mean sea level (MSL) (See Figure 4-1). The existing topography in Nāʻālehu is characterized by gradual slopes, which significantly impact the community's layout and land use patterns.

The Project Area is approximately 33.3 acres and bounded by Kaalaiki Road to the west and Māmalahoa Highway to the south.

Impacts and Mitigation Measures:

Alternatives 1 and 2 –Package Plant:
The topographical conditions under Alternative 1 are consistent with the existing conditions. Construction activities for the new collection system and treatment facility will involve grading and earthwork at the package plant site. Erosion control measures will be implemented to prevent soil erosion and maintain the existing topographic conditions. Excavation depths of 4 to 10 feet would be necessary to place the various components of the package plant. The effluent disposal facility would require excavation of trenches of up to 3 to 4 feet to place the subsurface drip irrigation lines. The affected areas would be restored to approximately existing conditions.

Source: State OP and ESRI

TOPOGRAPHIC MAP

NA'ALEHU WASTEWATER TREATMENT PLANT

FIGURE 4-1

The wastewater collection system would be constructed within the right-of-way of the County streets plus two segments within easements. Due to the existing topography, the collection system can be fed by gravity if the pipes are deep below the low point of low-lying parcels.

The sewer trenches are typically approximately 3 feet wide with depths between 10 to 15 feet to suite the gravity sewer lines. Once the line is placed in the trench, the affected area would be backfilled to restore the area to existing conditions which would have minimal effect on the topographic conditions of the area. Proper erosion control measures will be implemented to prevent potential soil erosion during the construction period. Construction of the package plant, subsurface irrigation system and collection system would not create significant changes to the existing topographic conditions of the Nāʽālehu area.

Alternatives 3 and 4 – Individual Wastewater System Program:
The topography for Alternatives 3 and 4 aligns with the existing conditions in Nāʽālehu. Construction activities for the IWS will involve excavation for placement of the septic tank and absorption bed. Once the tank and effluent disposal system have been put into place, minor grading will be needed to restore the affected area. Erosion control measures will be implemented during construction to prevent runoff and soil erosion during storm events. These measures will be designed to protect the existing topographic conditions of the surrounding area.

No-Action Alternative:
Under the No-Action Alternative, the existing LCCs are situated within the existing topography. There are no modifications or construction activities associated with this alternative, and the topography remains unchanged.

Proper erosion control measures will be implemented to minimize potential impacts on the topography during construction activities, ensuring its preservation. Overall, the topography in the Nāʽālehu area is not anticipated to undergo significant alterations as a result of the proposed project alternatives.

4.2.2 Geology
The Island of Hawaiʽi was formed by the activity of five shield volcanoes. These shield volcanoes are Kohala (extinct), Mauna Kea (active), Hualalai (active), Mauna Loa (active), and Kilauea (active) (USGS).

The Project Area is situated at the eastern end of the island and on the lower, southeastern flank of the Mauna Loa Volcano. This volcano appears to be made up of at least two huge shield volcanoes built around two separate eruptive centers, referred to as the Mauna Loa shield. The Mauna Loa shield was created by eruptions along two rift zones that extend in a southwest and east-northeast direction from the caldera. Rift zones are elongated areas of the ground fissures where volcanic activity such as earthquakes and volcanic eruptions are concentrated. In contrast, a few eruptions have taken place along the lower northeast rift zone.

The surrounding area consists of several interstratified beds of volcanic ash that sit upon the exposed bed rock. The Nāʽālehu area is known to contain lava tubes, which often occur in many places around the Island of Hawaiʽi. Lava tubes are natural conduits or voids that form when molten lava flows beneath the hardened surface of a previous lava flow. When the volcanic eruption stops, and the lava drains out, a lava tube forms in the void. Lava tubes can range in size from a few inches to more than two feet in diameter. The diameter and length can usually be identified through subsurface probing or geophysical surveys.

Fieldwork completed during an Archeological Inventory Survey (AIS) by Cultural Surveys Hawaiʻi (CSH) identified a depression caused by a collapsed lava tube system within the proposed WWTP project area where one lava tube opening was encountered.

Impacts and Mitigation Measures:

Alternatives 1 and 2 – Package Plant

Grading, excavating, and fill activities during the construction of the WWTP package plant and effluent disposal system and the new collection system would occur between 10 to 25 feet below grade. A preliminary layout of a gravity sewer system resulted in sewer depths of about 20 to 25 feet at the deepest point on the upper portions of Ohai Road and Nahele Street, and 15 to 18 feet at the deepest point on Lokelani Street and Kilika Street. The soil depth to rock in the area as reported by USGS and verified by past geotechnical investigations is 40 to 60 inches; therefore, excavation for the deep gravity sewers would be mainly in rock.

If bedrock is encountered during excavation for the proposed actions, removal would be accomplished using excavators or hydraulics hoe rams and/or pneumatic drill hammers consistent with other construction activities on the Hawaiian Islands. Archaeological monitoring is recommended during all project ground-disturbing activities to facilitate identification for information purposes, especially of any subsurface lava tubes that may contain historic properties.

Alternatives 3 and 4 – Individual Wastewater System Program:

Alternatives 3 and 4 involve the installation and maintenance of the IWS. While this alternative may require construction activities that could disturb deeper geological layers up to 10 feet, this depth of excavation should not affect the geology of the Nāʽālehu area. The August 2023 PER indicated construction/installation of an IWS can be relatively invasive process to a homeowner, involving large equipment such as excavators and cranes and removal of fencing, trees and landscaping and, in some cases, small structures. Determining a path to bring large equipment to the IWS site would need to account for building/structure footprints and roof overhangs and soffits.

No-Action Alternative:

Under the No-Action Alternative, the existing LCCs continue to operate without any modification. This alternative does not involve any construction activities or modifications to the existing conditions, and therefore would not have any impact on geology in the Nāʽālehu area.

4.2.3 Soils

According to the U.S. Department of Agriculture Natural Resource Conservation Service (NRCS) Soil Survey of the island, soil types within the Nāʽālehu area include Nāʽālehu medial silty clay loam which possess moderately high to high permeability characteristic and consist of well-drained soils formed of volcanic ash. The Nāʽālehu area also include Kanohina-Lava flows complex and Lava flows- Kanohina complex soils which are considered to have high surface runoff; however, flows reaching the lava area fan out and are known to percolate through tubes within the lava rock. Specifically, the Nāʽālehu area is comprised of the following soil profiles (See Figure 4-2):

- Nāʽālehu medial silty clay loam, 0 to 3 percent (Map Unit Symbol (MUSYM):538)
- Nāʽālehu medial silty clay loam, 3 to 10 percent slopes (MUSYM: 521)
- Nāʽālehu medial silty clay loam, 10 to 20 percent slopes (MUSYM: 522)
- Nāʽālehu medial silty clay loam, 20 to 35 percent slopes (MUSYM: 523)
- Kanohina - Lava flows complex, 2 to 10 percent slopes (MUSYM: 734)
- Lava flows – Kanohina complex, 2 to 20 percent slopes (MUSYM: 271)

Impacts and Mitigation Measures:

All Proposed Alternatives

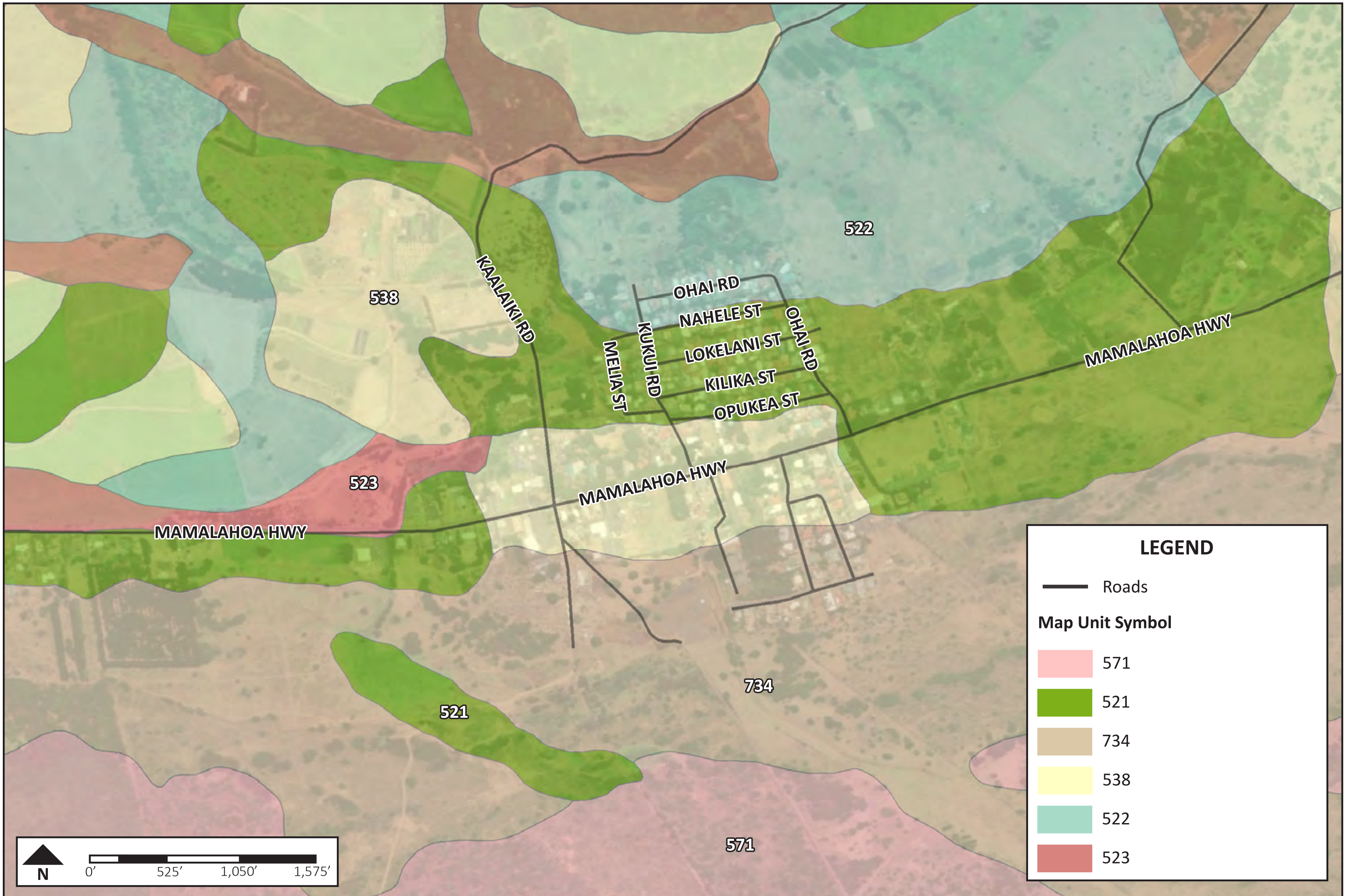
Construction of the new collection system would occur below the travel ways or shoulders of the streets in the Nāʽālehu community. The collection system would not generate adverse impacts to soils in previously disturbed areas.

Construction of remaining proposed alternatives would require vegetation removal, clearing, and excavation. These activities would involve subsurface and surface disturbance to the soils of the affected areas. These impacts can be mitigated through incorporating appropriate stormwater and erosion control measures to ensure that soil erosion and transport during construction activities are minimized. Typically, the construction plans and documents would include erosion control plans which the construction contractor would need to follow.

No-Action Alternative

Under the No-Action Alternative, the existing LCCs would continue to operate without any modification. This alternative does not involve any construction activities or modification to existing conditions, and therefore would not cause any impacts to soils in the Nāʽālehu area.

Source: State OP and ESRI



SOIL CLASSIFICATION MAP

NA'ALEHU WASTEWATER TREATMENT PLANT

FIGURE 4-2

4.3 Water Resources

4.3.1 Surface Waters

Water resources in the area are important for the existing wastewater treatment systems and the local community. Groundwater and surface water sources play a vital role in sustaining the environment and supporting agriculture.

The Nāʽālehu community is situated southeast of the Alapaʽi Gulch. The southern point of the existing Nāʽālehu Wastewater System service area, north of Mamalahoa Highway, is located approximately 2 miles from the nearest coastline. According to USGS geologic maps, Honuʽapo Bay is located approximately 2.5 miles from the Nāʽālehu community.

The nearest stream within the Project Area is Nāʽālehu Stream, a non-perennial stream which originates from flows that begin at Ka'ū Forest Reserve (Figure 4-3).A concrete drainage channel runs between Kaʻalaiki Road and the residential community neighborhood along Melia Street. The drainage channel is utilized to carry storm runoff from upslope safely through the town and crosses under Mamalahoa Highway to the south. Further, an existing vegetated diversion channel and drainage outlet are located within the WWTP project site.

Impacts and Mitigation Measures:

Alternatives 1 and 2 – Package Plant:

Under Alternative 1, construction activities may temporarily impact water resources. The cumulative impacts of the wastewater treatment and disposal facility as well as the new collection system would require coverage under a National Pollutant Discharge Elimination System (NPDES) construction stormwater permit. Normally, this permit would mandate the implementation of best management practice (BMP) measures including silt fences, filter socks, and sediment traps to control sediment runoff. Since the NPDES permit requires detailed information about the means and method of construction, the selected contractor would need to submit the plans and documents to the DOH.

Construction trenches would be designed not to extend deeper than approximately 10 feet below grade when feasible, minimizing disturbance to the geology in the Nāʻālehu area. It should be noted that construction trenches may need to exceed 10 feet in depth in some design locations. A Site-Specific Construction BMP plan would be developed to prevent stormwater runoff along the collection system during construction.

The on-site drainage plan, as per Hawaiʽi County Code, Chapter 27, Section 20, would ensure that runoff caused by the construction activities in the WWTP project site area and effluent disposal area would need to account for expected one-hour, ten-year storm event, is retained within the site boundaries. Landscape buffers with dirt berms would act as secondary containment during large storm events, further safeguarding against adverse impacts on adjacent or downstream properties.

Source: State OP and ESRI

SURFACE WATERS MAP

NA'ALEHU WASTEWATER TREATMENT PLANT

FIGURE 4-3

Overall, construction-related impacts on surface water resources under Alternatives 1 and 2 are expected to be temporary in nature, with BMPs effectively minimizing potential impacts. However, the proposed WWTP is anticipated to involve drainage improvements including the realignment of the vegetated drainage diversion channel and relocation of the drainage outlet which is considered to be a long-term impact. The drainage improvements shall be designed in accordance with the County Department of Public Works (DPW) drainage standards and will not alter existing stormwater discharge from the property.

Alternative 3 – Individual Wastewater System-Maintenance Contract Model:
Alternative 3 entails the implementation of an IWS Maintenance Contract Model which can be an effective means of wastewater management when properly designed and operated. However, IWS that are poorly designed and maintained have been nationally recognized as having high failure rates. In order to ensure that the systems function as intended, the design must take into account a variety of technical considerations including system size, site conditions, location, subsurface soil characteristics, influent characteristics, and level of treatment.

Should the IWS begin to fail, untreated sewage containing pathogens (e.g. *E. coli*), nutrients and other harmful substances could be discharged into the groundwater or into nearby surface waters.

In the event that the County pursues the IWS Alternatives, the implementation of BMP measures, including silt fences, filter socks, and sediment traps, would be required during construction at each IWS site to control sediment runoff. Construction trenches would generally not extend deeper than approximately 10 feet below grade. Further, the IWS designs will need to consider the ground slopes and drainage patterns to ensure that effluent does not seep through these surfaces.

Overall, construction-related impacts on surface water resources under Alternative 3 are anticipated to be temporary and localized, with BMPs effectively minimizing potential impacts.

Alternative 4 – Individual Wastewater System-Operating Permit to Homeowners:
Alternative 4 involves the implementation of an IWS Operating Permit model. As noted under Alternative 3, a properly designed and operated IWS can be an effective means of wastewater management; however, IWS that are poorly designed and maintained have been nationally recognized as having high failure rates and have been linked to contaminated groundwater resources. Under Alternative 4, the homeowner will be responsible for operating and maintaining the IWS while the County is responsible for issuing maintenance notifications to the homeowner.

Like the other alternatives, construction activities may temporarily impact water resources. The implementation of BMP measures, including silt fences, filter socks, and sediment traps, would be required during construction to control sediment runoff. Construction trenches would generally not exceed approximately 10 feet below grade. Further, the IWS designs will need to consider the ground slopes and drainage patterns to ensure that effluent does not seep through these surfaces.

Construction-related impacts on surface water resources under Alternative 4 are expected to be temporarily and localized, with BMPs effectively minimizing potential impacts.

No-Action Alternative:
Under the No-Action Alternative, which involves the continued operation of the existing LCCs without modifications, there would be no construction activities or modifications to existing conditions. Therefore, this alternative would not cause any impacts to geology or surface water resources in the Nāʽālehu area.

It's important to note that the No-Action Alternative does not involve any mitigation measures to address potential stormwater-related risks associated with the existing LCCs.

4.3.2 Groundwater

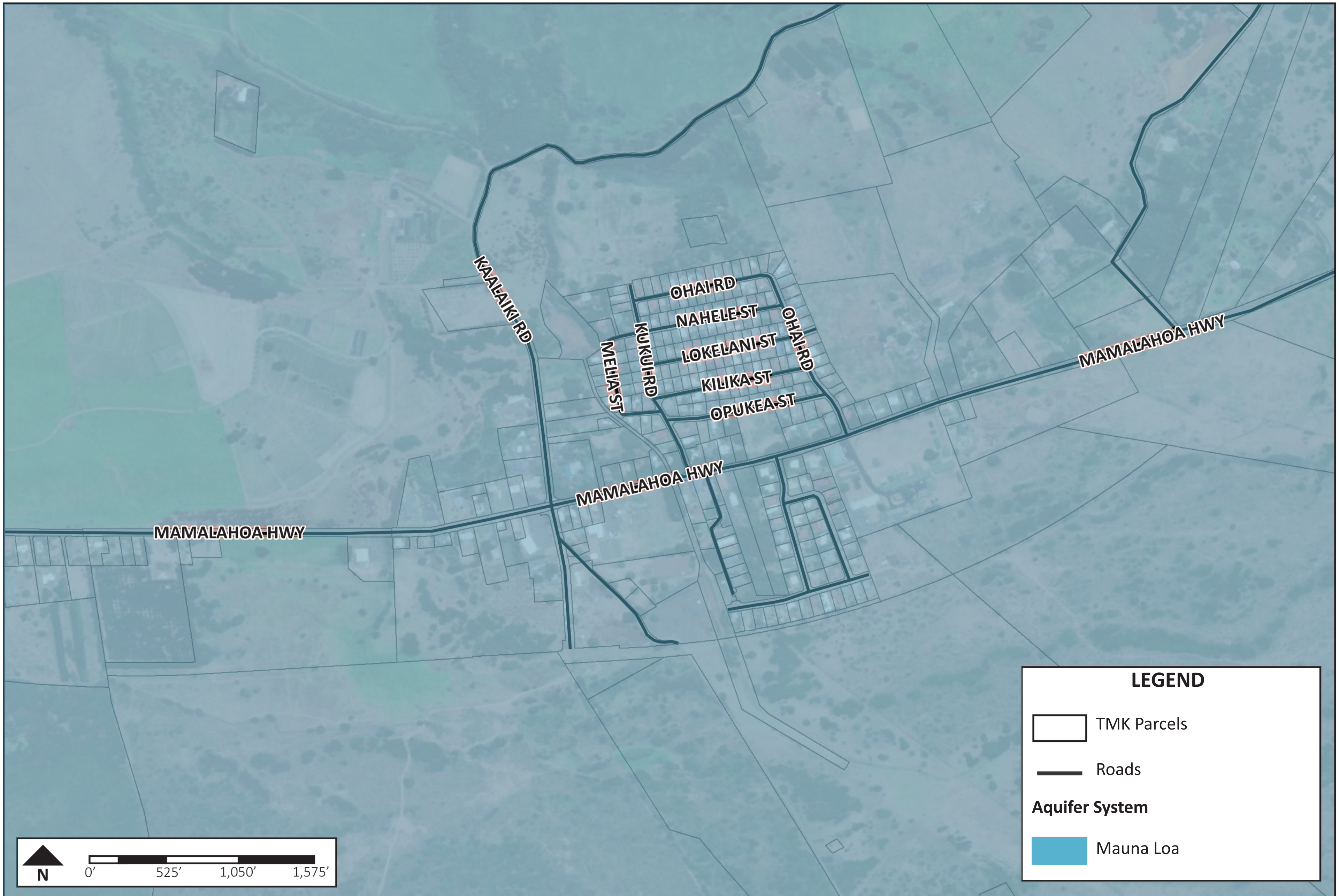
Groundwater occurs within portions of geologic formations where aquifers receive and store water. Depending on the geologic conditions of the area, many communities and areas on the island rely on groundwater wells to obtain drinking water. To protect the quality of underground source of drinking water from contamination by subsurface disposal of fluids, Hawaiʽi has adopted the Underground Injection Control (UIC) program administered by the DOH Safe Drinking Water Branch. Hawai'i Revised Statues (HRS) 340 E and Hawaiʽi Administrative Rules (HAR) 11-23 (Underground Injection Control) set forth the requirements relate to protections of underground sources of drinking water. The proposed WWTP Site is located above the UIC line and, as such, on top of underground sources of drinking water. To avoid impacts to drinking water wells, sewage injection wells cannot be constructed above the UIC line.

Under HAR 11-62, Appendix F, a minimum separation of 1,000 feet from existing wells is required for wastewater treatment sites.

Under the State's Water Resource Protection Plan, aquifers of the island of Hawaii have been classified under an aquifer coding system to identify and describe these aquifers. This system is comprised of Aquifer Sectors, and then Aquifer Systems located within these sectors. The Nāʽālehu community is serviced by the Southeast Mauna Loa Aquifer Sector (Sector 805). Within this sector, there are four aquifer systems which are the ʽŌlaʽa, Kapapala, Nāʽālehu, and Ka Lae systems. The Project Area is situated within the Nāʽālehu aquifer system (80503) which has a sustainable yield of 118 million gallons per day (mgd).

The State Department of Land and Natural Resources (DNLR), Commission on Water Resource Management (CWRM) has established a groundwater hydraulic unit and coding system for groundwater resource management. The Nāʽālehu Community is situated within the Nāʽālehu Aquifer System (See Figure 4-4). According to the County of Hawaiʽi Department of Water Supply, the Nāʽālehu community is situated within the Waiohinu-Naalehu Water System. The system primarily depends on the New Mountain House Tunnel Spring and Haao Spring for its supply. The Naalehu Well supplements the tunnel and spring sources during dry weather. The service area is

Source: State OP and ESRI



AQUIFER MAP

NA'ALEHU WASTEWATER TREATMENT PLANT

FIGURE 4-4

widespread, covering the communities of Waiohinu, Naalehu and South Point, spanning six service zones through two booster pump stations and nine storage tanks.

Impacts and Mitigation Measures:

Alternative 1 and 2 – Package Plant:

The approximately 10-15 foot trenches required to support the collection system would be relatively shallow in relation to groundwater resources in the Nāʻālehu area. Thus, construction of the collection system would not affect groundwater resources in the area.

The separation between the Nāʻālehu WWTP site and the location of Hawaiʻi State Water Well, Nāʻālehu Deepwell (Well ID 8-0335-001), indicates that constructions and operation of the treatment and disposal facility would not affect potable groundwater resources in the Nāʻālehu area as the WWTP is located outside of the designated 1000-foot setback area.

While the use of three existing LCCs has not resulted in any documented impacts to groundwater drinking resources, abandonment of the LCCs would remove a potential source of such impacts. Abandonment of the existing wastewater collection system would not affect groundwater within the affected areas.

Alternative 3 and 4 – Individual Wastewater System Program:

Alternatives 3 and 4 entail the implementation of an IWS program which, when properly designed and operated, can be an effective means of wastewater management; however, IWS that are poorly designed and maintained have been nationally recognized as having high failure rates. To ensure that the systems function as intended, the design must take into account a variety of technical considerations including system size, site conditions, location, influent characteristics, and level of treatment.

Should the IWS begin to fail, untreated sewage containing pathogens (e.g. *E. coli*), nutrients and other harmful substances can be discharged into the groundwater or into nearby surface waters. As such, proper operation of the IWS is necessary to prevent any system failures.

In the event that the County pursues the IWS Alternatives, the implementation of BMP measures during construction would be required at each site during construction, including silt fences, filter socks, and sediment traps to control sediment runoff.

Construction-related impacts on groundwater resources under Alternatives 3 and 4 are anticipated to be temporary and localized, with BMPs effectively minimizing potential impacts.

No-Action Alternative:

The No-Action Alternative has the potential to adversely impact groundwater resources due to the continued operation of the existing LCCs. EPA regulations mandate the closure of LCCs to prevent potential impacts on groundwater resources.

4.4 Agricultural Lands

The Land Study Bureau (LSB) at the University of Hawaiʽi issued L.S. Bulletin No. 6, *Detailed Land Classification-Island of Hawaiʽi* in November 1965. The LSB compiled and interpreted data on geology, topography, climate, water resources, soils, and crops from field investigations to create a land classification for the island. Bulletin No. 6 assigned two types of ratings for each land type: the overall or master productivity rating, which reflects degree of overall suitability for agricultural use, ranging from A (Very Good) to E (Very Poor); and selected use ratings, which indicate the degree of suitability for selected use alternatives. Bulletin No. 6 has not been revised or re-issued and remains as the reference document for lands classified by LSB.

In addition to the LSB rating, the State of Hawaiʽi has developed the Agricultural Lands of Importance to the State of Hawaiʽi (ALISH) Classification System. This system was developed and compiled in 1977 by the State Department of Agriculture with assistance from the NCRS, U.S. Department of Agriculture (formerly the Soil Conservation Service) and the College of Tropical Agriculture at the University of Hawaiʽi as part of a national effort to inventory important farmlands. Lands not considered for classification within this system are developed urban lands (over ten acres), natural or artificial bodies of water (over ten acres), public use of lands, forest reserves, lands with slopes in excess of thirty-five percent, and military installations (except undeveloped areas over ten acres). The ALISH Classification identifies the following three categories of land (equivalent NRCS categories in parentheses):

- Prime Agricultural Lands (Prime Farmlands) – Land that has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops economically when treated and managed according to modern farming methods.
- Unique Agricultural Lands (Unique Farmlands) – Land that has a special combination of soil quality, location, growing season, and moisture supply, and is used to produce sustained high-quality yields of a specific crop when treated and managed according to modern farming methods.
- Other Important Agricultural Land (Additional Farmland of Statewide and Local Importance) – Land other than Prime or Unique Agricultural Land that is also of statewide or local importance to agricultural use.

Impacts and Mitigation Measures:

Alternatives 1 and 2 – Package Plant:

The ALISH map shows the proposed WWTP and the collection system are located in "not rated" lands which is assigned to developed communities. Construction of the collection system within the County roads would not affect agricultural lands.

Abandonment of the three LCCs would reduce the potential for contamination of groundwater that is used for irrigation of agricultural lands. Otherwise, abandonment of the LCCs and the existing wastewater collection system would not affect agricultural lands within the affected areas.

Alternatives 3 and 4 – Individual Wastewater System Program:
As indicated by the LSB rating system, the lots identified for the IWS installation are "not rated" which is assigned to developed communities. Installation of the IWS would not affect agricultural lands.

No-Action Alternative
The No-Action Alternative would not impact agricultural lands. Continued operation of the existing LCCs could introduce pathogens and other contaminants to groundwater sources used for irrigation of agricultural lands.

4.5 Natural Hazards

The Disaster Mitigation Act of 2000, (Federal Emergency Management Agency (FEMA), 44 Code of Federal Regulations, Hazards Mitigation Planning required States and Counties to have approved hazard mitigation plans as of November 1, 2004 to receive Pre-Disaster Mitigation funding. The development of State and local hazard mitigation plans is critical for maintaining eligibility for future FEMA mitigation and disaster recovery funding.

Given Hawai'i's vulnerability to natural hazards and history of disasters, the State has maintained and implemented a comprehensive, multi-hazard mitigation strategy to reduce loss of life and property damage. This strategy is embodied in the *2018 State Multi-Hazard Mitigation Plan*. This plan identifies the major natural hazards that affect the state's population, property, and infrastructure to the specific hazard, and recommends actions that can be taken to reduce the risk and vulnerability to the hazard. The State Hazard Mitigation Plan also contains a description of programs, policy, statutes, and regulations applicable to hazard mitigation. It should be noted that the 2023 update to this plan has begun and is expected to be released at the end of 2023. Identified major natural hazards that could affect the State, as well as the County are Climate Change Effects (including sea level rise (SLR)/coastal erosion), floods, tsunamis, strong, windstorms/hurricanes, earthquakes, landslides/rockfalls, volcanic activity, and wildfires.

4.5.1 Sea Level Rise

Sea level is rising at increasing rates due to climate change leading to the melting of glaciers and ice sheets. Rising sea level and projections of stronger and more frequent El Niño events and tropical cyclones in water surrounding Hawai'i indicate a growing vulnerability to coastal flooding and erosion. The Hawai'i Sea Level Rise Vulnerability and Adaptation Report (2017) modeled exposure to chronic coastal flooding and erosion using projections from the Intergovernmental Panel on Climate Change (IPCC) 5th Assessment Report (IPCC, 2014) where the high-end scenario was up to 3.2-ft of sea level rise by the end of the century (Courtney et al., 2020).

Impacts and Mitigation Measures:
All Proposed Alternatives:
No short-or long-term impacts are anticipated during the construction or operation of any of the alternatives. The Nā'ālehu community is located approximately 2 miles from the nearest coastline and at elevations from 600 to 800 feet above mean sea level (msl). The community is not anticipated to be impacted by sea level rise under any of the proposed alternatives.

4.5.2 Flood and Tsunami Threat

The Nāʻālehu community is located southeast of the Alapaʻi Gulch. The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM), Community Panel No. 155166 1925F, effective date September 28, 2017, shows no special flood hazard areas present in the Nāʻālehu WWTP site and that most of the Nāʻālehu area is located in *Zone X*, which designates areas determined to be outside of the 0.2 percent annual chance (500-year) floodplain. A small portion of the community of Nāʻālehu, including some land within the collection system project site, is located within *Zone X – Other Flood Areas* (See Figure 4-5), indicating areas within the 0.2 percent annual chance (500-year) floodplain, or areas with a 1-percent annual chance of flooding with average flood depths less than 1-foot.

According to the FIRM, all three existing LCCs are also located within *Zone X*.

Impacts and Mitigation Measures:

All Proposed Alternatives:

Based on the above, no significant impacts on flood hazards are anticipated to occur within the Nāʻālehu region as a result of the alternatives considered.

No-Action Alternative

The No-Action Alternative, specifically the continued operation of LCC 1, could lead to impacts during a flooding event. LCC 1 is located very close to an area mapped as within the 0.2-percent annual change (500-year) floodplain. The existing collection system is substandard and in poor condition. A large flood could potentially cause the collection system and/or LCC to overflow as a result of stormwater inflow and result in an uncontrolled release of raw sewage, thus potentially contaminating flooded areas and creating a public health hazard.

4.5.3 Hurricane and Wind Hazard

Hurricanes seasonally affect the Hawaiian Islands from late summer to early winter months. The State of Hawaiʻi has not been impacted by a hurricane rated Category 3 or higher since Iniki in 1992. Hurricane strikes are relatively rare with near misses that generate large swell and moderately high winds more common in Hawaiʻi.

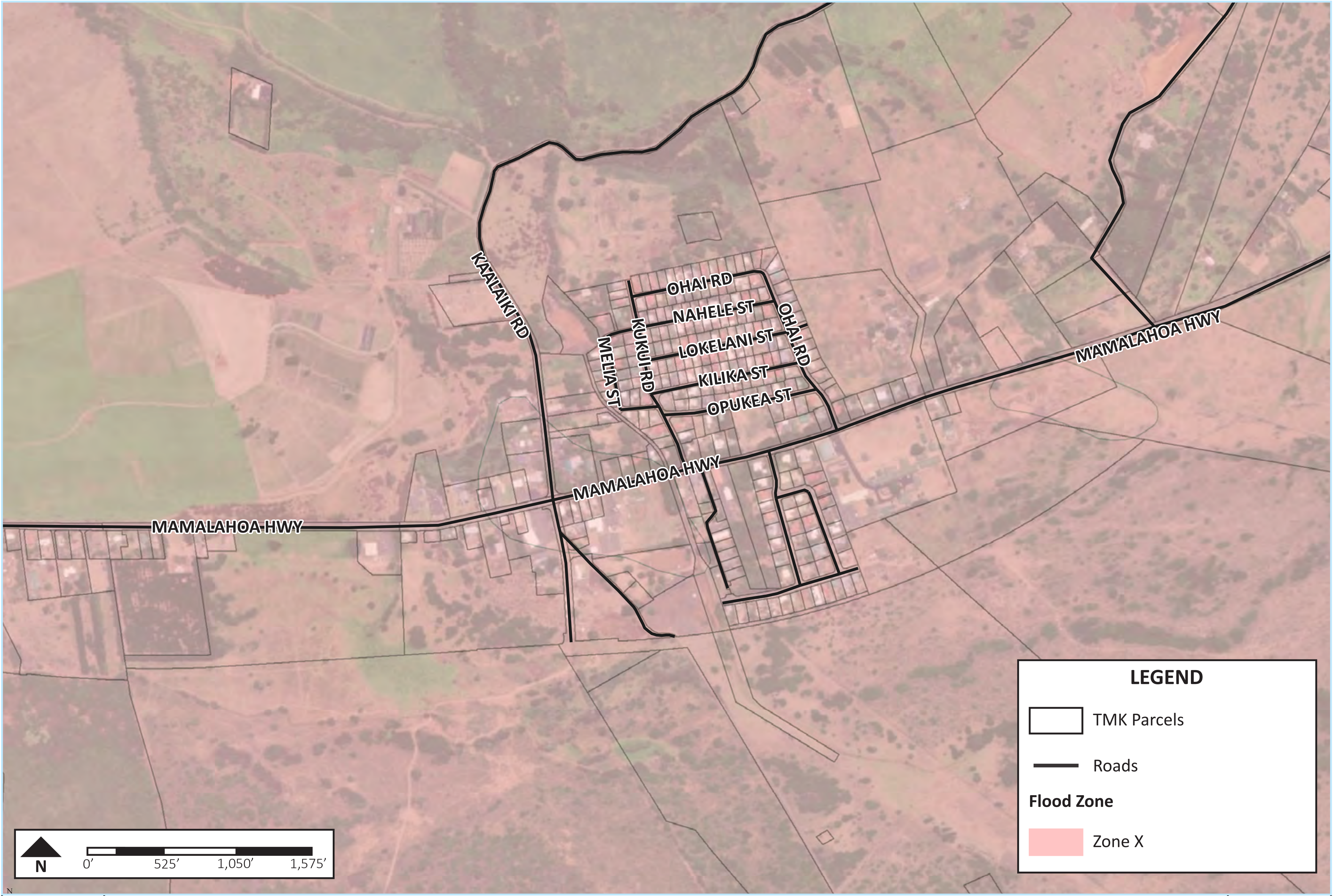
During hurricanes and storm conditions, high winds cause strong uplift forces on structures, particularly on roofs. Wind-driven materials and debris can attain high velocity and cause devastating property damage and harm. Along the coastline, a surge of water, topped by battering of waves can move ashore into low lying coastal areas. Due to differences in atmospheric pressure, tidal stage, coastal topography, and location relative to the eye of the hurricane it is difficult to predict how hurricane-induced storm surge may impact specific location. It is reasonable to assume that future events will occur.

Impacts and Mitigation Measures:

All Proposed Alternatives:

Based on the above, no significant impacts on hurricane and wind hazards are anticipated to occur within the Nāʻālehu region as a result of the alternatives considered.

Source: State OP and ESRI



Flood Insurance Rate Map

NA'ALEHU WASTEWATER TREATMENT PLANT

FIGURE
4-3

4.5.4 Seismic Hazard

Earthquakes in the Hawaiian Islands are primarily associated with volcanic eruptions resulting from the inflation or shrinkage of magma reservoirs beneath, which shift segments of the volcano. The Island of Hawai'i experiences thousands of earthquakes each year; however, most are so small that they can only be detected by instruments. Although difficult to predict, an earthquake of sufficient magnitude could cause structural or other damage to public facilities including wastewater treatment facilities. The seismic risk classification of the Island of Hawai'i is Zone 4 (County of Hawai'i, 2007).

Earthquakes may occur before or during an eruption or may result from the underground movement of magma that comes close to the surface. On the Island of Hawai'i, earthquakes directly associated with the movement of magma are concentrated beneath the active Kilauea and Mauna Loa Volcanoes. Typically, the risk of seismic activity and degree of ground movement decreases with the distance from these active volcanoes. A few of the island's earthquakes are less directly related to volcanism. These originate in the zones of structural weakness at the base of the volcanoes or deep within the earth beneath the island.

Several destructive earthquakes have occurred on the Island of Hawai'i. The locations of larger damaging on-island earthquakes since 1868 have generally occurred in the southeast portion of the island near Kilauea, with the most recent destructive earthquake on this south flank occurring on June 26, 1989 with a magnitude of 6.1. More recently, a magnitude 6.9 earthquake occurred on May 4, 2018 offshore and east of Kilauea, though this earthquake was classified as non-destructive.

Impacts and Mitigation Measures:

All Proposed Alternatives

Hawai'i County Code (HCC) § 5A indicates the "International Building Code, 2018 Edition" (IBC) – copyright and published in 2018 by the International Code Council, Incorporated – is adopted by the County. Chapter 5 is the applicable code for the construction of buildings, structures, and facilities in the County. The purpose of the seismic provisions in the IBC is primarily to safeguard against major structural failures and loss of life; limiting damage or maintaining functions is not a primary purpose. At a minimum, structures are to be designed and constructed to resist the effects of ground motions from seismic events. The seismic hazard characteristics described in the IBC are based on the seismic zone and proximity of the site to active seismic sources.

The proposed improvements would be designed and constructed to meet the requirements of the 2018 IBC and HCC Chapter 5 and would comply with seismic loadings established for the County of Hawai'i. This would minimize the potential for an uncontrolled release of untreated or partially treated sanitary wastewater, or diesel fuel from the tank being held for the emergency generator during a seismic event. The County would also develop a facility management plan in accordance with applicable rules and regulations.

No-Action Alternative:

The No-Action Alternative includes no construction or modification to existing conditions, and therefore would not impact seismic hazards in the Nāʽālehu area.

4.5.5 Volcanic Hazards

The U.S. Geologic Survey (USGS) prepared a volcanic hazard zone map for the island of Hawaiʽi which was last updated in 1997. The map shows lava flow hazard zones for the five on-island volcanoes. The map utilizes a 9-point ranking system which classifies zones ranked from 1 (highest hazard) through 9 (lowest hazard) based on the probability of coverage by lava flows. Nāʽālehu area has been assigned a rating of Zone 6. This designates areas which are less hazardous due to protection by topography.

Impacts and Mitigation Measures:

All Proposed Alternatives

Based on the volcanic hazard map, the potential for damage to buildings and structures is moderate, given the distance between the Nāʽālehu community and active vents and hazards. At this time, the County has no construction restrictions in Zone 6 areas. Therefore, the volcanic hazard designation would not affect the construction and operation of the collection system or the treatment and disposal facilities. Although the potential for volcanic activity in or around Nāʽālehu is present, the likelihood of that impact is relatively small. In the event of a volcanic eruption that threatens the Nāʽālehu area, it is likely that damage would occur in residences, the treatment and disposal facility, the collection system and other assets in the area. There are no mitigation measures to prevent the potential impacts from volcanic activity, and the impacts would be similar regardless of the location of the treatment and disposal facility or treatment system employed.

No-Action Alternative

The No-Action Alternative includes no construction or modification to existing conditions, and therefore would not impact volcanic hazards in the Nāʽālehu area.

4.5.6 Wildfire Hazards

Wildfires can threaten life and property, but they can also harm the environment and threaten important natural resources such as endangered species. While sometimes caused by lightning, nine out of ten wildfires are human-caused. Put simply, "wildfire" is the term applied to any unwanted and unplanned fire burning in forest, shrub or grass regardless of whether it is naturally or human induced (DEM, 2020).

All of the Hawaiian Islands are susceptible to wildfires, especially during prolonged drought and high winds. In recent years, the average annual cost to suppress wildfires in Hawaiʽi is about $1,100,000 – making it a Statewide risk (DEM, 2020). The greatest danger of fire is where wildlands border urban areas. Through August 2018, wildfires in Hawaiʽi have burned 30,000 acres (about double the annual average). Historically, the majority of these fires have been directly caused by humans, either directly or by negligence.

According to the Fire Risk Area Map, the Project Area is located in a medium risk area (See Figure 4-6). As further evidenced by recent events in West Maui, wildfires pose a significant threat to human health and human safety and must be taken very seriously.

Impacts and Mitigation Measures:

Alternatives 1 and 2

The proposed alternatives are not anticipated to have impacts that could result in wildfire. The State Department of Land and Natural Resources-Division of Forestry and Wildfire (DLNR-DOFAW) has adopted a Fire Management Handbook, which specifies its standards for prevention, pre-suppression, and suppression. The document provides a structured approach in providing for public/firefighter safety and minimizing damage to Hawai'i's environment. Additionally, the DLNR-DOFAW is a key agency within the State who can trigger provisions of the Stafford Act (Fire Suppression Assistance), which provides for FEMA funding assistance in situations where forest and grass fires on public or private lands threaten a major disaster to communities and economies.

The package plant and related facilities would be designed according to National Fire Prevention Association (NFPA) 820 "Standard for Fire Protection in Wastewater Treatment and Collection Facilities." In accordance with Hawai'i Fire Department requirements, Fire Department access and water supply to the proposed WWTP site would be designed to comply with Chapter 18 of NFPA 2006 Uniform Fire Code as amended by the County.

Alternatives 3 and 4

The IWS systems do not include construction of facilities which would be susceptible to fire hazards.

No-Action Alternative

The No-Action Alternative includes no construction or modification to existing conditions, and therefore would not impact wildfire hazards in the Nā'ālehu area.

4.6 Flora and Fauna

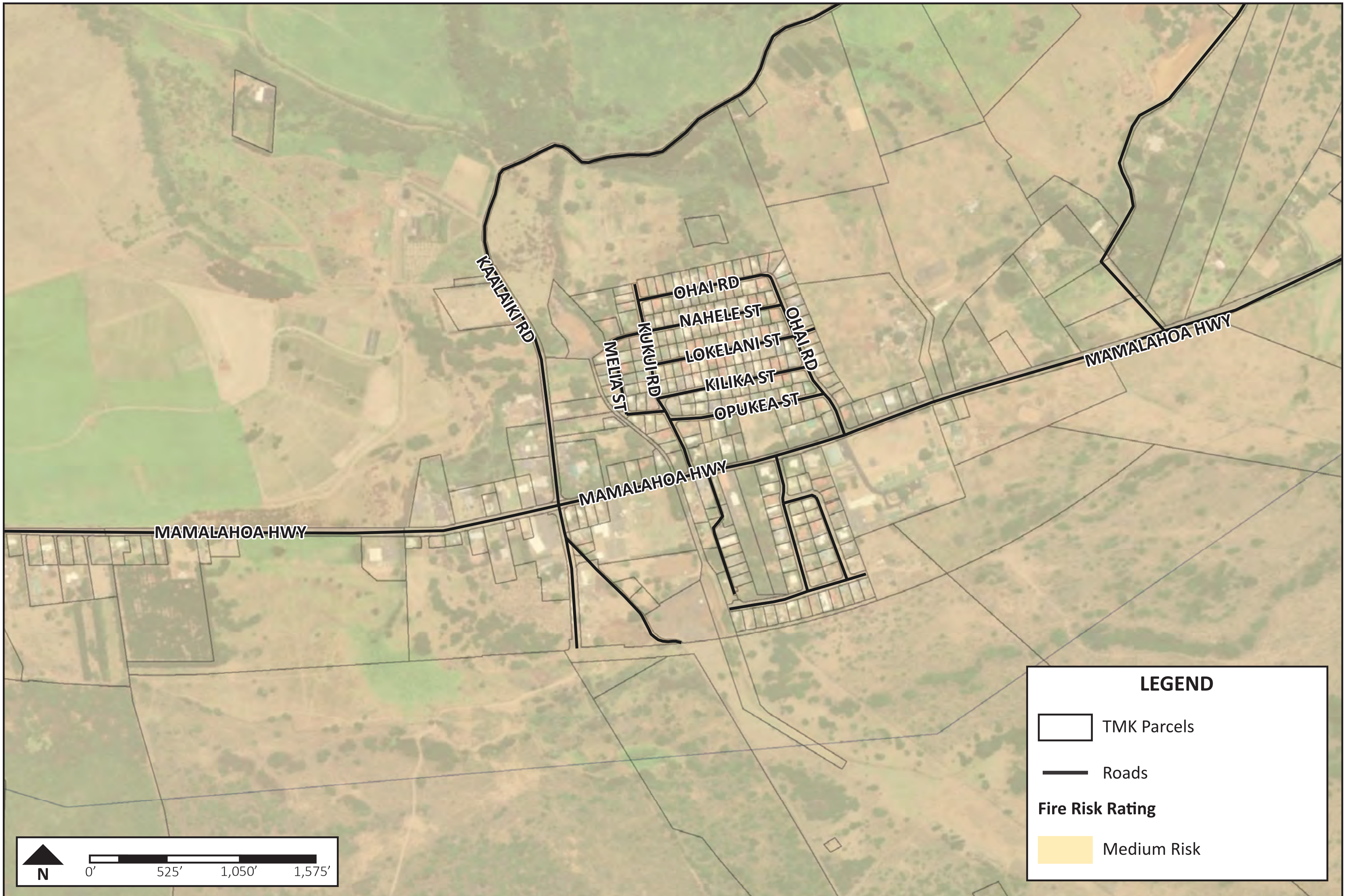
Two biological surveys were conducted on the sites: one in 2012 and one in 2021; both surveys were conducted by AECOS Inc. (AECOS, 2021). During the botanical, avian, and mammalian resources surveys no listed or proposed-for-listing species under federal statutes was recorded. The assessment observed avian diversity and densities present within the Project Area and its surrounding vicinity. A summary of the Natural Resources Assessment (NRA) is outlined below and included herein as Appendix B.

Survey Results

Vegetation

Vegetation across the site consists entirely of grass pasture (predominantly Guinea grass or Megathyrsus maximus) and areas of mostly low scrub growth, dominated by lantana. Trees are scattered around the site, especially along a shallow swale feature that transects the area from north to southeast. The site of the proposed SPS is a former pasture dominated by tall Guinea grass.

Source: State OP and ESRI



WILDFIRE RISK MAP

NA'ALEHU WASTEWATER TREATMENT PLANT

FIGURE 4-6

The NRA provides a listing of all the species of flowering plants (angiosperms) observed during the surveys with a total of 66 taxa identified from the three survey areas. The vast majority (91%) are naturalized or non-native) species. Three native indigenous plants (4.5%) and one early Polynesian species (3%). The native species are ʻilima (*Sida fallax*), ʻilieʻe (*Plumbago zeylanica*), and ʻuhaloa (*Waltheria indica*); all common plants. The early Polynesian introduction (so-called "canoe plant") is yellow wood sorrel (ʻihiʻai or *Oxalis corniculata*), a very common small weed.

Avian Fauna

A total of 239 individual birds of 15 species, representing 10 separate families, were recorded during point counts. One species recorded, Pacific Golden-Plover (*Pluvialis fulva*), is an indigenous migratory shorebird species. The remaining 13 species recorded are all established alien or feral species. Avian diversity and densities were in keeping with the location of the three sites and the vegetation present. Three introduced species—Common Myna (*Acridotheres tristis*), House Finch (*Haemorhous mexicanus*), and Zebra Dove (*Geopilia striata*)—accounted for 44% of the total number of birds recorded. Common Myna was the most commonly tallied species, which accounted for 23 percent of the birds recorded during point counts.

Mammals

Terrestrian mammalian species detected during the survey include the domestic dog (*Canis lupus familiaris*), small Indian mongoose (*Herpestes javanicus*), house cat (*Felis catus*), pig (*Sus scrofa*), and domestic cattle (*Bos taurus*). All of which are alien species, introduced to the Hawaiian Islands by humans. The methods in which these species were detected include audio, scat, tracks, and signs.

Impacts and Mitigation Measures:
All Proposed Alternatives:
Based on the findings of the botanical and biological field surveys, construction activities associated with the new collection system and wastewater treatment and disposal facility are not anticipated to result in adverse impacts to botanical and faunal resources in the Nāʻālehu area.

The following minimization measures will be implemented during construction and following build out to ensure that the project minimizes all impacts to listed species to the maximum extent practicable.

Floral Resources

No plants of conservation concern or enjoying statutory protection (that is, listed as threatened or endangered; HDLNR, 1998; USFWS, 2020) were noted in the survey and given the highly disturbed nature of the site, would not be expected to be growing there. For comparative purposes, this survey revealed 66 species with 4 species as either indigenous or of early Polynesian introduction. The previous site☐located on the makai side of Māmalahoa Highway 1 mi (1.6 km) east (also pastureland)☐yielded 30 species of introduced plants and 1 species each of indigenous and early Polynesian introduction. A survey of the much smaller Waiʻōhinu Transfer Station (AECOS, 2020) in Waiʻōhinu, 2 mi

(3.4 km) to the west produced a list of 59 taxa. Although a much smaller area, the latter site is both highly disturbed (increasing the count of ruderal species) and subject to frequent introductions of species on vehicles and rubbish loads.

Faunal Resources

Insects

Several insects are now listed as endangered in the Hawaiian Islands: seven species of the yellow-faced bee (*Hylaeus anthracinus, H. assimulans, H. facilis, H. hilaris, H. kuakea, H. longiceps,* and *H. mana*) and Blackburn's sphinx moth (*Manduca blackburnii*).

No yellow-faced bee species was observed during the survey and no potential habitat or food sources were noted. The caterpillar of the sphinx moth feeds exclusively on plants in the Family Solanaceae. In particular, where the moth is found, caterpillars are most often associated with the widely distributed, non-native tree tobacco plant (*Nicotiana glauca*). The only plant observed representing the Family Solanaceae was a single wild cherry tomato plant (*Solanum lycopersicum var. cerasiforme*). This species is not known to be utilized by the caterpillar. We would deem any threat to these insect species due to Project activities as non-existent.

Terrestrial Birds

The findings of the avian survey are consistent with the vegetation present on the three sites. The WWTP site is mostly pasture that has been bulldozed in places. The other two smaller sites, located in town, have very limited plant species dominated by alien species. Fourteen of the recorded bird species are alien, naturalized bird species. The only native bird, the Pacific Golden-Plover, is an indigenous migratory shorebird commonly seen across the state between late September and the end of April each year. This species migrates to Arctic breeding grounds in late April or the first week of May.

Seabirds

It is possible that the endangered Hawaiian Petrel (*Puffinus sandwichesis*), Band-rumped Storm-Petrel (*Hydrobates castro*), and the threatened Newell's Shearwater (*Puffinus newelli*) over-fly the Project area between April and the middle of December each year in very small numbers.

The potential impact that the Project poses to protected seabirds is the increased threat that birds will be downed during the seabird fledging season (from September 15 through December 15) after becoming disoriented by lights associated with the Project. The two main types of outdoor lighting posing a threat to nocturnally flying seabirds are: 1) night-time construction lights; and 2) exterior lighting around Project infrastructure.

- Fully shield all outdoor lights so the bulb can only be seen from below bulb height and only use when necessary; install automatic motion sensor switches and timer controls on all installed outdoor lights or turn off lights when human activity is not occurring in the lighted area. All external lighting structures should be fully "dark sky compliant" (HDLNR-DOFAW, 2016).

Waterbirds

No habitats suitable for waterbird species are present on any of the three sites. Once the WWTP is constructed it is possible that one or more species will be attracted to ponds associated with the WWTP. No species currently listed or proposed for listing as threatened or endangered under federal or state endangered species statutes is associated with the project site.

It should be mentioned that in the original plans for this project, which USFWS responded to in the TA letter (USFWS, 2019), standard wastewater open ponds were proposed for the new facility. Following public scoping meetings with the public the plan was revised to eliminate open wastewater lagoons. The current plan has the treatment plant being above ground and contained in what is referred to as a "Package Plant". This eliminates the attractive nuisance that open wastewater lagoons pose to endangered water obligate species in the Hawaiian Islands.

Mammalian Resources

Hawaiian Hoary Bat

No Hawaiian hoary bats or were detected during the course of our survey. It is within the realm of possibility that this species uses resources within the Project Area on a seasonal basis. The principal impact that the construction may pose to bats is during the clearing and grubbing phases as vegetation is removed and if proposed security fencing includes use of barbed wire. The removal of vegetation within the project site may temporarily displace individual bats using trees for roosting. As bats use multiple roosts within their home territories, the potential disturbance resulting from the removal of the vegetation is likely to be minimal. During the pupping season, females carrying their pups may be less able to rapidly vacate a roost site as the vegetation is cleared. Additionally, adult female bats sometimes leave their pups in a roost tree while they forage. Very small pups may be unable to flee a tree that is being felled.

- Potential adverse impacts from such disturbance can be avoided or minimized by not clearing woody vegetation taller than 4.6 m (15 ft) between June 1 and September 15, the period in which bats may have pups.

- No barbed wire will be installed on any fence or structures on the site to ensure that Hawaiian hoary bats do not get caught on the barbs.

Critical Habitat

No federally delineated Critical Habitat for any species occurs within the Project area (USFWS, 2024).

Jurisdictional Waters

No streams or wetlands occur in the Project area, although the WWTP site itself is located within a shallow drainage swale and runoff flow will be directed around the WWTP infrastructure in a new channel. Biological observed no indications of water flow in the swale at the Project site. A concrete drainage channel crossed by the proposed force main on Melia Street is similar in directing runoff through town into shallow swale further downslope. Neither of these drainageways direct flows to streams or outlets on the ocean shore. Annual rainfall in the Nāʽālehu area is on the order of 40 in (1020 mm) and the porous geology is not conducive to stream formation.

On May 31, 2024, the DOH initiated consultation with the U.S. Fish and Wildlife Service (FWS) pursuant to Section 7 of the Endangered Species Act (See Appendix C). The consultation requested the FWS' concurrence with the determination that the Proposed Action "may affect, but is not likely to adversely affect" federally listed species. In a letter dated June 21, 2024, the FWS provided concurrence with this determination. Additionally, the FWS provided avoidance and minimizations to be implemented to avoid adverse effects (See Appendix D).

It should be noted that for Alternatives 3 and 4, the area of disturbance for the proposed action will take place on private residential property. However, it is expected that Alternatives 3 and 4 will result in no impacts to botanical and faunal resources.

Generally, minimization measures discussed herein are intended to minimize any potential impacts on flora and fauna that could result from the construction and operations of the wastewater treatment and disposal facility and associated infrastructure. The proactive consultation with relevant authorities ensures compliance with regulations and protection of sensitive species. Additionally, the note regarding Alternatives 3 and 4 acknowledges the unique context of disturbance on private residential property while anticipating minimal impacts.

No-Action Alternative:
The No-Action Alternative involves no modifications to the existing LCC system and is not expected to impact flora or fauna.

4.7 Cultural, Historical, and Archaeological Resources

In May 2024, a Draft Archeological Inventory Survey (AIS) Report was completed by Cultural Surveys Hawaiʻi. The AIS is was designed to be compliant with both Federal and Hawaiʽi State environmental and historic preservation review legislation. The AIS was conducted to assess any historic properties for integrity and site significance in accordance with HAR §13-275-6. This report is also intended to support any project-related historic preservation consultation with consulting parties, such as state and county agencies and interested Native Hawaiian Organizations (NHOs) and community groups, if applicable. A summary of the AIS is outlined below and included herein as Appendix E.

The AIS identified four previously documented and seven newly documented historic properties in the Project Area. The four previously documented sites include the following:

- SIHP # 50-10-74-29507 is a historic ranching complex. Pursuant to HAR §13-275-6 it is assessed as significant under Criterion d for the information it has yielded about historic ranching activity in the project area. It is evaluated as not eligible for listing on the National Register of Historic Places ("National Register").

- SIHP # 50-10-47-30187 comprises the former and present alignments of the Māmalahoa Highway, also known as the Belt Road (variably State Routes 11, 19, 180, and 190). Pursuant to HAR §13-275-6 it is assessed as significant under Criterion a for its association with events that have made an important contribution to the development of transportation routes on Hawaii Island, and under Criterion d for having yielded information about historic transportation in the project area. Pursuant to 36 CFR 60.4 is evaluated as eligible for listing on the National Register under Criterion A (for its association with events that have made a significant contribution to the broad patterns of our history) and Criterion D (for having yielded, or being likely to yield, information important in history).
- SIHP # 50-0-74-30929 is a pre-Contact activity area and historic ranching complex. It is assessed as significant under Criterion d for the information it has yielded about traditional and historic land use in the project area. It is evaluated as not eligible for listing on the National Register.

- SIHP # 50-10-74-30930 is a historic ranch wall. It is assessed as significant under Criterion d for the information it has yielded about historic ranching activity in the project area. It is evaluated as not eligible for listing on the National Register.

The seven newly documented historic properties in the project area include the following:

- SIHP# 50-10-74-31268 is a historic earthen drainage ditch used to channel storm water. It is assessed as significant under Criterion d for the information it has provided about historic water control activity in the project area. It is evaluated as not eligible for listing on the National Register.

- SIHP # 50-10-74-31269 is a historic ranching complex. It is assessed as significant under Criterion d for the information it has yielded about historic ranching activity in the project area. It is evaluated as not eligible for listing on the National Register.

- SIHP # 50-10-74-31270 is a historic jeep road. It is assessed as significant under Criterion d for the information it has yielded about historic transportation in the project area. It is evaluated as not eligible for listing on the National Register.

- SIHP # 50-10-74-31271 is the historic Nāʽālehu Spur Road. It is assessed as significant under Criterion d for the information it has yielded about historic transportation in the project area. It is evaluated as not eligible for listing on the National Register.

- SIHP # 50-10-74-31272 is the historic Kaʽalaiki Road. It is assessed as significant under Criterion d for the information it has yielded about historic transportation in the project area. It is evaluated as not eligible for listing on the National Register.

- SIHP # 50-10-74-31273 is a historic complex comprising a concrete drainage channel and associated footbridge. It is assessed as significant under Criterion d for the information it has yielded about historic water control activity in the project area. It is evaluated as not eligible for listing on the National Register.

- SIHP # 50-10-74-31274 is a historic boundary wall. It is assessed as significant under Criterion d for the information it has yielded about historic land use in the project area. It is evaluated as not eligible for listing on the National Register.

As a part of previous environmental documentation efforts, a 2019 EA Pre-Assessment Package was distributed. In response the Pre-Assessment, the Ala Kahakai Trail Association provided further historical and cultural context on the 2013-acre parcel TMK (3) 9-5-007:016 in which the WWTP is proposed to be sited. According to the Ala Kahakai Trail Association (ATA), the parcel, known as the "Waikapuna Property" has exception cultural, historical, environmental, and natural resources. The property contains 2.3 miles of coastline that includes the ancient Alaloa footpath which once encircled the island, also known as the Alanui or Ala Kahakai National Historic Trail. The property is presently used by local fishermen, Native Hawaiian descendants and gatherers of various natural and marine resources for subsistence, recreational, or cultural purposes.

Impacts and Mitigation Measures:
In accordance with federal regulations (36 CFR 800.5), the results of the AIS are intended to support a future determination of "no adverse effect" by the Hawaiʽi State Department of Health (DOH) on behalf of the Environmental Protection Agency (EPA). Additionally, in accordance with HAR §13-275-7, the Hawaiʽi State DOH and County of Hawaii Department of Environmental Management (COH-DEM) are expected to determine the project effect as "effect, with proposed mitigation commitments." In a letter dated June 3, 2024, the DOH formally initiated consultation with the SHPD (See Appendix F). Future correspondence with the SHPD shall be included in future EID / EA efforts.

One historic property on the project area has been evaluated as eligible for inclusion on the National Register: SIHP # 50-10-47-30187 (Māmalahoa Highway). The 15-m (50-ft) portion of this historic property within the project area retains integrity of location only, as all the constructed elements of the original Māmalahoa Highway are no longer evident today. While the project will affect the modern roadway elements, these elements will be replaced following construction, and the integrity and significance of the highway will not be diminished. Therefore, the project will have no adverse effect on SIHP # -30187. This site is assessed as significant under Criterion a of the State of Hawaiʽi significance criteria for its association with events that have made an important contribution to the development of transportation routes on Hawaii Island, and under Criterion d for having yielded information about historic transportation in the project area. Documentation of SIHP # -30187 in this AIS has included historical research, GPS data collection, photographs, and written description. This AIS has adequately documented the location, extent, function, age, and construction methods of the portion of SIHP # -30187 in the project area, mitigating project-related impacts pursuant to HAR §13-275-8.

The remaining ten historic properties in the project area (SIHP #s 50-10-74-29507, -30929, -30930, -31268, -31269, -31270, -31271, -31272, -31273, and -31274) may also be impacted by project development. These historic properties have been evaluated as not eligible for inclusion on the National Register. These sites are assessed as significant under Criterion d of the State of Hawai'i significance criteria because they have yielded information important for research on history. Documentation of these historic properties in this AIS has included historical research, GPS data collection, photographs, plan view maps, and written descriptions. This AIS has adequately documented the location, extent, function, age, and construction methods of these ten historic properties, mitigating project-related impacts pursuant to HAR §13-284-8.

The single historic property evaluated as eligible for listing on the National Register (SIHP # 50-10-47-30187, Māmalahoa Highway), will not be adversely impacted by the project as its integrity and significance will not be diminished. This AIS has adequately documented the location, extent, function, age, and construction methods of the 11 historic properties within the project area, mitigating any project-related impacts pursuant to HAR §13-284-8. No further work is recommended for these 11 historic properties.

Archaeological monitoring is recommended during all project ground-disturbing activities to facilitate identification for information purposes, especially of any subsurface lava tubes that may contain historic properties. Archaeological monitoring will proceed under an archaeological monitoring plan that meets the requirements of HAR §13-279-4, which will be submitted to the SHPD for review and acceptance prior to project initiation.

Although historic properties have been determined to require no further work, the County will consider further communication and coordination with ATA, on developing feasible and reasonable accommodations on either preserving historic properties or alternatives that integrate the broader preservation goals of the Waikapuna property. Further, for security and safety purposes, the COH-DEM plans to move forward with plans to construct the security fence around the perimeter of the facility.

No Action Alternative

Under the No Action Alternative, existing cultural, historical, and archeological resources in the project area will not be impacted.

4.8 Air Quality and Odors

The project area falls within the purview of ambient air quality standards (AAQS) at both national (NAAQS) and state levels, encompassing the criteria pollutants, including carbon monoxide, nitrogen dioxide, lead, ozone, and particulate matter (PM_{10} and $PM_{2.5}$). It is noteworthy that the State of Hawaii has standards that align with the national standards in terms of stringency. The Hawaiʻi DOH operated an extensive network of air quality monitoring stations across the state. Ensuring that criteria pollutant levels have consistently remained below both federal and state AAQS thresholds throughout the state, include the Nāʻālehu area.

Air quality issues most applicable to the proposed project sites in the Nāʽālehu community concern short-term construction related emissions such as fugitive dust. Vehicular emissions (CO) from traffic occurring along the residential streets are not considered to be an important factor influencing the project areas. This project involves the construction of new underground sewer improvements and a WWTP that will not generate any long-term traffic in the area.

Impacts and Mitigation Measures:

Alternatives 1 and 2 - Package Plant:

During the construction phase of the wastewater collection system and treatment facility associated with Alternative 1, short-term impacts on air quality may manifest as fugitive dust emissions resulting from construction activities. These emissions would be effectively managed through the implementation of a comprehensive dust control plan. Measures within this plan would encompass the application of water to active work areas, the use of wind screens, vigilant maintenance of adjacent roads to prevent dust build-up, and the covering of open-bodied trucks. It is plausible that exhaust emissions from mobile construction equipment, in conjunction with traffic disruptions associated with construction activities, could exert a minor influence on air quality during this phase.

As previously discussed, the PER recommended a granular activated carbon (GAC) scrubber be used at Nāʽālehu WWTP headworks. A GAC scrubber passes odorous air through a bed of activated carbon, which absorbs the odorous constituents within the pore spaces of the carbon. Chemical oxidation or reduction of some compounds can also occur. Also, emissions would occur from trucks used to haul the solids to the County West Hawaiʽi Sanitary Landfill at Puuanahulu, located north of Kailua Kona. These trips are not expected to exceed federal or state ambient air quality standards for criteria pollutants. The presence of an emergency standby diesel-powered generator, operated periodically for testing and during the power outages, is unlikely to have a significant adverse impact on air quality.

Alternatives 3 and 4 - Individual Wastewater System Program:

Air quality impacts for Alternatives 3 and 4 primarily relate to the installation and maintenance of the IWS by homeowners. These activities may yield minor emissions associated with construction equipment and vehicles. However, any potential air quality impacts would be transient and localized to specific residential areas. Additionally, there is a slight risk of odors emanating from maintenance activities or system breakages within the IWS. Homeowners would be responsible for managing and mitigating these potential odors.

No-Action Alternative:

The No-Action Alternative entails no modifications to the existing LCC system and, therefore, is not projected to introduce new air quality impacts to the Nāʻālehu area. Historical air quality records indicate that the area has consistently met ambient standards during the operation of the existing LCCs.

4.9 Noise

The existing noise environment in the Project Area is generally associated with vehicular traffic and general activities associated with residences such as children playing, radio or television noise, or voices. Most of the proposed collection system routes will occur along residential roadways within the Project Area. Additional sources of noise include some commercial sites and schools. Existing noise is not expected to generate volumes that may exceed State DOH standards. Similarly, the schools and commercial sites should meet applicable noise limits.

Impacts and Mitigation Measures:

Alternatives 1 and 2 – Package Plant:

During the construction of the wastewater treatment facilities and collection systems, it is anticipated that there will be an increase in noise levels associated with the operation of heavy machinery, construction equipment, and from potential increased vehicle traffic. Construction activities can generate temporary noise impacts in the Project Area. Noise from construction activities is regulated under Title 11, Chapter 46 (Community Noise Control) of the State DOH's Administrative Rules. Under these regulations, the Project Area and immediate vicinity fall under the Class A zoning district. The district allows daytime (7 a.m. to 10 p.m.) maximum permissible sound levels up to 55 dBA. Construction activities are not planned at night, so the nighttime noise level restrictions should not be applicable.

To minimize construction-related noise impacts, the project can implement standard noise control measures such as avoiding noisy activities during quiet hours (e.g., evenings and weekends), and employing noise barriers or sound-reducing equipment where feasible. While construction may introduce short-term noise, the continuous operational noise from these facilities is generally localized and can be controlled with noise-reducing measures. Transportation noise may be minimal as wastewater can be treated onsite.

The operational phase of the wastewater treatment facilities may introduce continuous noise sources, such as equipment operation, pumps, and mechanical systems. While these noise sources are generally not excessively loud, they can contribute to ambient noise levels in the immediate vicinity of the facilities. It should also be noted that, in the case of a power outage, emergency generators shall be utilized and may generate additional noise.

To address operational noise, the project can consider noise-reducing designs for the treatment facilities, such as noise barriers or acoustic enclosures for noisy equipment. Additionally, maintenance schedules can be optimized to minimize noisy activities during sensitive times.

Vehicle traffic associated with travel to the Nāʽālehu WWTP by plant operators and with trucks needed to remove solids, based on the location of package plant would not affect noise in the residential areas.

Alternatives 3 and 4 – Individual Wastewater System Program:
During construction of the IWS, it is anticipated that there will be an increase in noise levels associated with the operation of heavy machinery, construction equipment, and due to vehicle traffic. These construction activities can generate temporary noise impacts in the Project Area.

To minimize construction-related noise impacts, the project can implement standard noise control measures such as scheduling construction activities during daytime hours, avoiding noisy activities during quiet hours (e.g., evenings and weekends), and employing noise barriers or sound-reducing equipment where feasible.

The installation and maintenance of the IWS may result in localized noise during construction and maintenance activities. However, these impacts are distributed across multiple resident properties.

No-Action Alternative:
This alternative maintains the existing LCC system. While it avoids construction-related noise, it may not address long-term noise concerns associated with the aging infrastructure.

4.10 Energy and Natural Resources

The Nāʽālehu area relies on a mix of energy sources for electricity, including fossil fuels (e.g., oil) and renewable sources (e.g., solar and wind). The specific energy mix can vary over time and may be influenced by state and county policies promoting renewable energy. Although the integration of renewable energy sources to reduce reliance on fossil fuels and promote sustainability can be considered, WWTP facilities typically rely on a consistent source of power. Electrical infrastructure in the Project Area is managed and maintained by the Hawaiian Electric company (HECO). The existing Punaluʻu and South Point Substations and the 12,470-volt overhead distribution system currently serving the Project Area. Currently, the existing Punaluʻu and South Point Substations and the 12,470-volt overhead distribution system serve the Project Area. It is anticipated that the capacity of the existing substation may be adequate to serve the anticipated load.

Impacts and Mitigation Measures:

All Proposed Alternatives:
The construction and operation of wastewater treatment facilities will require energy inputs. Construction equipment, pumps, aeration systems, and other mechanical components consume energy during installation and operation. Implementing energy-efficient technologies and practices during facility construction and operation can help reduce energy consumption. Additionally, the proposed gravity flow system is intended to be require lower energy demands compared to centralized facilities.

Additionally, the feasibility of incorporating renewable energy systems into the wastewater treatment facilities to reduce carbon emissions and energy costs should be evaluated.

During the design phase, the County shall coordinate with HECO to provide detailed loading and civil plans to coordinate electrical power to the Project Site.

4.11 Land Use and Land Use Plans

The existing land use in the Project Area includes residential, agricultural, and undeveloped land. The Project Area is located within the Urban and Agricultural State Land Use Districts (SLUD). The WWTP site is entirely located within the Agricultural SLUD. As such, the Proposed Action would be required to comply with the regulations set forth in the State Land Use Law (HRS, Chapter 205).

Furthermore, the County of Hawai'i General Plan calls for the preparation of community development plans (CDPs) "to translate the broad General Plan statement to specific actions as they apply to specific geographical areas."

The Ka'ū CDP is one of nine CDPs for Hawai'i County. On October 17, 2017, the Ka'ū CDP was adopted as Ordinance No. 2017-66. The purpose of the CDPs is to implement the broad goals within the General Plan on a regional basis and to translate the broad General Plan statements into specific actions. CDPs are the forum for community input into managing growth and coordinating the delivery of government services to the community. CDPs designate detailed development patterns and direct physical development and public improvements by detailing land use policies and infrastructure priorities.

Section 5 of the CDP prioritizes improvements in the infrastructure, facilities, and services, including Section 5.8 applicable to Environmental Management which states:

> "Policy 120 Extend the primary wastewater collection lines in Pāhala and Nā'ālehu so that infill development projects can connect wastewater systems built for new subdivisions to the County systems."

The collection system will be consistent with Policy 120 as the improvements for the Nā'ālehu LCC Replacement Project have been designed not to preclude expansion to accommodate the future needs of the Nā'ālehu community. Future subdivisions would be accommodated, as capacity allows, on a first-come, first-served basis.

Impacts and Mitigation Measures:

Alternative 1 and 2 – Package Plant:

Construction activities will result in land disturbance, affecting natural habitats and agricultural areas. Minimizing the affected area will act to footprint of construction activities and implementing erosion control measures can help mitigate land disturbance impacts.

Although the package plant in Alternative 2 would allow additional facilities, use of the existing collection system would not allow flows from the residential areas to the north and east to connect to the package plant and treatment disposal system.

As previously noted, the WWTP will be configured within a 28.74-acre portion of the subject TMK parcel. Following the final design of the WWTP, lands not utilized for the WWTP shall be converted back to conservation land.

Alternatives 3 and 4 – Individual Wastewater System Program:
Construction activities can result in land disturbance, affecting natural habitats and will affect the residential parcels, including affecting existing buildings, structures, and landscaping. Minimizing the footprint of construction activities and implementing erosion control measures can help mitigate land disturbance impacts.

These alternatives are designed to use gravity flows which will mean lower energy demands compared to centralized facilities.

No-Action Alternative:
The existing LCC system will not require energy consumption. No significant changes in energy use are anticipated with this alternative.

4.12 Roadways and Traffic

The existing roadway and traffic conditions in the Nāʻālehu area provide essential context for assessing the impacts and mitigation measures associated with the proposed wastewater treatment project. Key considerations include:

Road Network: Nāʻālehu is served by a network of roadways which are under the jurisdiction of the County and include Māmalahoa Highway and local roads in Nāʻālehu is generally low, reflecting the rural nature of the area. Limited vehicular traffic contributes to the low levels of congestion and a relatively peaceful road environment.

Access to Project Sites: The proposed project sites, including the preferred location for the wastewater treatment and disposal facility, are accessible via the existing road network. Consideration of the impact of construction and operational traffic on local roads is necessary.
Safety: Road safety is a critical concern in the area. Ensuring the safety of residents, commuters, and workers during construction and operation is a primary focus. Safety measures may include signage, flaggers, and traffic control measures as needed.

Impacts and Mitigation Measures:
Alternative 1 and 2 – Package Plant:
During the construction phase of the wastewater treatment project, temporary disruptions to traffic flow on local roads may occur. Mitigation measures include the development of traffic management plans to minimize construction-related traffic impacts. These plans may include designated construction-related traffic impacts. These plans may include designated construction access points, scheduling work during off-peak hours and flaggers to ensure safe traffic flow.

The influx of construction vehicles, equipment, and workers to the Project Area may result in increased traffic volume on local roads. To mitigate this, construction logistics planning should aim to minimize the impact on existing road users and ensure the safety of all road users.

Safety measures, such as signage, temporary speed limits, and traffic control personnel, will be employed as necessary during construction activities to maintain the safety of both workers and the local community.

As part of the project, any necessary upgrades or improvements to local roads or intersections impacted by construction activities will be considered and implemented. This may include road repairs, resurfacing, or other enhancements to ensure the continued integrity of roadways.

During the operation of the wastewater treatment facility, regular visits by facility operators are expected. While these visits would introduce minimal traffic, safety remains a priority, and any potential traffic impacts will be mitigated through adherence to established safety protocols.

Continuous monitoring of traffic conditions and adherence to traffic management plans will be essential to address any unforeseen issues promptly. Compliance with local traffic regulations and safety standards will be enforced throughout the project's lifecycle.

In summary, the existing road network in Nāʽālehu serves as the backdrop for assessing potential impacts and mitigation measures associated with the proposed wastewater treatment project. During both the construction and operation phases, careful planning, safety measures, and infrastructure improvements will be implemented to minimize disruptions and maintain the safety and functionality of local roadways.

Additionally, the new collection system or methods of integration with the existing collection system may require careful planning and engineering to ensure compatibility and minimize impacts on the existing infrastructure.

Alternatives 3 and 4 – Individual Wastewater System Program:
Unlike the centralized package plant options, this alternative involves the installation and maintenance of the IWS at each residence within the service area. Logistically, this can be challenging due to the need for coordination with numerous property owners.

Obtaining access to private properties and ensuring compliance with installation and maintenance requirements for the IWS may pose logistical challenges. Coordinating schedules and ensuring proper installation and maintenance become complex tasks; however, it should be noted that septage trucks would only need to visit each property every three to five years to pump the septic tanks.

The ongoing operation and management of multiple individual systems can be logistically complex. Ensuring that all systems meet required standards and addressing any issues promptly is a continuous endeavor.

No-Action Alternative:
Maintenance of Existing Infrastructure: Under the No-Action Alternative, there would be no changes to the existing infrastructure. While this avoids the logistical challenges of the new construction, it does not address potential issues such as road closures or construction traffic which may be associated with maintenance and repairs of the existing and aging LCC infrastructure.

Long-Term Considerations: Continuing with the existing system may provide short-term stability, but it may not be a sustainable long-term solution for wastewater treatment in the area.

4.13 Hazardous Materials

The existing conditions in Nāʽālehu regarding hazardous materials primarily pertain to the operation of the Nāʽālehu LCCs, which historically managed wastewater treatment for the community. No chemicals are currently being used for treatment at the Nāʽālehu LCCs, however, wastewater treatment processes generate residual waste, including sludge and biosolids. Proper management and disposal of these materials are essential to prevent environmental contamination.

Impacts and Mitigation Measures:
All Proposed Alternatives:
The impacts and mitigation measures related to hazardous materials are primarily associated with the closure of the Nāʽālehu LCCs and the transition to alternative wastewater treatment methods:

- As the LCCs cease operation, residual waste, such as sludge and biosolids, must be managed appropriately. Mitigation involves planning for the safe removal and disposal of these materials to prevent adverse environmental impacts.
- Depending on the condition of the LCC sies, remediation efforts may be required to address any soil or groundwater contamination resulting from historical operations. Remediation plans and measures will ensure that the sites are restored to acceptable environmental standards.
- For proposed alternative wastewater treatment methods, any hazardous materials or chemicals used in the new treatment processes would be subject to stringent safety protocols, handling procedures, and storage requirements. Mitigation measures include compliance with safety regulations and ongoing staff training.

Continuous monitoring of the environment by the homeowners, including soil and water quality, will be essential to detect any potential impacts related to hazardous materials. Mitigation measures involve the implementation of robust monitoring programs to promptly address any issues that may arise.

The closure of the Nāʽālehu LCCs and the transition to alternative wastewater treatment methods in Nāʽālehu require careful management of hazardous materials and chemicals to prevent adverse environmental impacts. Proper disposal, remediation, and adherence to safety protocols are crucial mitigation measures to ensure the safe and responsible handling of hazardous materials throughout the project's lifecycle.

No-Action Alternative"

The No-Action Alternative does not involve any new construction or modification of the existing sewage system; however, this would not allow the County to meet the requirements of the AOC and SDWA.

4.14 Socioeconomics & Environmental Justice

The U.S. Census Bureau provides the American Community Survey (ACS) for Census Designated Places, which updates selected demographic, social, and economic, information for various years. The ACS shows age distribution, racial composition, and economic information, including employment and household income by Census Designated Place for various locations in Hawaiʽi County. The version of the ACS referenced is the 2021 5-Year Estimates, released in December 2022.

The population for the Nāʽālehu census designated place (CDP), which includes the project service area, was 890 persons based upon the ACS 2022 5-year data Census data. There were 264 households and the median age of residents was 29.9 years (US Census Bureau 2022). Table 4-1 shows this CDP census information in comparison to both the County and State.

Overall, Nāʽālehu is characterized by a racial composition that includes a greater proportion of minorities compared to the County. The Nāʽālehu racial distribution includes a much lower proportion of White residents, a much higher proportion of Asian and Hispanic residents, and lower populations of other minority groups, including Native Hawaiians when compared to the County. There are also more residents of two or more races in Nāʽālehu than in the County.

Nāʽālehu has a higher proportion of residents that have completed high school and some college than the County overall, but a lower proportion with college degrees (bachelor's and graduate or professional degrees). From an economic perspective, Nāʻālehu generally has a lower median household income than the County.

Lastly, Nāʽālehu had a higher proportion of employment in agriculture, forestry, fishing, hunting, and construction (6.2 percent), and retail trade (6.6 percent) compared to the County 1.7 percent and 5.0 percent respectively. Nāʽālehu had a lower proportion in education and health care (3.4 percent), compared to the County (9.6 percent).

Table 4-1
Demographic, Economic and Social Characteristics of Nā'ālehu and Hawai'i County

Item	Nā'ālehu Total	Nā'ālehu Percent	Hawai'i County Total	Hawai'i County Percent
Demographic Characteristics				
Total Population	890		206,315	
Under 5 to 19 years	324	36.5	46, 627	22.6
20 to 39 years	169	19.0	47, 039	22.8
40 to 59 years	220	24.8	49, 515	24.0
60 to 79 years	136	15.3	54, 054	26.2
80 years and older	40	4.5	9, 077	4.4
Median age	29.9		44.1	
Race				
White	39	4.4	61, 069	29.6
African American (inc. American Indian/Alaska Native)	44	0.5	1, 444	0.7
Asian	244	27.6	35, 279	17.1
Other Pacific Islander	53	6.0	23, 313	11.3
Two or more	267	30.0	54, 879	26.6
Hispanic	281	31.6	28, 677	13.9
Other	0	0.0	1, 237	0.6
Native Hawaiian	0	0.0	412	0.2
Social/Educational Characteristics				
Less than 9th grade	93	10.5	15, 267	7.4
High School to High School Graduate	391	44.0	59, 625	28.9
Some college to associate degrees	329	37.0	65, 195	31.6
Bachelor degree	42	4.8	38, 580	18.7
Graduate/professional degree	33	3.8	70, 147	13.4
Household Income Characteristics				
Less than $24,999	104	11.7	27, 027	13.1
$25,000 to $49,999	121	13.7	23, 726	11.5
$50,000 to $99,999	240	27.1	55, 086	26.7
$100,000 to $199,999	281	31.6	64, 163	31.1
$200,000 or more	141	15.9	31, 772	15.4
Median household income	$54,688		$72,568	
Employment Characteristics				
Agriculture, forestry, fishing and mining	55	6.2	3, 587	1.7
Construction	17	1.9	7, 344	3.5
Manufacturing and wholesale trade	11	1.2	4, 094	2.0
Retail trade	59	6.6	10, 457	5.0
Transportation, warehousing, and utilities	0	0.0	3, 960	1.9
Information tech, finance, insurance and real estate	3	0.3	6, 312	3.0
Professional, scientific and technical services	28	3.1	10, 306	5.0
Education and health care	30	3.4	19, 938	9.6
Arts, entertainment and recreation	47	5.3	14, 398	7.0
Other services, public administration	18	2.0	3, 894	1.9

A subset of social resources is environmental justice. Environmental justice considers sensitive populations, such as children, minorities, and low-income communities. Sensitive populations are identified in two Executive Orders (EOs):

- EO 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, serves to avoid the disproportionate placement of adverse environmental, economic, social, or health impacts from federal actions and policies on minority and low-income populations.
- EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, states that federal agencies will identify and address environmental health and safety risks from their activities, policies, or programs that may disproportionately affect children.

As noted above, Nā'ālehu has a higher proportion of minority and children residents as compared to the County as a whole. For purposes of this assessment, and to correspond with the available ACS demographic characteristic data, "low income" is defined as having a household income of less than $24,999; "minority" is defined as any race population other than White; and "children" is defined as the "Under 5 to 19" age category.

Impacts and Mitigation Measures:

Alternatives 1 and 2 – Package Plant:

In the short-term, construction projects would require a number of contractors and their subcontractors. Construction contract documents would reference HRS 103B, which requires the contractor (including subcontractors) to include not less than 80 percent Hawai'i residents in the work force. This would limit the importation of workers from outside the local area and the associated increase in demand for local housing.

The Alternative 1 would generate employment as the contractor would need workers to undertake construction of the improvements for the wastewater collection system and the WWTP and effluent disposal facility. This employment would generate wages and salaries paid to the contractor and subcontractor work forces. The wages and salaries paid to the work force would in turn generate purchases of goods and services, which would result in taxes paid to the State of Hawai'i. In addition, the contractor and their subcontractors would need to purchase equipment, supplies, and materials, some of which would be purchased from local suppliers and vendors. Direct purchases of equipment, supplies, and materials by the contractor would also generate taxes. Overall, Alternative 1 would result in positive employment benefits which would result in higher levels of income and overall economic benefits to the local economy.

The Alternative 1 is not likely to directly impact long-term employment or education trends since the wastewater plant operator would likely be based in Hilo or Kona, meaning the project would not involve long-term relocation of any staff to Nā'ālehu. Instead, the project is anticipated to create additional job opportunities for local community members. Additionally, Alternative 1 wastewater collection system and treatment and disposal facility would not be designed to encourage or accommodate substantial population growth in Nā'ālehu.

Alternative 3 and 4 – Individual Wastewater System Program:
Construction of the IWS would also create the need for workers to construct the septic system including the absorption bed or seepage pits. Since the IWS would not involve the complex treatment processes, the level of employment could be lower than Alternative 1 or 2. However, to construct over 100 IWS would require multiple crews or contractors. Overall, the economic impact may be similar to Alternatives 1 and 2.

No-Action Alternative:
The No-Action Alternative does not involve any new construction or modification of the existing sewage system, and therefore, it is not expected to impact socioeconomic or demographic conditions in the Nāʽālehu area.

No specific mitigation measures related to socioeconomic characteristics are required for this alternative.

These adapted impacts and mitigation measures address the potential socioeconomic impacts for all five alternatives, emphasizing employment and economic benefits while considering sensitive populations.

All Proposed Alternatives:
Despite the relatively high proportions of minority and children residents in Nāʽālehu compared to the County overall, the proposed alternatives would not result in disproportionately high and adverse human health or environmental effects on the minority or low income populations. The design and location of the proposed wastewater and disposal facility would minimize odor and air quality impacts. Construction of the wastewater collection system would result in intermittent and unavoidable noise from construction vehicles and equipment within the Nāʽālehu community, including noise associated with the removal of bedrock. However, as discussed in Section 3.18.2, construction activities within the community would comply with provisions of HAR 11-46 (Community Noise Control). This includes obtaining a noise permit for any activities that would generate noise exceeding the permissible sound levels from excessive noise sources; and would require the applicant to notify affected members of the public in advance of any planned nighttime construction activity (which must not exceed the permissible sound levels). Overall, the proposed alternatives are expected to result in positive human health and environmental effects to Nāʽālehu residents by providing a cleaner and longer-lasting wastewater treatment system.

4.15 Sustainability

The concept of sustainability is vital in understanding the environmental, economic, and social conditions in Nāʽālehu and its surrounding areas. Sustainability encompasses the balance between meeting the needs of the present without compromising the ability of the future generations to meet their own needs. In the context of Nāʽālehu, several factors influence the existing conditions related to sustainability:

Nāʽālehu ’s environmental sustainability is influenced by its unique natural surroundings, including its proximity to the Kilauea Volcano and the potential impact of volcanic activity on air and water quality. The region’s lush vegetation and agricultural activities contribute to its environmental diversity.

The local economy in Nāʻālehu is characterized by farming, fishing and forestry, a significant contributor to the region’s economic sustainability. Additionally, employment opportunities in construction, education and healthcare play a role in the local economy.

Nāʻālehu’s community consists of residents with diverse racial backgrounds, therefore factors such as education levels, access to healthcare services, and community engagement are influential in the region’s social sustainability.

Impacts and Mitigation Measures:

Alternatives 1 and 2 - Package Plant:

The construction of a new wastewater collection system and treatment facility may have short-term environmental impacts, such as soil disturbance and potential disruption of local ecosystems. Mitigation measures include adherence to environmental regulations and best construction practices to minimize ecological disturbances.

The construction phase is expected to generate employment opportunities, contributing positively to economic sustainability in the short term. Long-term economic impacts include the potential for increased economic activity due to improved wastewater infrastructure.

Minimal direct social impacts are expected during construction. The long-term social benefits include improved access to wastewater services, contributing to the overall quality of life and social sustainability.

Alternatives 3 and 4 - Individual Wastewater System:

The installation and maintenance of the IWS may have minimal environmental impacts, mainly related to construction activities. Mitigation measures involve adherence to environmental regulations during installation.

This alternative provides opportunities for local residents to participate in the installation and maintenance of IWS, potentially benefiting economic sustainability at the community level.

The social impacts are localized, involving homeowners and their immediate surroundings. The long-term social benefit includes improved wastewater systems for individual households, enhancing overall social sustainability.

No-Action Alternative:

This alternative maintains the existing conditions, resulting in minimal changes to the environment.

The economic impacts of the No-Action Alternative are limited, as it does not involve new construction or economic development related to wastewater infrastructure.

This alternative does not introduce significant social changes, as it maintains the status quo in terms of wastewater services and community conditions.

4.16 Human Health and Safety

In Nāʽālehu, access to adequate wastewater treatment services is a fundamental necessity for maintaining public health and environmental quality. Existing conditions reseal the following:

- Proper wastewater treatment is vital for safeguarding public health. Inadequate treatment can result in the contamination of groundwater and surface water, posing risks to drinking water sources and recreational areas. It can also lead to the spread of waterborne diseases.
- Effective wastewater treatment is essential for preserving the local environment. Uncontrolled discharge of untreated sewage can harm aquatic ecosystems, damage coral reefs, and degrade coastal waters, impacting the region's biodiversity and natural beauty.
- Reliable wastewater treatment infrastructure contributes to the overall well-being of the community. It ensures that residents can enjoy a safe and healthy environment and minimizes nuisances such as foul odors and unsightly conditions associated with inadequate treatment.

The Closure of the LCCs and Improved Services:

The closure of the LCCs and the proposed wastewater treatment alternatives aim to address existing challenges and improve wastewater treatment services in Nāʽālehu:

- The closure of the LCCs signifies a shift towards more modern and effective wastewater treatment methods. The proposed alternatives include advanced treatment processes that can remove a higher percentage of contaminants from wastewater, resulting in cleaner effluent.
- Improved wastewater treatment aligns with the community's commitment to environmental stewardship. By ensuring that treated effluent meets stringent quality standards, the closure of the LCC supports the conservation of local ecosystems and marine life.
- The closure of the LCCs and the adoption of alternative wastewater treatment methods provide significant public health benefits. Treated wastewater reduces the risk of waterborne diseases and protects the health of residents and visitors.
- Adequate wastewater treatment services contribute to community satisfaction and quality of life. Residents can enjoy a cleaner and healthier environment, and in turn, can have positive social and economic impacts on the community.

The closure of the LCCs represents a critical step toward enhancing wastewater treatment services in Nāʽālehu. It reflects the community's commitment to protecting public health, conserving the environment, and improving overall community well-being. The proposed alternatives offer modern and effective solutions to ensure that wastewater is treated to the highest standards, addressing the pressing need for adequate wastewater treatment in the area.

Impacts and Mitigation Measures:

All Proposed Alternatives:

The Nāʽālehu LCC Closure project would not result in construction of new above-ground infrastructure within the 500-year floodplain. Although a small portion of the proposed collection system is located within the 500-year floodplain, the associated trenching operations would be temporary and would not alter the 500-year floodplain. Thus, no impacts to the existing floodplain are expected from the Proposed Action. For information related to stormwater management and impacts, please refer to Section 3.23.

Abandonment of the two LCCs and the existing wastewater collection system would not affect floodplains within the affected areas.

No-Action Alternative

The No-Action Alternative, specifically the continued operation of LCC 1, could lead to impacts during a flooding event. LCC 1 is located very close to an area mapped as within the 0.2-percent annual change (500-year) floodplain. The existing collection system is substandard and in poor condition. A large flood could potentially cause the collection system and/or LCC to overflow as a result of stormwater inflow and result in an uncontrolled release of raw sewage, thus potentially contaminating flooded areas and creating a public health hazard.

4.17 Unresolved Issues

The EID serves to assess the anticipated environmental impacts of each alternative on various environmental resources; however, there are still several unresolved issues that may affect the completion of the project under any of the Proposed Alternatives.

Construction Feasibility

Lots to be served in the Nāʻālehu community vary in size from 0.12 to 1.94 acres with a median size of 0.16 acres. Space available for IWS installation on these properties is further limited by the presence of existing structures. For properties that could accommodate a septic tank, the soils may have percolation rates that are too slow to allow for seepage pits based on HAR 11-62-34 regulations. Residents with insufficient space for a seepage pit may need to import fill soil to create elevated mound systems or convert to household aerobic treatment units. As a solution, seepage pits can be installed in lieu of absorption beds in space constrained lots, and IWS installations could be installed encroaching into County Right-of-Way, if permitted by Hawaiʻi County.

Additionally, as discussed throughout the EID, the IWS recommended by the PER also requires the installation of a septic tank with an absorption bed. The PER further outlines that this absorption shall not be installed on lands with a slope gradient of greater than 8 percent. Sites in Nāʻālehu have slopes that vary from 6-10%. This is likely to affect the constructability of absorption beds as a method of wastewater disposal. Per HAR 11-62-34, absorption beds shall not be installed on land with a slope gradient greater than 8%, while absorption trenches are permitted on a slope of up to 12%. In case this slope requirement cannot be fulfilled, the DOH would allow a seepage pit to be installed instead of an absorption bed.

Access to Properties

Under Alternative 3, the County will fund, design, and manage the project. Obtaining Right of Entry (ROE) to private properties for various purposes, such as infrastructure development or land surveys, can present several challenging issues. The process often involves negotiation, legal considerations, and respect for property rights. Failing to clarify these issues can lead to legal disputes and project delays. The most straightforward way to gain ROE is through the voluntary consent and permission of property owners. However, some property owners may be unwilling to grant access due to concerns about privacy, property damage, or other reasons.

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CHAPTER 5: RELATIONSHIP TO PLANS, POLICIES, AND CONTROLS

5.1 State of Hawai'i Land Use Plans and Policies

5.1.1 Hawai'i State Plan

The Hawai`i State Plan, Chapter 226, Hawai`i Revised Statutes (HRS), as amended, provides goals, objectives, policies, and priorities for the State. The purpose of the Hawai'i State Plan is to set forth a plan that shall serve as a guide for the future long-range development of the State; identify the goals, objectives, policies, and priorities for the State; provide a basis for determining priorities and allocating limited resources, such as public funds, services, human resources, land, energy, water, and other resources; improve coordination of federal, state, and county plans, policies, programs, projects, and regulatory activities; and to establish a system for plan formulation and program coordination to provide for an integration of all major state, and county activities. The State Plan is divided into three sections. Part 1 is Overall Theme, Goals, Objectives and Policies. Part 2 is Planning Coordination and Implementation. Part 3 is Priority Guidelines. The Proposed Action's consistency with applicable goals, objectives and policies of Part 1 is discussed in Table 5-1, and an assessment of conformance with Part 3 is discussed in Table 5-2. Part 2 of the State Plan, which primarily covers internal government affairs, is not related to the Proposed Action.

To facilitate describing the relationships of the Proposed Action to the numerous land use and natural or cultural resource plans, policies, and controls for the affected area, some of those plans, policies, and controls are presented in tabular form, and are described with text and/or the following letter code:

S = Supportive, NS = Not Supportive, N/A = Not Applicable

Table 5-1: The Hawai`i State Plan	S	NS	N/A
§226-4 State goals. In order to ensure, for present and future generations, those elements of choice and mobility that ensure that individuals and groups may approach their desired levels of self-reliance and self-determination, it shall be the goal of the State to achieve:			
(1) A strong, viable economy, characterized by stability, diversity, and growth, that enables the fulfillment of the needs and expectations of Hawai`i's present and future generations.	**X**		
(2) 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.	**X**		
(3) Physical, social, and economic well-being, for individuals and families in Hawai`i, that nourishes a sense of community responsibility, of caring, and of participation in community life.	**X**		
Discussion: The Proposed Action will support the State's goals, for present and future generations, to ensure individuals and groups may approach their desired levels of self-reliance and self-determination. The Proposed Action involved the rehabilitation and replacement of existing plant facilities and construction of new facilities will ensure wastewater treatment efficiency for present and future generations.			

Table 5-1: The Hawaiʽi State Plan	S	NS	N/A
A well-maintained wastewater treatment plant ensures the proper disposal of wastewater will reduce pollution risks and support the overall economic stability and growth of the region. Moreover, the Proposed Action will lead to improved treatment processes, reducing the impact on the surrounding environment and enhancing the stability of natural systems. While the primary focus of the Proposed Action is on environmental and public health aspects, it will also indirectly contribute to the well-being of communities by ensuring the availability of clean water resources and protecting public health.			
§226-5 Objectives and policies for population. (a) It shall be the objective in planning for the State's population to guide population growth to be consistent with the achievement of physical, economic, and social objectives contained in this chapter. To achieve the population objective, it shall be the policy of this State to:			
(1) Manage population growth statewide in a manner that provides increased opportunities for Hawaiʽi's people to pursue their physical, social, and economic aspirations while recognizing the unique needs of each county.			X
(2) Encourage an increase in economic activities and employment opportunities on the Neighbor Islands consistent with community needs and desires.			X
(3) Promote increased opportunities for Hawaiʽi's people to pursue their socio-economic aspirations throughout the islands.			X
(4) Encourage research activities and public awareness programs to foster an understanding of Hawaiʽi's limited capacity to accommodate population needs and to address concerns resulting from an increase in Hawaiʽi's population.	X		
(5) Encourage federal actions that will promote a more balanced distribution of immigrants among the states, provided that such actions do not prevent the reunion of immediate family members.			X
(6) Pursue an increase in federal assistance for states with a greater proportion of foreign immigrants relative to their state's population.			X
(7) Plan the development and availability of land and water resources in a coordinated manner so as to provide for the desired levels of growth in each geographic area.	X		
Discussion: The Proposed Action will support the objectives and policies of the State for population. The Proposed Action will not significantly contribute to the County's population growth. The Proposed Action will generate employment opportunities both in the short-term construction phase and the long-term operation, providing individuals with a means to pursue their socio-economic aspirations.			
§226-6 Objectives and policies for the economy— in general. (a) Planning for the State's economy in general shall be directed toward achievement of the following objectives: (1) Increased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawaiʻi's people. (2) A steady growing and diversified economic base that is not overly dependent on a few industries, and includes the development and expansion of industries on the neighbor islands. (b) To achieve the general economic objectives, it shall be the policy of this State to:			

Table 5-1: The Hawaiʽi State Plan	S	NS	N/A
(1) Promote and encourage entrepreneurship within Hawaiʽi by residents and nonresidents of the State.			X
(2) Expand Hawaiʽi's national and international marketing, communication, and organizational ties, to increase the State's capacity to adjust to and capitalize upon economic changes and opportunities occurring outside the State.			X
(3) Promote Hawaiʽi as an attractive market for environmentally and socially sound investment activities that benefit Hawaiʽi's people.			X
(4) Transform and maintain Hawaiʽi as a place that welcomes and facilitates innovative activity that may lead to commercial opportunities.			X
(5) Promote innovative activity that may pose initial risks, but ultimately contribute to the economy of Hawaii.			X
(6) Seek broader outlets for new or expanded Hawaiʽi business investments.			X
(7) Expand existing markets and penetrate new markets for Hawaiʽi's products and services.			X
(8) Assure that the basic economic needs of Hawaiʽi's people are maintained in the event of disruptions in overseas transportation.			X
(9) Strive to achieve a level of construction activity responsive to, and consistent with, state growth objectives.	X		
(10) Encourage the formation of cooperatives and other favorable marketing arrangements at the local or regional level to assist Hawaiʽi's small scale producers, manufacturers, and distributors.			X
(11) Encourage labor-intensive activities that are economically satisfying and which offer opportunities for upward mobility.	X		
(12) Encourage innovative activities that may not be labor-intensive, but may otherwise contribute to the economy of Hawaii.			X
(13) Foster greater cooperation and coordination between the public and private sectors in developing Hawaiʽi's employment and economic growth opportunities.			X
(14) Stimulate the development and expansion of economic activities which will benefit areas with substantial or expected employment problems.			X
(15) Maintain acceptable working conditions and standards for Hawaiʽi's workers.	X		
(16) Provide equal employment opportunities for all segments of Hawaiʽi's population through affirmative action and non-discrimination measures.			X
(17) Stimulate the development and expansion of economic activities capitalizing on defense, dual-use, and science and technology assets, particularly on the neighbor islands where employment opportunities may be limited.			X
(18) Encourage businesses that have favorable financial multiplier effects within Hawaiʽi's economy, particularly with respect to emerging industries in science and technology.			X
(19) Promote and protect intangible resources in Hawaiʽi, such as scenic beauty and the aloha spirit, which are vital to a healthy economy.			X

Table 5-1: The Hawai'i State Plan	S	NS	N/A
(20) Increase effective communication between the educational community and the private sector to develop relevant curricula and training programs to meet future employment needs in general, and requirements of new, potential growth industries in particular.			**X**
(21) Foster a business climate in Hawai'i- including attitudes, tax and regulatory policies, and financial and technical assistance programs-that is conducive to the expansion of existing enterprises and the creation and attraction of new business and industry.			**X**
Discussion: The Proposed Action will support the objectives and policies of the State for the economy – in general. The Proposed Action will contribute to the local economy on Hawai'i Island, directly and indirectly, during the construction period. The construction of the Proposed Action will create expenditures, a portion of which will be used towards the purchase of material from local suppliers. The employment of a local workforce will enable the use of income for local retail businesses. Furthermore, implementation of the Proposed Action will provide necessary work experience to help build the local skilled labor workforce. The Proposed Action will maintain/improve acceptable working conditions and standards by adhering to relevant labor laws, regulations, and industry best practices in terms of worker safety.			
§226-7 Objectives and policies for the economy— agriculture. (a) Planning for the State's economy with regard to agriculture shall be directed towards achievement of the following objectives: (1) Viability of Hawaii's sugar and pineapple industries. (2) Growth and development of diversified agriculture throughout the State. (3) An agriculture industry that continues to constitute a dynamic and essential component of Hawaii's strategic, economic, and social well-being To achieve the agriculture objectives, it shall be the policy of this State to:			
(1) Establish a clear direction for Hawaii's agriculture through stakeholder commitment and advocacy.			**X**
(2) Encourage agriculture by making the best use of natural resources.			**X**
(3) Provide the governor and the legislature with information and options needed for prudent decision-making for the development of agriculture.			**X**
(4) Establish strong relationships between the agricultural and visitor industries for mutual marketing benefits.			**X**
(5) Foster increased public awareness and understanding of the contributions and benefits of agriculture as a major sector of Hawai'i's economy.			**X**
(6) Seek the enactment and retention of federal and state legislation that benefits Hawai'i's agricultural industries.			**X**
(7) Strengthen diversified agriculture by developing an effective promotion, marketing, and distribution system between Hawai'i's food producers and consumers in the State, nation, and world.			**X**
(8) Support research and development activities that strengthen economic productivity in agriculture, stimulate greater efficiency, and enhance the development of new products and agricultural by-products.			**X**
(9) Enhance agricultural growth by providing public incentives and encouraging private initiatives.			**X**

Table 5-1: The Hawai'i State Plan	S	NS	N/A
(10) Assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs.			X
(11) Increase the attractiveness and opportunities for an agricultural education and livelihood.			X
(12) In addition to the State's priority on food, expand Hawai'i's agricultural base by promoting growth and development of flowers, tropical fruits and plants, livestock, feed grains, forestry, food crops, aquaculture, and other potential enterprises.			X
(13) Promote economically competitive activities that increase Hawai'i's agricultural self-sufficiency, including the increased purchase and use of Hawaii-grown food and food products by residents, businesses, and governmental bodies as defined under section 103D-104.			X
(14) Promote and assist in the establishment of sound financial programs for diversified agriculture			X
(15) Institute and support programs and activities to assist the entry of displaced agricultural workers into alternative agricultural or other employment.			X
(16) Facilitate the transition of agricultural lands in economically non-feasible agricultural production to economically viable agricultural uses.			X
(17) Perpetuate, promote, and increase use of traditional Hawaiian farming systems, such as the use of loko i'a, māla, and irrigated lo'i, and growth of traditional Hawaiian crops, such as kalo, 'uala, and 'ulu.			X
(18) Increase and develop small-scale farms.			X
Discussion: The Proposed Action will not impact any of the objectives and policies outlined above for the economy related to agriculture.			
226-8 Objective and policies for the economy— visitor industry. (a) Planning for the State's economy with regard to the visitor industry shall be directed towards the achievement of the objective of a visitor industry that constitutes a major component of steady growth for Hawai'i's economy. (b) To achieve the visitor industry objective, it shall be the policy of this State to:			
(1) Support and assist in the promotion of Hawai'i's visitor attractions and facilities.			X
(2) Ensure that visitor industry activities are in keeping with the social, economic, and physical needs and aspirations of Hawai'i's people.			X
(3) Improve the quality of existing visitor destination areas by utilizing Hawaii's strengths in science and technology.			X
(4) Encourage cooperation between the public and private sectors in developing and maintaining well-designed, adequately serviced visitor industry and related developments which are sensitive to neighboring communities and activities.			X
(5) Develop the industry in a manner that will continue to provide new job opportunities and steady employment for Hawai'i's people.			X
(6) Provide opportunities for Hawai'i's people to obtain job training and education that will allow for upward mobility within the visitor industry.			X

Table 5-1: The Hawaiʻi State Plan	S	NS	N/A
(7) Foster a recognition of the contribution of the visitor industry to Hawaiʻi's economy and the need to perpetuate the aloha spirit.			X
(8) Foster an understanding by visitors of the aloha spirit and of the unique and sensitive character of Hawaiʻi's cultures and values.			X
Discussion: The Proposed Action will not impact any of the objectives and policies outlined above for the economy related to the visitor industry.			
§226 9 Objective and policies for the economy— federal expenditures. (a) Planning for the State's economy with regard to federal expenditures shall be directed towards achievement of the objective of a stable federal investment base as an integral component of Hawaiʻi's economy. (b) To achieve the federal expenditures objective, it shall be the policy of this State to:			
(1) Encourage the sustained flow of federal expenditures in Hawaiʻi that generates long-term government civilian employment.			X
(2) Promote Hawaii's supportive role in national defense, in a manner consistent with Hawaii's social, environmental, and cultural goals by building upon dual-use and defense applications to develop thriving ocean engineering, aerospace research and development, and related dual-use technology sectors in Hawaii's economy.			X
(3) Promote the development of federally supported activities in Hawaiʻi that respect statewide economic concerns, are sensitive to community needs, and minimize adverse impacts on Hawaiʻi's environment.	X		
(4) Increase opportunities for entry and advancement of Hawaiʻi's people into federal government service.			X
(5) Promote federal use of local commodities, services, and facilities available in Hawaiʻi.	X		
(6) Strengthen federal-state-county communication and coordination in all federal activities that affect Hawaiʻi.			X
(7) Pursue the return of federally controlled lands in Hawaiʻi that are not required for either the defense of the nation or for other purposes of national importance, and promote the mutually beneficial exchanges of land between federal agencies, the State, and the counties.			X
Discussion: The Proposed Action will support the objectives and policies for the economy related to federal expenditures. The various improvements will be primarily funded by the County and may also utilize federal funds through the State of Hawai'i Department of Health (DOH) Clean Water State Revolving Fund (CWSRF) Program.			
§226-10 Objective and policies for the economy— potential growth and innovative activities. (a) Planning for the State's economy with regard to potential growth and innovative activities shall be directed towards achievement of the objective of development and expansion of potential growth and innovative activities that serve to increase and diversify Hawaiʻi's economic base. (b) To achieve the potential growth activity objective, it shall be the policy of this State to:			
(1) Facilitate investment and employment growth in economic activities that have the potential to expand and diversify Hawaii's economy, including but not limited to			X

Table 5-1: The Hawai'i State Plan	S	NS	N/A
diversified agriculture, aquaculture, renewable energy development, creative media, health care, and science and technology-based sectors.			
(2) Facilitate investment in innovative activity that may pose risks or be less labor-intensive than other traditional business activity, but if successful, will generate revenue in Hawai'i through the export of services or products or substitution of imported services or products.			X
(3) Encourage entrepreneurship in innovative activity by academic researchers and instructors who may not have the background, skill, or initial inclination to commercially exploit their discoveries or achievements.			X
(4) Recognize that innovative activity is not exclusively dependent upon individuals with advanced formal education, but that many self-taught, motivated individuals are able, willing, sufficiently knowledgeable, and equipped with the attitude necessary to undertake innovative activity.			X
(5) Increase the opportunities for investors in innovative activity and talent engaged in innovative activity to personally meet and interact at cultural, art, entertainment, culinary, athletic, or visitor-oriented events without a business focus.			X
(6) Expand Hawai'i's capacity to attract and service international programs and activities that generate employment for Hawai'i's people.			X
(7) Enhance and promote Hawai'i's role as a center for international relations, trade, finance, services, technology, education, culture, and the arts.			X
(8) Accelerate research and development of new energy-related industries based on wind, solar, ocean, and underground resources and solid waste.			X
(9) Promote Hawai'i's geographic, environmental, social, and technological advantages to attract new economic activities into the State.			X
(10) Provide public incentives and encourage private initiative to attract new industries that best support Hawai'i's social, economic, physical, and environmental objectives.			X
(11) Increase research and the development of ocean related economic activities such as mining, food production, and scientific research.			X
(12) Develop, promote, and support research and educational and training programs that will enhance Hawai'i's ability to attract and develop economic activities of benefit to Hawai'i.			X
(13) Foster a broader public recognition and understanding of the potential benefits of new, growth oriented industry in Hawai'i.			X
(14) Encourage the development and implementation of joint federal and state initiatives to attract federal programs and projects that will support Hawaii's social, economic, physical, and environmental objectives.			X
(15) Increase research and development of businesses and services in the telecommunications and information industries.			X
(16) Foster the research and development of nonfossil fuel and energy efficient modes of transportation			X

Table 5-1: The Hawai'i State Plan	S	NS	N/A
(17) Recognize and promote health care and health care information technology as growth industries.			X
Discussion: The Proposed Action will not impact any of the objectives and policies outlined above for the economy related to potential growth and innovative activities.			
226-10.5 Objectives and policies for the economy— information industry. (a) Planning for the State's economy with regard to telecommunications and information technology shall be directed toward recognizing that broadband and wireless communication capability and infrastructure are foundations for an innovative economy and positioning Hawai'i as a leader in broadband and wireless communications and applications in the Pacific Region. (b) To achieve the information industry objective, it shall be the policy of this State to:			
(1) Promote efforts to attain the highest speeds of electronic and wireless communication within Hawai'i and between Hawai'i and the world, and make high speed communication available to all residents and businesses in Hawaii			X
(2) Encourage the continued development and expansion of the telecommunications infrastructure serving Hawai'i to accommodate future growth and innovation in Hawaii's economy.			X
(3) Facilitate the development of new or innovative business and service ventures in the information industry which will provide employment opportunities for the people of Hawaii.			X
(4) Encourage mainland- and foreign-based companies of all sizes, whether information technology-focused or not, to allow their principals, employees, or contractors to live in and work from Hawaii, using technology to communicate with their headquarters, offices, or customers located out-of-state.			X
(5) Encourage greater cooperation between the public and private sectors in developing and maintaining a well-designed information industry.			X
(6) Ensure that the development of new businesses and services in the industry are in keeping with the social, economic, and physical needs and aspirations of Hawaii's people.			X
(7) Provide opportunities for Hawaii's people to obtain job training and education that will allow for upward mobility within the information industry.			X
(8) Foster a recognition of the contribution of the information industry to Hawaii's economy.			X
(9) Assist in the promotion of Hawai'i as a broker, creator, and processor of information in the Pacific.			X
Discussion: The Proposed Action will not impact any of the objectives or policies outlined above for the economy related to telecommunications and information technology industries.			
§226-11 Objectives and policies for the physical environment— land-based, shoreline, and marine resources. (a) The land-based, shoreline, and marine resources objectives are: (1) Prudent use of Hawai'i's land-based, shoreline, and marine resources. (2) Effective protection of Hawai'i's unique and fragile environmental resources.			

Table 5-1: The Hawai'i State Plan	S	NS	N/A
(b) To achieve the land-based, shoreline, and marine resources objectives, it shall be the policy of this State to:			
(1) Exercise an overall conservation ethic in the use of Hawai'i's natural resources.			X
(2) Ensure compatibility between land-based and water-based activities and natural resources and ecological systems.	X		
(3) Take into account the physical attributes of areas when planning and designing activities and facilities.	X		
(4) Manage natural resources and environs to encourage their beneficial and multiple use without generating costly or irreparable environmental damage.	X		
(5) Consider multiple uses in watershed areas, provided such uses do not detrimentally affect water quality and recharge functions.	X		
(6) Encourage the protection of rare or endangered plant and animal species and habitats native to Hawai'i.	X		
(7) Provide public incentives that encourage private actions to protect significant natural resources from degradation or unnecessary depletion.			X
(8) Pursue compatible relationships among activities, facilities, and natural resources.	X		
(9) Promote increased accessibility and prudent use of inland and shoreline areas for public recreational, educational, and scientific purposes.			X
Discussion: The Proposed Action will support the objective and policies for the physical environment related to land-based, shoreline, and marine resources. All native plants found on the site are relatively common. No significant adverse impacts on threatened or endangered species or their habitat are anticipated as a result of the Proposed Action. Project Site is located at the edge of the urban environment. The improvements will provide a facility for present and future generations. The project site is located approximately two miles away from the nearest coastline. There are no delineated or proposed wetlands in the project area and there are no direct hydrologic connections between the project area and nearby surface waters. No impacts to these resources are anticipated.			
§226-12 Objective and policies for the physical environment— scenic, natural beauty, and historic resources. (a) Planning for the State's physical environment shall be directed towards achievement of the objective of enhancement of Hawai'i's scenic assets, natural beauty, and multi-cultural/historical resources (b) To achieve the scenic, natural beauty, and historic resources objective, it shall be the policy of this State to:			
(1) Promote the preservation and restoration of significant natural and historic resources.	X		
(2) Provide incentives to maintain and enhance historic, cultural, and scenic amenities.			X
(3) Promote the preservation of views and vistas to enhance the visual and aesthetic enjoyment of mountains, ocean, scenic landscapes, and other natural features.	X		
(4) Protect those special areas, structures, and elements that are an integral and functional part of Hawai'i's ethnic and cultural heritage.	X		

Table 5-1: The Hawaiʽi State Plan	S	NS	N/A
(5) Encourage the design of developments and activities that complement the natural beauty of the islands.	X		
Discussion: The Proposed Action will support the objectives and policies for the physical environment related to scenic, natural beauty, and historic resources. The Proposed Action will minimize and prevent disturbance to significant natural and historic resources to the fullest reasonable extents possible. Through the AIS conducted, one historic property that was evaluated as eligible for listing on the National Register, shall not be impacted by the Proposed Project as its integrity and significance shall not be diminished. Additionally,11 historic properties have been identified within the Project Area. The AIS has adequately documented the location, extent, function, age, and construction methods of these properties. Archeological monitoring has been recommended during all ground disturbing activities to facilitate identification for information purposes. Although historic properties have been determined to require no further work, the County will consider further communication and coordination with identified stakeholders to develop feasible and reasonable accommodations on either preserving historic properties or alternatives that integrate the broader preservation goals of the Waikapuna property.			
§226-13 Objectives and policies for the physical environment— land, air, and water quality. (a) Planning for the State's physical environment with regard to land, air, and water quality shall be directed towards achievement of the following objectives: (1) Maintenance and pursuit of improved quality in Hawaiʽi's land, air, and water resources. (2) Greater public awareness and appreciation of Hawaiʽi's environmental resources. (b) To achieve the land, air, and water quality objectives, it shall be the policy of this State to:			
(1) Foster educational activities that promote a better understanding of Hawaiʽi's limited environmental resources.			X
(2) Promote the proper management of Hawaiʽi's land and water resources.	X		
(3) Promote effective measures to achieve desired quality in Hawaiʽi's surface, ground, and coastal waters.	X		
(4) Encourage actions to maintain or improve aural and air quality levels to enhance the health and well-being of Hawaiʽi's people.	X		
(5) Reduce the threat to life and property from erosion, flooding, tsunamis, hurricanes, earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters.			X
(6) Encourage design and construction practices that enhance the physical qualities of Hawaiʽi's communities.			X
(7) Encourage urban developments in close proximity to existing services and facilities.	X		
(8) Foster recognition of the importance and value of the land, air, and water resources to Hawaiʽi's people, their cultures and visitors.			X
Discussion: The Proposed Action supports the objectives and policies for the physical environment related to land, air, and water quality. The Proposed Action will improve wastewater treatment facilities to ensure wastewater treatment efficiency to maintain water resources quality for present and future generations. This will enhance the health and well-being of Hawaiʽi's people.			

Table 5-1: The Hawai'i State Plan	S	NS	N/A
Construction of the proposed action would involve land disturbing activities, which may result in short-term soil erosion impacts and generate temporary increases in fugitive dust. Construction activities must comply with the provisions of Hawaiʻi Administrative Rules, §11-60.1-33 on Fugitive Dust. Therefore, a dust control management plan will be developed which identifies and mitigates all activities that may generate airborne, visible fugitive dust. Measures to control airborne, visible fugitive dust from the road areas and during the various phases of construction will be incorporated into the project plans and specifications. Respective contractors would be responsible for adhering to air quality standards and minimizing air quality impacts during the various phases of construction. An air pollution control permit may be required to operate certain construction equipment, such as crushers or generator sets, which may be used during construction. If required, the contractor will be responsible for obtaining an air pollution control permit from the Clean Air Branch and complying with all applicable conditions and requirements. Air monitoring would also be required during construction. With the appropriate controls in place, no significant impacts on air quality are anticipated as a result of the proposed action. Any potential impacts on air quality would be mitigated by complying with the State DOH Administrative Rules, Title 11, Chapter 60 "Air Pollution Control". In the long-term, GHG emissions in the project area are not expected to increase as future land use plans proposed by DEM are expected to involve consolidation of existing solid waste management program components from the surrounding area. Soil erosion impacts would be mitigated by incorporating best management practices (BMP) and erosion control measures into the project plans and specifications. Specific measures may include but are not limited to phasing the project to minimize the total area of exposed soil at any given time, revegetating or stabilizing disturbed areas of soil as soon as possible after working, minimizing disturbance of soil during periods of heavy rain, applying protective covers to soil and material stockpiles, and installing appropriate erosion and sedimentation control devices during construction. In addition, the proposed action will comply with the requirements of Hawaiʻi County Code, Chapter 10, related to Erosion and Sedimentation Control. Following construction, exposed soils in the project area would be stabilized or re-vegetated to control erosion. Soil erosion impacts would also be mitigated through coordination with the appropriate agencies during permitting and construction. A NPDES permit for storm water runoff from construction activities is anticipated to be required as individual and/or cumulative soil disturbances in the project area may exceed one acre of land area. Any discharges related to project construction or operation activities will comply with applicable State Water Quality Standards as specified in HAR Chapter 11-54 Water Quality Standards and HAR Chapter 11-55 Water Pollution Control, Department of Health. The Proposed Action will be developed in an urbanized environment that is in close proximity to many available services and facilities within Nāʻālehu.			
§226-14 Objective and policies for facility systems— in general. (a) Planning for the State's facility systems in general shall be directed towards achievement of the objective of water, transportation, waste disposal, and energy and telecommunication systems that support statewide social, economic, and physical objectives. (b) To achieve the general facility systems objective, it shall be the policy of this State to :			
(1) Accommodate the needs of Hawai'i's people through coordination of facility systems and capital improvement priorities in consonance with state and county plans.	X		
(2) Encourage flexibility in the design and development of facility systems to promote prudent use of resources and accommodate changing public demands and priorities.	X		
(3) Ensure that required facility systems can be supported within resource capacities and at reasonable cost to the user.	X		

Table 5-1: The Hawai'i State Plan	S	NS	N/A
(4) Pursue alternative methods of financing programs and projects and cost-saving techniques in the planning, construction, and maintenance of facility systems.	X		
Discussion: The Proposed Action supports the objectives and policies for facility systems in general. The Proposed Action will result in the closer of the LCCs in the Naalehu area and develop a new WWTP facility to ensure wastewater treatment efficiency accommodating the needs of Hawai'i's present and future generations. Furthermore, future expansion of subsurface drip irrigation are planned to improve operating efficiency and support maintenance activities. The Proposed Action shall allow for flexibility in the design and development of the WWTP to best suite public needs,			
§226-15 Objectives and policies for facility systems— solid and liquid wastes. (b) Planning for the State's facility systems with regard to solid and liquid wastes shall be directed towards the achievement of the following objectives: (1) Maintenance of basic public health and sanitation standards relating to treatment and disposal of solid and liquid wastes. (2) Provision of adequate sewerage facilities of physical and economic activities that alleviate problems in housing, employment, mobility, and other areas. (c) To achieve solid and liquid waste objectives, it shall be the policy of this State to:			
(1) Encourage the adequate development of sewerage facilities that complement planned growth.	X		
(2) Promote re-use and recycling to reduce solid and liquid wastes and employ a conservation ethic.	X		
(3) Promote research to develop more efficient and economical treatment and disposals of solid and liquid wastes.			X
Discussion: The Proposed Action will support the objectives and policies for facility systems related to solid and liquid wastes. The Proposed Action will result in the closer of the LCCs in the Naalehu area and develop a new WWTP facility to ensure wastewater treatment efficiency accommodating the needs of Hawai'i's present and future generations. Furthermore, future expansion of subsurface drip irrigation are planned to improve operating efficiency and support maintenance activities.			
§226-16 Objective and policies for facility systems— water. (a) Planning for the State's facility systems with regard to water shall be directed towards achievement of the objective of the provision of water to adequately accommodate domestic, agricultural, commercial, industrial, recreational, and other needs within resource capacities. (b) To achieve the facility systems water objective, it shall be the policy of the State to:			
(1) Coordinate development of land use activities with existing and potential water supply.			X
(2) Support research and development of alternative methods to meet future water requirements well in advance of anticipated needs.			X
(3) Reclaim and encourage the productive use of runoff water and wastewater discharges.	X		
(4) Assist in improving the quality, efficiency, service, and storage capabilities of water systems for domestic and agricultural use.	X		

Table 5-1: The Hawaiʻi State Plan	S	NS	N/A
(5) Support water supply services to areas experiencing critical water problems.			X
(6) Promote water conservation programs and practices in government, private industry, and the general public to help ensure adequate water to meet long-term needs.			X
Discussion: The Proposed Action will support the objectives and policies for facility systems related to water. In anticipation of future development within Nāʻālehu, it is recommended that the Proposed Action design be rated to treat an average dry weather flow of 125,000 gpd. Drainage improvements shall be made onsite to maintain runoff conditions within the vicinity of the project area.			
§226-17 Objectives and policies for facility systems— transportation. (a) Planning for the State's facility systems with regard to transportation shall be directed towards the achievement of the following objectives: (1) An integrated multi-modal transportation system that services statewide needs and promotes the efficient, economical, safe, and convenient movement of people and goods. (2) A statewide transportation system consistent with planned growth objectives throughout the State (b) To achieve the transportation objectives, it shall be the policy of this State to:			
(1) Design, program, and develop a multi-modal system in conformance with desired growth and physical development as stated in this chapter.			X
(2) Coordinate state, county, federal, and private transportation activities and programs toward the achievement of statewide objectives.			X
(3) Encourage a reasonable distribution of financial responsibilities for transportation among participating governmental and private parties.			X
(4) Provide for improved accessibility to shipping, docking, and storage facilities.			X
(5) Promote a reasonable level and variety of mass transportation services that adequately meet statewide and community needs.			X
(6) Encourage transportation systems that serve to accommodate present and future development needs of communities.			X
(7) Encourage a variety of carriers to offer increased opportunities and advantages to inter-island movement of people and goods.			X
(8) Increase the capacities of airport and harbor systems and support facilities to effectively accommodate transshipment and storage needs.			X
(9) Encourage the development of transportation, systems and programs which would assist statewide economic growth and diversification.			X
(10) Encourage the design and development of transportation systems sensitive to the needs of affected communities and the quality of Hawaiʻi's natural environment.			X
(11) Encourage safe and convenient uses of low-cost, energy-efficient, non-polluting means of transportation.			X
(12) Coordinate intergovernmental land use and transportation planning activities to ensure the timely delivery of supporting transportation infrastructure in order to accommodate planned growth objectives.			X

Table 5-1: The Hawai`i State Plan	S	NS	N/A
(13) Encourage diversification of transportation modes and infrastructure to promote alternate fuels and energy efficiency.			X
Discussion: The Proposed Action will not impact any of the objectives and policies outlined above for facility systems related to transportation.			
§226-18 Objectives and policies for facility systems— energy. (a) Planning for the State's facility systems with regard to energy shall be directed toward the achievement of the following objectives, giving due consideration to all: (1) Dependable, efficient, and economical statewide energy and telecommunication systems capable of supporting the needs of the people. (2) Increased energy self-sufficiency through the reduction and ultimate elimination of Hawaii's dependence on imported fuels for electrical generation and ground transportation; (3) Greater diversification of energy generation in the face of threats to Hawaii's energy supplies and systems; (4) Reduction, avoidance, or sequestration of greenhouse gas emissions from energy supply and use; and (5) Utility models that make the social and financial interests of Hawaii's utility customers a priority.. (b) To achieve the energy objectives, it shall be the policy of this State to ensure the provision of adequate, reasonably priced, and dependable energy services to accommodate demand (c) To further achieve the energy objectives, it shall be the policy of this State to:			
(1) Support research and development as well as promote the use of renewable energy sources.			X
(2) Ensure a sufficient supply of energy to enable power systems to support the demands of growth.			X
(3) Base decisions of least-cost supply-side and demand-side energy resource options on a comparison of their total costs and benefits when a least-cost is determined by a reasonably comprehensive, quantitative, and qualitative accounting of their long-term, direct and indirect economic, environmental, social, cultural, and public health costs and benefits.			X
(4) Promote all cost-effective conservation of power and fuel supplies through measures, including: (A) Development of cost-effective demand-side management programs; (B) Education; (C) Adoption of energy-efficient practices and technologies; and (D) Increasing energy efficiency and decreasing energy use in public infrastructure.			X
(5) Ensure, to the extent that new supply-side resources are needed, that the development or expansion of energy systems uses the least-cost energy supply option and maximizes efficient technologies.			X
(6) Support research, development, demonstration, and use of energy efficiency, load management, and other demand-side management programs, practices, and technologies.			X
(7) Promote alternate fuels and transportation energy efficiency.			X

Table 5-1: The Hawai‘i State Plan	S	NS	N/A
(8) Support actions that reduce, avoid, or sequester greenhouse gases in utility, transportation, and industrial sector applications.			**X**
(9) Support actions that reduce, avoid, or sequester Hawaii's greenhouse gas emissions through agriculture and forestry initiatives.			**X**
(10) Provide priority handling and processing for all state and county permits required for renewable energy projects.			**X**
(11) Ensure that liquefied natural gas is used only as a cost-effective transitional, limited-term replacement of petroleum for electricity generation and does not impede the development and use of other cost-effective renewable energy sources.			**X**
(12) Promote the development of indigenous geothermal energy resources that are located on public trust land as an affordable and reliable source of firm power for Hawaii.			**X**
Discussion: The Proposed Action will not impact any of the objectives and policies outlined above for facility systems related to energy.			
§226-18.5 Objectives and policies for facility systems— telecommunications. (a) Planning for the State's telecommunications facility systems shall be directed towards the achievement of dependable, efficient, and economical statewide telecommunications systems capable of supporting the needs of the people. (b) To achieve the telecommunications objective, it shall be the policy of this State to ensure the provision of adequate, reasonably priced, and dependable telecommunications services to accommodate demand. (c) To further achieve the telecommunications objective, it shall be the policy of this State to:			
(1) Facilitate research and development of telecommunication systems and resources.			**X**
(2) Encourage public and private sector efforts to develop means for adequate, ongoing telecommunication planning.			**X**
(3) Promote efficient management and use of existing telecommunication systems and services.			**X**
(4) Facilitate the development of education and training of telecommunication personnel.			**X**
Discussion: The Proposed Action will not impact any of the objectives and policies outlined above for facility systems related to telecommunications.			
§226-19 Objectives and policies for socio-cultural advancement— housing. (a) Planning for the State's socio-cultural advancement with regard to housing shall be directed toward the achievement of the following objectives: (1) Greater opportunities for Hawaii's people to secure reasonably priced, safe, sanitary, and livable homes, located in suitable environments that satisfactorily accommodate the needs and desires of families and individuals, through collaboration and cooperation between government and nonprofit and for-profit developers to ensure that more rental and for sale affordable housing is made available to extremely low-, very low-, lower-, moderate-, and above moderate-income segments of Hawaii's population. (2) The orderly development of residential areas sensitive to community needs and other land uses.			

Table 5-1: The Hawai'i State Plan	S	NS	N/A
(3) The development and provision of affordable rental housing by the State to meet the housing needs of Hawaii's people. (b) To achieve the housing objectives, it shall be the policy of this State to:			
(1) Effectively accommodate the housing needs of Hawai'i's people.			**X**
(2) Stimulate and promote feasible approaches that increase affordable rental and for sale housing choices for extremely low-, very low-, lower-, moderate-, and above moderate-income households.			**X**
(3) Increase homeownership and rental opportunities and choices in terms of quality, location, cost, densities, style, and size of housing.			**X**
(4) Promote appropriate improvement, rehabilitation, and maintenance of existing housing units and residential areas.			**X**
(5) Promote design and location of housing developments taking into account the physical setting, accessibility to public facilities and services, and other concerns of existing communities and surrounding areas.			**X**
(6) Facilitate the use of available vacant, developable, and underutilized urban lands for housing.			**X**
(7) Foster a variety of lifestyles traditional to Hawai'i through the design and maintenance of neighborhoods that reflect the cultures and values of the community.			**X**
(8) Promote research and development of methods to reduce the cost of housing construction in Hawai'i.			**X**
Discussion: The Proposed Action will not impact the objectives and policies for socio-cultural advancement related to housing.			
§226-20 Objectives and policies for socio-cultural advancement— health. (a) Planning for the State's socio-cultural advancement with regard to health shall be directed towards achievement of the following objectives: (1) Fulfillment of basic individual health needs of the general public. (2) Maintenance of sanitary and environmentally healthful conditions in Hawai'i's communities. (3) Elimination of health disparities by identifying and addressing social determinants of health. (b) To achieve the health objectives, it shall be the policy of this State to:			
(1) Provide adequate and accessible services and facilities for prevention and treatment of physical and mental health problems, including substance abuse.			**X**
(2) Encourage improved cooperation among public and private sectors in the provision of health care to accommodate the total health needs of individuals throughout the State.			**X**
(3) Encourage public and private efforts to develop and promote statewide and local strategies to reduce health care and related insurance costs.			**X**
(4) Foster an awareness of the need for personal health maintenance and preventive health care through education and other measures.			**X**

Table 5-1: The Hawai`i State Plan	S	NS	N/A
(5) Provide programs, services, and activities that ensure environmentally healthful and sanitary conditions.	**X**		
(6) Improve the State's capabilities in preventing contamination by pesticides and other potentially hazardous substances through increased coordination, education, monitoring, and enforcement			**X**
(7) Prioritize programs, services, interventions, and activities that address identified social determinants of health to improve native Hawaiian health and well-being consistent with the United States Congress' declaration of policy as codified in title 42 United States Code section 11702, and to reduce health disparities of disproportionately affected demographics, including native Hawaiians, other Pacific Islanders, and Filipinos. The prioritization of affected demographic groups other than native Hawaiians may be reviewed every ten years and revised based on the best available epidemiological and public health data.			**X**
Discussion: The Proposed Action will support the objectives and policies for socio-cultural advancement regarding health. The Proposed Action will undertake the construction of critical wastewater treatment facilities to improve treatment processes and fulfill objectives and policies related to socio-cultural advancements with regards to health.			
§226-21 Objective and policies for socio-cultural advancement— education. (a) Planning for the State's socio-cultural advancement with regard to education shall be directed towards achievement of the objective of the provision of a variety of educational opportunities to enable individuals to fulfill their needs, responsibilities, and aspirations. (b) To achieve the education objective, it shall be the policy of this State to:			
(1) Support educational programs and activities that enhance personal development, physical fitness, recreation, and cultural pursuits of all groups.			**X**
(2) Ensure the provision of adequate and accessible educational services and facilities that are designed to meet individual and community needs.			**X**
(3) Provide appropriate educational opportunities for groups with special needs.			**X**
(4) Promote educational programs which enhance understanding of Hawaii's cultural heritage.			**X**
(5) Provide higher educational opportunities that enable Hawaii's people to adapt to changing employment demands.			**X**
(6) Assist individuals, especially those experiencing critical employment problems or barriers, or undergoing employment transitions, by providing appropriate employment training programs and other related educational opportunities.			**X**
(7) Promote programs and activities that facilitate the acquisition of basic skills, such as reading, writing, computing, listening, speaking, and reasoning.			**X**
(8) Emphasize quality educational programs in Hawaii's institutions to promote academic excellence.			**X**
(9) Support research programs and activities that enhance the education programs of the State.			**X**
Discussion: The Proposed Action will not impact the objectives and policies of the State for the socio-cultural advancement regarding education.			

Table 5-1: The Hawaiʻi State Plan	S	NS	N/A
§226-22 Objective and policies for socio-cultural advancement— social services. (a) Planning for the State's socio-cultural advancement with regard to social services shall be directed towards the achievement of the objective of improved public and private social services and activities that enable individuals, families, and groups to become more self-reliant and confident to improve their well-being. (b) To achieve the social services objective, it shall be the policy of this State to:			
(1) Assist individuals, especially those in need of attaining a minimally adequate standard of living and those confronted by social and economic hardship conditions, through social services and activities within the State's fiscal capacities.			**X**
(2) Promote coordination and integrative approaches among public and private agencies and programs to jointly address social problems that will enable individuals, families, and groups to deal effectively with social problems and to enhance their participation in society.			**X**
(3) Facilitate the adjustment of new residents, especially recently arrived immigrants, into Hawai'i's communities			**X**
(4) Promote alternatives to institutional care in the provision of long-term care for elder and disabled populations.			**X**
(5) Support public and private efforts to prevent domestic abuse and child molestation, and assist victims of abuse and neglect.			**X**
(6) Promote programs which assist people in need of family planning services to enable them to meet their needs.			**X**
Discussion: The Proposed Action will not impact the objectives and policies for socio-cultural advancement related to social services.			
§226-23 Objective and policies for socio-cultural advancement— leisure. (a) Planning for the State's socio-cultural advancement with regard to leisure shall be directed towards the achievement of the objective of the adequate provision of resources to accommodate diverse cultural, artistic, and recreational needs for present and future generations. (b) To achieve the leisure objective, it shall be the policy of this State to:			
(1) Foster and preserve Hawaiʻi's multi-cultural heritage through supportive cultural, artistic, recreational, and humanities-oriented programs and activities.			**X**
(2) Provide a wide range of activities and facilities to fulfill the cultural, artistic, and recreational needs of all diverse and special groups effectively and efficiently.			**X**
(3) Enhance the enjoyment of recreational experiences through safety and security measures, educational opportunities, and improved facility design and maintenance.			**X**
(4) Promote the recreational and educational potential of natural resources having scenic, open space, cultural, historical, geological, or biological values while ensuring that their inherent values are preserved			**X**
(5) Ensure opportunities for everyone to use and enjoy Hawaiʻi's recreational resources.			**X**

Table 5-1: The Hawaiʽi State Plan	S	NS	N/A
(6) Assure the availability of sufficient resources to provide for future cultural, artistic, and recreational needs			X
(7) Provide adequate and accessible physical fitness programs to promote the physical and mental well-being of Hawaiʻi's people.			X
(8) Increase opportunities for appreciation and participation in the creative arts, including the literary, theatrical, visual, musical, folk, and traditional art forms.			X
(9) Encourage the development of creative expression in the artistic disciplines to enable all segments of Hawaiʻi's population to participate in the creative arts.			X
(10) Assure adequate access to significant natural and cultural resources in public ownership.			X
Discussion: The Proposed Action will not impact the objectives and policies for socio-cultural advancement related to leisure.			
§**226-24 Objective and policies for socio-cultural advancement-—-individual rights and personal well-being.** (a) Planning for the State's socio-cultural advancement with regard to individual rights and personal well-being shall be directed towards achievement of the objective of increased opportunities and protection of individual rights to enable individuals to fulfill their socio-economic needs and aspirations. (b) To achieve the individual rights and personal wellbeing objective, it shall be the policy of this State to:			
(1) Provide effective services and activities that protect individuals from criminal acts and unfair practices and that alleviate the consequences of criminal acts in order to foster a safe and secure environment.			X
(2) Uphold and protect the national and state constitutional rights of every individual.			X
(3) Assure access to, and availability of, legal assistance, consumer protection, and other public services which strive to attain social justice.			X
(4) Ensure equal opportunities for individual participation in society.			X
Discussion: The Proposed Action will not impact the objectives and policies for socio-cultural advancement related to individual rights and personal well-being.			
§226-25 Objective and policies for socio-cultural advancement— culture. (a) Planning for the State's socio-cultural advancement with regard to culture shall be directed toward the achievement of the objective of enhancement of cultural identities, traditions, values, customs, and arts of Hawaiʽi's people. (b) To achieve the culture objective, it shall be the policy of this State to:			
(1) Foster increased knowledge and understanding of Hawaiʽi's ethnic and cultural heritages and the history of Hawaiʽi.			X
(2) Support activities and conditions that promote cultural values, customs, and arts that enrich the lifestyles of Hawaiʽi's people and which are sensitive and responsive to family and community needs.			X
(3) Encourage increased awareness of the effects of proposed public and private actions on the integrity and quality of cultural and community lifestyles in Hawaiʽi.			X

Table 5-1: The Hawai'i State Plan	S	NS	N/A
(4) Encourage the essence of the aloha spirit in people's daily-activities to promote harmonious relationships among Hawai'i's people and visitors.			X
Discussion: The Proposed Action will not impact the objectives and policies for socio-cultural advancement related to culture.			
§226-26 Objectives and policies for socio-cultural advancement— public safety.			
(a) Planning for the State's socio-cultural advancement with regard to public safety shall be directed towards the achievement of the following objectives:			
(1) Assurance of public safety and adequate protection of life and property for all people.			
(2) Optimum organizational readiness and capability in all phases of emergency management to maintain the strength, resources, and social and economic well-being of the community in the event of civil disruptions, wars, natural disasters, and other major disturbances.			
(3) Promotion of a sense of community responsibility for the welfare and safety of Hawai'i's			
(b) To achieve the public safety programs objectives, it shall be the policy of this State to:			
(1) Ensure that public safety programs are effective and responsive to community needs.			X
(2) Encourage increased community awareness and participation in public safety programs.			X
(c) To achieve the public safety programs objectives, it shall be the policy of this State to:			
(1) Support criminal justice programs aimed at preventing and curtailing criminal activities.			X
(2) Develop a coordinated, systematic approach to criminal justice administration among all criminal justice agencies.			X
(3) Provide a range of correctional resources which may include facilities and alternatives to traditional incarceration in order to address the varied security needs of the community and successfully reintegrate offenders into the community.			X
(d) To further achieve public safety objectives related to emergency management, it shall be the policy of this State to:			
(1) Ensure that responsible organizations are in a proper state of readiness to respond to major war related, natural, or technological disasters and civil disturbances at all times.			X
(2) Enhance the coordination between emergency management programs throughout the State.			X
Discussion: The Proposed Action will not impact the objectives and policies for socio-cultural advancement related to public safety.			
§226-27 Objectives and policies for socio-cultural advancement— government.			
(a) Planning the State's socio-cultural advancement with regard to government shall be directed towards the achievement of the following objectives:			
(1) Efficient, effective, and responsive government services at all levels in the State.			

Table 5-1: The Hawai`i State Plan	S	NS	N/A
(2) Fiscal integrity, responsibility and efficiency in the state government and county governments. (b) To achieve the government objectives, it shall be the policy of this State to:			
(1) Provide for necessary public goods and services not assumed by the private sector.	X		
(2) Pursue an openness and responsiveness in government that permits the flow of public information, interaction, and response.			X
(3) Minimize the size of government to that necessary to be effective.			X
(4) Stimulate the responsibility in citizens to productively participate in government for a better Hawai`i.			X
(5) Assure that government attitudes, actions, and services are sensitive to community needs and concerns.	X		
(6) Provide for a balanced fiscal budget.			X
(7) Improve the fiscal budgeting and management system of the State.			X
(8) Promote the consolidation of state and county governmental functions to increase the effective and efficient delivery of government programs and services and to eliminate duplicative services wherever feasible.			X
Discussion: The Proposed Action will support the objectives and policies for socio-cultural advancement related to government. The COH-DEM is proposing to undertake the construction of critical facilities to improve wastewater treatment processes in the Nā'ālehu community. Therefore, the project supports the achievements of the objectives and policies for socio-cultural advancement with regards to government.			

PART III. PRIORITY GUIDELINES

Part III of the Hawai`i State Plan establishes the overall priority guidelines to address areas of statewide concern. Under HRS § 226-102, "*The State shall strive to improve the quality of life for Hawai`i's present and future population through the pursuit of desirable courses of action in seven major areas of Statewide concern which merit priority attention: economic development, population growth and land resource management, affordable housing, crime and criminal justice, quality education, principles of sustainability, and climate change adaptation*."

Table 5-2: Part III of the Hawai`i State Plan	S	NS	N/A
§226-103 Economic priority guidelines. (a) Priority guidelines to stimulate economic growth and encourage business expansion and development to provide needed jobs for Hawai`i's people and achieve a stable and diversified economy:			
(1) Seek a variety of means to increase the availability of investment capital for new and expanding enterprises.			X

Table 5-2: Part III of the Hawaiʻi State Plan	S	NS	N/A
(2) Encourage the expansion of technological research to assist industry development and support the development and commercialization of technological advancements.			X
(3) Improve the quality, accessibility, and range of services provided by government to business, including data and reference services and assistance in complying with governmental regulations.			X
(4) Seek to ensure that state business tax and labor laws and administrative policies are equitable, rational, and predictable.			X
(5) Streamline the building and development permit and review process, and eliminate or consolidate other burdensome or duplicative governmental requirements imposed on business, where public health, safety, and welfare would not be adversely affected.			X
(6) Encourage the formation of cooperatives and other favorable marketing or distribution arrangements at the regional or local level to assist Hawaiʻi's small-scale producers, manufacturers, and distributors.			X
(7) Continue to seek legislation to protect Hawaiʻi from transportation interruptions between Hawaiʻi and the continental United States.			X
(8) Provide public incentives and encourage private initiative to develop and attract industries which promise long-term growth potentials and which have the following characteristics: (a) An industry that can take advantage of Hawaiʻi's unique location and available physical and human resources. (b) A clean industry that would have minimal adverse effects on Hawaiʻi's environment. (c) An industry that is willing to hire and train Hawaiʻi's people to meet the industry's labor needs. (d) An industry that would provide reasonable income and steady employment.			X
(9) Support and encourage, through educational and technical assistance programs and other means, expanded opportunities for employee ownership and participation in Hawaiʻi business.			X
(10) Enhance the quality of Hawaiʻi's labor force and develop and maintain career opportunities for Hawaiʻi's people through the following actions: (a) Expand vocational training in diversified agriculture, aquaculture, and other areas where growth is desired and feasible. (b) Encourage more effective career counseling and guidance in high schools and post-secondary institutions to inform students of present and future career opportunities. (c) Allocate educational resources to career areas where high employment is expected and where growth of new industries is desired. (d) Promote career opportunities in all industries for Hawaiʻi's people by encouraging firms doing business in the State to hire residents. (e) Promote greater public and private sector cooperation in determining industrial training needs and in developing relevant curricula and on-the-job training opportunities.			X

Table 5-2: Part III of the Hawai‘i State Plan	S	NS	N/A
(f) Provide retraining programs and other support services to assist entry of displaced workers into alternative employment.			
(b) Priority guidelines to promote the economic health and quality of the visitor industry:			
(1) Promote visitor satisfaction by fostering an environment which enhances the Aloha Spirit and minimizes inconveniences to Hawai‘i's residents and visitors.			**X**
(2) Encourage the development and maintenance of well-designed, adequately serviced hotels and resort destination areas which are sensitive to neighboring communities and activities and which provides for adequate shoreline setbacks and beach access.			**X**
(3) Support appropriate capital improvements to enhance the quality of existing resort destination areas and provide incentives to encourage investment in upgrading, repair, and maintenance of visitor facilities.			**X**
(4) Encourage visitor industry practices and activities which respect, preserve, and enhance Hawai‘i's significant natural, scenic, historic, and cultural resources.			**X**
(5) Develop and maintain career opportunities in the visitor industry for Hawai‘i's people, with emphasis on managerial positions.			**X**
(6) Support and coordinate tourism promotion abroad to enhance Hawai‘i's share of existing and potential visitor markets.			**X**
(7) Maintain and encourage a more favorable resort investment climate consistent with the objectives of this chapter.			**X**
(8) Support law enforcement activities that provide a safer environment for both visitors and residents alike.			**X**
(c) Priority guidelines to promote the continued viability of the sugar and pineapple industries:			
(1) Provide adequate agricultural lands to support the economic viability of the sugar and pineapple industries.			**X**
(2) Continue efforts to maintain federal support to provide stable sugar prices high enough to allow profitable operations in Hawai‘i.			**X**
(3) Support research and development, as appropriate, to improve the quality and production of sugar and pineapple crops.			**X**
(d) Priority guidelines to promote the growth and development of diversified agriculture and aquaculture:			
(1) Identify, conserve, and protect agricultural and aquacultural lands of importance and initiate affirmative and comprehensive programs to promote economically productive agricultural and aquacultural uses of such lands.			**X**
(2) Assist in providing adequate, reasonably priced water for agricultural activities.			**X**
(3) Encourage public and private investment to increase water supply and to improve transmission, storage, and irrigation facilities in support of diversified agriculture and aquaculture.			**X**
(4) Assist in the formation and operation of production and marketing associations and cooperatives to reduce production and marketing costs.			**X**

Table 5-2: Part III of the Hawai‘i State Plan	S	NS	N/A
(5) Encourage and assist with the development of a waterborne and airborne freight and cargo system capable of meeting the needs of Hawai‘i's agricultural community			X
(6) Seek favorable freight rates for Hawai‘i's agricultural products from interisland and overseas transportation operators.			X
(7) Encourage the development and expansion of agricultural and aquacultural activities which offer long-term economic growth potential and employment opportunities.			X
(8) Continue the development of agricultural parks and other programs to assist small independent farmers in securing agricultural lands and loans.			X
(9) Require agricultural uses in agricultural subdivisions and closely monitor the uses in these subdivisions.			X
(e) Priority guidelines for water use and development:			
(1) Maintain and improve water conservation programs to reduce the overall water consumption rate.			X
(2) Encourage the improvement of irrigation technology and promote the use of non-potable water for agricultural and landscaping purposes.			X
(3) Increase the support for research and development of economically feasible alternative water sources.			X
(4) Explore alternative funding sources and approaches to support future water development programs and water system improvements.			X
(f) Priority guidelines for energy use and development:			
(1) Encourage the development, demonstration, and commercialization of renewable energy sources.			X
(2) Initiate, maintain, and improve energy conservation programs aimed at reducing energy waste and increasing public awareness of the need to conserve energy.			X
(3) Provide incentives to encourage the use of energy conserving technology in residential, industrial, and other buildings.			X
(4) Encourage the development and use of energy conserving and cost-efficient transportation systems.			X
(g) Priority guidelines to promote the development of the information industry:			
(1) Establish an information network, with an emphasis on broadband and wireless infrastructure and capability that will serve as the foundation of and catalyst for overall economic growth and diversification in Hawaii.			X
(2) Encourage the development of services such as financial data processing, a products and services exchange, foreign language translations, telemarketing, teleconferencing, a twenty-four-hour international stock exchange, international banking, and a Pacific Rim management center.			X
(3) Encourage the development of small businesses in the information field such as software development; the development of new information systems, peripherals,			X

Table 5-2: Part III of the Hawai‘i State Plan	S	NS	N/A
and applications; data conversion and data entry services; and home or cottage services such as computer programming, secretarial, and accounting services.			
(4) Encourage the development or expansion of educational and training opportunities for residents in the information and telecommunications fields.			X
(5) Encourage research activities, including legal research in the information and telecommunications fields.			X
(6) Support promotional activities to market Hawai'i's information industry services.			X
(7) Encourage the location or co-location of telecommunication or wireless information relay facilities in the community, including public areas, where scientific evidence indicates that the public health, safety, and welfare would not be adversely affected.			X
Discussion: The Proposed Action will not impact the objectives and policies outlined within the Hawai‘i State plan for economic priority guidelines.			
§226-104 Population growth and land resources priority guidelines. (a) Priority guidelines to effect desired statewide growth and distribution:			
(1) Encourage planning and resource management to ensure that population growth rates throughout the State are consistent with available and planned resource capacities and reflect the needs and desires of Hawai‘i's people.	X		
(2) Manage a growth rate for Hawai‘i's economy that will parallel future employment needs for Hawai‘i's people.			X
(3) Ensure that adequate support services and facilities are provided to accommodate the desired distribution of future growth throughout the State.	X		
(4) Encourage major state and federal investments and services to promote economic development and private investment to the neighbor islands, as appropriate.			X
(5) Explore the possibility of making available urban land, low-interest loans, and housing subsidies to encourage the provision of housing to support selective economic and population growth on the neighbor islands.			X
(6) Seek federal funds and other funding sources outside the State for research, program development, and training to provide future employment opportunities on the neighbor islands.			X
(7) Support the development of high technology parks on the neighbor islands.			X
(b) Priority guidelines for regional growth distribution and land resource utilization:			
(1) Encourage urban growth primarily to existing urban areas where adequate public facilities are already available or can be provided with reasonable public expenditures and away from areas where other important benefits are present, such as protection of important agricultural land or preservation of lifestyles.			X
(2) Make available marginal or non-essential agricultural lands for appropriate urban uses while maintaining agricultural lands of importance in the agricultural district.			X
(3) Restrict development when drafting of water would result in exceeding the sustainable yield or in significantly diminishing the recharge capacity of any groundwater area.			X

Table 5-2: Part III of the Hawai‘i State Plan	S	NS	N/A
(4) Encourage restriction of new urban development in areas where water is insufficient from any source for both agricultural and domestic use.			X
(5) In order to preserve green belts, give priority to state capital improvement funds which encourage location of urban development within existing urban areas except where compelling public interest dictates development of a non-contiguous new urban core.			X
(6) Seek participation from the private sector for the cost of building infrastructure and utilities, and maintaining open spaces.			X
(7) Pursue rehabilitation of appropriate urban areas.			X
(8) Support the redevelopment of Kaka‘ako into a viable residential, industrial, and commercial community.			X
(9) Direct future urban development away from critical environmental areas or impose mitigating measures so that negative impacts on the environment would be minimized.	X		
(10) Identify critical environmental areas in Hawai‘i to include but not be limited to the following: watershed and recharge areas; wildlife habitats (on land and in the ocean); areas with endangered species of plants and wildlife; natural streams and water bodies; scenic and recreational shoreline resources; open space and natural areas; historic and cultural sites; areas particularly sensitive to reduction in water and air quality; and scenic resources.			X
(11) Identify all areas where priority should be given to preserving rural character and lifestyle.			X
(12) Utilize Hawai‘i's limited land resources wisely, providing adequate land to accommodate projected population and economic growth needs while ensuring the protection of the environment and the availability of the shoreline, conservation lands, and other limited resources for future generations.	X		
(13) Protect and enhance Hawai‘i's shoreline, open spaces, and scenic resources.			X
Discussion: The Proposed Action will support the objectives and policies for Population Growth and Land Resources Priority Guidelines. The Proposed Action aims to construct a new wastewater treatment system for the Nāʻālehu community. The Proposed Action is necessary to ensure that adequate support services and facilities are provided. The Proposed Action will occur in an existing urban area in close proximity to other services and facilities. Additionally, the construction and operation of the Proposed Action will implement appropriate mitigation measures to minimize and avoid any negative impacts on the environment.			
§226-105 Crime and criminal justice Priority guidelines in the area of crime and criminal justice:			
(1) Support law enforcement activities and other criminal justice efforts that are directed to provide a safer environment.			X
(2) Target state and local resources on efforts to reduce the incidence of violent crime and on programs relating to the apprehension and prosecution of repeat offenders.			X
(3) Support community and neighborhood program initiatives that enable residents to assist law enforcement agencies in preventing criminal activities.			X

Table 5-2: Part III of the Hawai'i State Plan	S	NS	N/A
(4) Reduce overcrowding or substandard conditions in correctional facilities through a comprehensive approach among all criminal justice agencies which may include sentencing law revisions and use of alternative sanctions other than incarceration for persons who pose no danger to their community.			X
(5) Provide a range of appropriate sanctions for juvenile offenders, including community-based programs and other alternative sanctions.			X
(6) Increase public and private efforts to assist witnesses and victims of crimes and to minimize the costs of victimization.			X
Discussion: The Proposed Action will not impact the objectives and policies outlined within the Hawai'i State plan related to crime and criminal activity.			
§226-106 Affordable housing Priority guidelines for the provision of affordable housing:			
(1) Seek to use marginal or non-essential agricultural land and public land to meet housing needs of low and moderate-income and gap-group households.			X
(2) Encourage the use of alternative construction and development methods as a means of reducing production costs.			X
(3) Improve information and analysis relative to land availability and suitability for housing.			X
(4) Create incentives for development which would increase home ownership and rental opportunities for Hawai'i's low and moderate-income households, gap-group households, and residents with special needs.			X
(5) Encourage continued support for government or private housing programs that provide low interest mortgages to Hawai'i's people for the purchase of initial owner-occupied housing.			X
(6) Encourage public and private sector cooperation in the development of rental housing alternatives.			X
(7) Encourage improved coordination between various agencies and levels of government to deal with housing policies and regulations.			X
(8) Give higher priority to the provision of quality housing that is affordable for Hawaii's residents and less priority to development of housing intended primarily for individuals outside of Hawaii.			X
Discussion: The Proposed Action will not impact the objectives and policies outlined within the Hawai'i State plan related to affordable housing.			
§226-107 Quality education. Priority guidelines to promote quality education:			
(1) Pursue effective programs which reflect the varied district, school, and student needs to strengthen basic skills achievement.			X
(2) Continue emphasis on general education "core" requirements to provide common background to students and essential support to other university programs.			X
(3) Initiate efforts to improve the quality of education by improving the capabilities of the education work force.			X

Table 5-2: Part III of the Hawai'i State Plan	S	NS	N/A
(4) Promote increased opportunities for greater autonomy and flexibility of educational institutions in their decision-making responsibilities.			X
(5) Increase and improve the use of information technology in education by the availability of telecommunications equipment for: (A) The electronic exchange of information; (B) Statewide electronic mail; and (C) Access to the Internet. Encourage programs that increase the public's awareness and understanding of the impact of information technologies on our lives.			X
(6) Pursue the establishment of Hawai'i's public and private universities and colleges as research and training centers of the Pacific.			X
(7) Develop resources and programs for early childhood education.			X
(8) Explore alternatives for funding and delivery of educational services to improve the overall quality of education.			X
(9) Strengthen and expand educational programs and services for students with special needs.			X
Discussion: The Proposed Action will not impact the objectives and policies outlined within the Hawai'i State plan related to quality education.			
§226-108 Sustainability. Priority guidelines and principles to promote sustainability:			
(1) Encouraging balanced economic, social, community, and environmental priorities.			X
(2) Encouraging planning that respects and promotes living within the natural resources and limits of the State.	X		
(3) Promoting a diversified and dynamic economy.	X		
(4) Encouraging respect for the host culture.			X
(5) Promoting decisions based on meeting the needs of the present without compromising the needs of future generations.	X		
(6) Considering the principles of the ahupua'a system.	X		
(7) Emphasizing that everyone, including individuals, families, communities, businesses, and government, has the responsibility for achieving a sustainable Hawai'i.			X
Discussion: The Proposed Action will support the priority guidelines and principles regarding sustainability. Public infrastructure, such as wastewater systems, are essential to building a strong economy, protecting the environment, and providing an enhanced quality of life. The Proposed Action seeks to rehabilitate aging wastewater infrastructure to provide effective and efficient treatment of wastewater. The Proposed Action supports sustainable economic development and growth through the creation of short-term construction and long-term operations employment opportunities.			
§226-109 Climate change adaptation. Priority guidelines for climate change adaptation:			
(1) Ensure that Hawaii's people are educated, informed, and aware of the impacts climate change may have on their communities.			X

Table 5-2: Part III of the Hawai'i State Plan	S	NS	N/A
(2) Encourage community stewardship groups and local stakeholders to participate in planning and implementation of climate change policies.			X
(3) Invest in continued monitoring and research of Hawaii's climate and the impacts of climate change on the State.			X
(4) Consider native Hawaiian traditional knowledge and practices in planning for the impacts of climate change.			X
(5) Encourage the preservation and restoration of natural landscape features, such as coral reefs, beaches and dunes, forests, streams, floodplains, and wetlands that have the inherent capacity to avoid, minimize, or mitigate the impacts of climate change.			X
(6) Explore adaptation strategies that moderate harm or exploit beneficial opportunities in response to actual or expected climate change impacts to the natural and built environments.			X
(7) Promote sector resilience in areas such as water, roads, airports, and public health, by encouraging the identification of climate change threats, assessment of potential consequences, and evaluation of adaptation options.	X		
(8) Foster cross-jurisdictional collaboration between county, state, and federal agencies and partnerships between government and private entities and other nongovernmental entities, including nonprofit entities.	X		
(9) Use management and implementation approaches that encourage the continual collection, evaluation, and integration of new information and strategies into new and existing practices, policies, and plans.			X
(10) Encourage planning and management of the natural and built environments that effectively integrate climate change policy.			X
Discussion: The Proposed Action will support the priority guideline policies and objectives related to climate change adaptation. The Proposed Action serves to provide effective and efficient treatment of wastewater for the Nāʻālehu community. The various improvements will be primarily funded by the County and may also utilize federal funds through the State of Hawai'i Department of Health (DOH) Clean Water State Revolving Fund (CWSRF) Program.			

5.1.2 State Functional Plans

The Hawaiʻi State Plan directs appropriate State agencies to prepare Functional Plans which address statewide needs, problems, and issues, and recommend policies and actions to mitigate those problems. The Functional Plans are prepared to further define and implement statewide goals, objectives, policies, and priority guidelines contained in the Hawaiʻi State Plan. Thirteen Functional Plans were prepared to implement the State Plan provisions in the areas of agriculture, conservation lands, education, employment, energy, health, higher education, historic preservation, housing, human services, recreation, tourism, and transportation.

	Table 5-3: Hawai'i State Functional Plans	S	NS	N/A
1	**Agricultural State Functional Plan (1991)**			
Purpose: Continued viability of agriculture throughout the State.				X

Table 5-3: Hawai'i State Functional Plans		S	NS	N/A
Discussion: The Proposed Action is not directly appliable to the Agricultural State Functional Plan.				
2	**Conservation Lands State Functional Plan (1991)**			
Purpose: Addresses issues of population and economic growth and its strain on current natural resources; broadening public use of natural resources while protecting lands and shorelines from overuse; additionally, promotes the aquaculture industry.		X		
Discussion: The Proposed Action will support the Conservation Lands State Functional Plan. The Proposed Action will not be applicable to the use of Conservation lands in the State. As previously discussed, the Proposed Action is located about two miles from the shoreline and, as such, the project improvements will not affect the shoreline.				
3	**Education State Functional Plan (1989)**			
Purpose: Improvements to Hawai'i's educational curriculum, quality of educational staff, and access to adequate facilities.				X
Discussion: The Proposed Action is not directly applicable to the Education State Functional Plan.				
4	**Employment State Functional Plan (1990)**			
Purpose: Improve the qualifications, productivity, and effectiveness of the State's workforce through better education and training of workers as well as efficient planning of economic development, employment opportunities, and training activities.				X
Discussion: The Proposed Action is not directly applicable to the Employment State Functional Plan.				
5	**Energy State Functional Plan (1991)**			
Purpose: Lessen the reliance on petroleum and other fossil fuels in favor of alternative sources of energy so as to keep up with the State's increasing energy demands while also becoming a more sustainable island state; achieving dependable, efficient, and economical statewide energy systems.				X
Discussion: The Proposed Action is not directly applicable to the Energy State Functional Plan.				
6	**Health State Functional Plan**			
Purpose: Improve the health care system by providing for those who do not have access to private health care providers; increasing preventative health measures; addressing 'quality of care' elements in private and public sectors to cut increasing costs.				X
Discussion: The Proposed Action is not directly applicable to the Health State Functional Plan.				
7	**Higher Education Functional Plan (1984)**			
Purpose: Prepare Hawai'i's citizens for the demands of an increasingly complex world through providing technical and intellectual tools.				X
Discussion: The Proposed Action is not directly applicable to the Higher Education Functional Plan.				
8	**Historic Preservation State Functional Plan (1991)**			
Purpose: Preservation of historic properties, records, artifacts and oral histories; provide public with information/education on the ethnic and cultural heritages and history of Hawai'i				X
Discussion: The Proposed Action is not directly applicable to the Historic Preservation State Functional Plan.				
9	**Housing State Functional Plan (1989)**			
Purpose: Provide affordable rental and for-sale housing; increase homeownership and amount of rental housing units; acquiring public and privately-owned lands for future residential development; maintain a statewide housing data system				X
Discussion: The Housing State Functional Plan is not directly applicable to the Proposed Action.				

Table 5-3: Hawai'i State Functional Plans		S	NS	N/A
10	**Human Services State Functional Plan (1991)**			
Purpose: Refining support systems for families and individuals by improving elderly care, increasing preventative measures to combat child/spousal abuse and neglect; providing means for 'self-sufficiency'				**X**
Discussion: The Proposed Action is not directly applicable to the Human Services State Functional Plan.				
11	**Recreation State Functional Plan (1991)**			
Purpose: Manage the use of recreational resources via addressing issues: (1) ocean and shoreline recreation, (2) mauka, urban, and other recreation, (3) public access to shoreline and upland recreation areas, (4) resource conservation and management, (5) management of recreation programs/facilities/areas, and (6) wetlands protection and management.				**X**
Discussion: The Proposed Action is not directly applicable to the Recreation State Functional Plan.				
12	**Tourism State Functional Plan (1991)**			
Purpose: Balance tourism/economic growth with environmental and community concerns; development that is cognizant of the limited land and water resources of the islands; maintaining friendly relations between tourists and community members; development of a productive workforce and enhancement of career and employment opportunities in the visitor industry.				**X**
Discussion: The Proposed Action is not directly applicable to the Tourism State Functional Plan.				
13	**Transportation State Functional Plan (1991)**			
Purpose: Development of a safer, more efficient transportation system that also is consistent with planned physical and economic growth of the state; construction of facility and infrastructure improvements; develop a transportation system balanced with new alternatives; pursue land use initiatives which help reduce travel demand.				**X**
Discussion: The Proposed Action is not directly applicable to the Transportation State Functional Plan.				

5.1.3 State Land Use Law, Chapter 205, Hawai'i Revised Statutes

The State Land Use Law, Chapter 205, HRS, is intended to preserve, protect and encourage the development of lands in the State for uses which are best suited to the public health and welfare of Hawai'i's people. Under Chapter 205, HRS, all lands in the State are classified into four land use districts by the State Land Use Commission (LUC): Urban, Agricultural, Conservation, and Rural. The State Land Use Commission (LUC) is responsible for preserving and protecting Hawai'i's lands and encouraging those uses to which lands are best suited. Permitted uses within the districts are prescribed under Title 12, Chapter 205 (Land Use Commission), HRS, and the State Land Use Commission's Administrative Rules prescribed under Title 15, Subtitle 3, Chapter 15 HAR.

Discussion:

The State Land Use District Map for the island of Hawaiʻī designates the project area as part of the Urban and Agricultural District. The existing and planned use are a permitted use for areas within the State Land Use Urban District. A Special Permit approved by the East Hawai'i Planning Commission is required for proposed uses within the State Land Use Agricultural District.

5.2 County of Hawaiʻi Land Use Plans and Policies

5.2.1 County of Hawaiʻī General Plan

The County of Hawaiʽi's General Plan is the blueprint that guides the long-term development of Hawaiʽi Island. It considers the needs of the entire island, and provides a sound growth strategy that directs future opportunities related to land use, zoning amendments and capital expenditures. The General Plan strives to position Hawaiʽi Island for economic progress while preserving the environment and strengthening community foundations. The current General Plan was adopted in 2005 and has guided County structure and future growth.

In September 2023, the Planning Department issued the first draft General Plan 2045. The purpose of the draft was to solicit feedback from the public, organizations, and agencies. The gathered information will be complied to form the basis for revisions to the draft General Plan prior or submission to the Planning Commission and the County Council. To date, since that process has not been completed, the existing General Plan adopted by the Hawaiʻi County Council in February 2005 (amended in December 2006), serves as the overall planning document outlining the long-range comprehensive development of Hawaiʻi Island. Since review of the General Plan 2040 has not been completed, the 2005 General Plan will be used for analysis. See below for further discussion related to the latest version of the General Plan. The Planning Department is in the process of revising the Draft General Plan 2045. A Final Recommended Draft Plan shall be released to the public in July 2024.

The Draft General Plan 2045 vision, goals, and objectives provide a high-level integrated direction for the community and a holistic perspective. The goals are divided into groups which together encompass the three sustainability pillars of community, economy, and environment. These groups include: 1) addressing climate change for island-wide health, 2) sustainable development and resilient communities, 3) thriving, diverse, and regenerative economy, and 4) collaborative biocultural stewardship.

Regulatory implementing actions are one of two types of approaches used in the General Plan to pursue the vision, goals, and objectives. Regulatory actions are controlling in that they define boundaries, development parameters, and measures intended to implement goals or objectives. The three regulatory implementing actions include: future land use maps, policies, and standards. In the 2045 General Plan, future land use maps, policies, and standards are specific to the actions through which zoning ordinances, subdivisions, and public improvements or projects are initiated or adopted because, as they must conform to and implement the general plan in accordance with the County Charter §3-15.

The second approach of implementing actions is not regulatory or controlling and requires subsequent decisions and/or the allocation of resources. The three types of non-regulatory implementing actions include: programs, projects, and interagency coordination.

A discussion of consistency with the goals, policies, and standards of the currently available Draft General Plan is provided in Table 5-5 below.

Table 5-5: County of Hawai'i Draft General Plan 2045	S	NS	N/A
Climate Change Goal Ensure a just transition to a climate resilient island by addressing the causes and impacts of climate change through incorporating equitable climate mitigation and adaptation priorities into policies, programs, infrastructure, and decision-making.			
Objective 1: Ensure that climate actions are equitable and uplift historically marginalized and disadvantaged communities.			
Policies			
1.1 Prioritize and support existing community-led organizations, businesses, and programs through County purchasing and procurement policies.			X
1.2 Prioritize and support Low- and Moderate-Income (LMI) communities through tax incentives, grants, and financial support provided to community members			X
1.3 Prioritize projects in communities that experience disproportionate impacts of climate disasters.			X
1.4 Consider financial, time barriers, geographic constraints, and language accessibility when conducting community outreach.			X
1.5 Improve communication of climate risks and opportunities for adaptation.			X
1.6 Help communities become fire adapted as they prepare for climate change.			X
1.7 Expand urban forestry benefits to disadvantaged communities.			X
1.8 Support social science research and applications to help address environmental justice and intergenerational equity.			X
1.9 Include native Hawaiian traditional knowledge and practices in planning for the impacts of climate change.			X
Objective 2: Achieve net carbon neutrality by 2045. Achieve a 100 percent renewable-powered County fleet by 2035 and 100 percent renewable ground transportation by 2045. Support the achievement of 70 percent renewable energy for the electricity sector by 2030, with 40 percent from renewables and 30 percent from efficiency, and 100 percent by 2045.			
Policies			
2.1 Create codes and efficiencies that integrate affordable housing and carbon neutrality.			X
2.2 Require energy efficiency designs in all new County facilities and upgrade existing facilities with energy-efficient systems.			X
2.3 Support building code updates that incentivize energy-efficient designs and climate-neutral building methods and materials.			X
2.4 Implement the use of technologies, techniques, and materials in building design, construction, and removal that minimize the ecological footprint over the life cycle of the structure.			X
2.5 Encourage and incentivize large developments to meet energy sustainability certification standards.			X
2.6 Strive for energy sustainability certification for new County buildings or when renovating existing buildings for County use.			X

2.7 Prioritize energy-efficient designs, energy-efficient systems, and waste reduction and/or reuse at County facilities.			X
2.8 Evaluate Capital Improvement Projects for energy efficiency and carbon reduction, including the cost savings related to improved design			X
2.9 Partner with government, private and nonprofit agencies, and other stakeholders to develop comprehensive and coordinated strategies promoting energy and water conservation to strive for climate change resilience.			X
2.10 When evaluating public investments, including acquisition, siting, and design, consider the potential of natural areas for carbon sequestration and provide climate adaptation and mitigation opportunities.			X
2.11 Integrate urban forestry into all scales of planning.			X
2.12 Develop carbon-emission standards and an incentive program aimed at achieving County. carbon-emission goals.			X
2.13 Mandate reporting of energy use of all County facilities annually.			X
2.14 Program the upgrading of the vehicle fleet and equipment to zero emissions.			X
2.15 The Mass Transit Agency shall operate a zero emissions fleet by 2035.			X
2.16 Prioritize the installation of electric vehicle chargers at community facilities, for both County vehicles and public parking.			X
2.17 Mandate reporting of all new County vehicle purchases including average mpg, emissions equivalent per gallon of fuel (or kWh), and estimated annual operation and maintenance costs.			X
Objective 3: Improve the identification of climate change threats, assessment of potential consequences, and evaluation of adaptation options.			
Policies			
3.1 Use accurate and up-to-date scientific predictions and observations related to climate change impacts to guide adaptation policy and future land use decisions.	X		
3.2 Support local and regional climate change modeling and monitoring programs.			X
3.3 Collaborate with government, private and nonprofit agencies, and other stakeholders to monitor impacts that may be specific to Hawaiʻi County due to its unique exposure to climate change and sea level rise impacts.			X
3.4 Improve assessments of climate change threats and potential consequences to determine specific geographic areas impacted and projected financial cost.			X
3.5 Climate change adaptation shall be considered in County budgetary, land use, and other decision-making processes.			X
3.6 Implement a sea-level rise planning and policy benchmark of 4 feet by 2100 and 6 feet for public infrastructure projects and other projects with a low tolerance for risk.			X
3.7 Prioritize the preservation and restoration of natural landscape features, such as coral reefs, beaches and dunes, forests, streams, floodplains, and wetlands, that have the inherent capacity to avoid, minimize, or mitigate the impacts of climate change.			X
3.8 Develop adaptation strategies (e.g., protection, accommodation, managed retreat, and preservation) for capital improvements to assure that the project's useful life and service expectations can be met in the face of projected climate change impacts.	X		
3.9 Design and maintain infrastructure, including roads, buildings, and stream crossings, to accommodate increases in flooding and geologic hazards such as landslides.	X		

3.10 Partner with communities to develop adaptation strategies (e.g., protection, accommodation, managed retreat, and preservation) for vulnerable areas including conducting vulnerability assessments and assessing land use and land availability.			X
3.11 Partner with government (e.g., State Office of Planning and Sustainable Development [OPSD]), private and nonprofit agencies, and other stakeholders to analyze conservation buffers to accommodate shifting native habitats impacted by climate change, particularly wetlands and high-elevation forests.			X
Discussion: The Proposed Action will not directly impact the goals, objectives, and policies outlined in the County of Hawaiʻi Draft General Plan regarding climate change. The design of the WWTP will not discharge to surface water sources and will take into consideration the potential for increased storm intensity. Drainage improvements will be implemented within the WWTP project site to manage stormwater during intense weather events, ensuring the facility's resilience to changing storm patterns. In the short-term, the construction phase may result in temporary greenhouse gas emissions due to heavy equipment operations and the transportation of supplies to the WWTP project site and along the streets for the new collection system. However, these emissions will be temporary during the construction period. Upon completion of the construction, emissions and greenhouse gases should return to current conditions.			
Land Use Goal Strategically apply progressive land use strategies incorporating indigenous and contemporary knowledge and place-based practices to direct and manage growth for the health and safety of our communities.			
Objective 4: Maintain community character and land use compatibility.			
Policies			
4.1 The development of commercial facilities should be designed to reflect the character of the community while providing desired services and mitigating impacts on the surrounding environment.			X
4.2 In those cases where provisions of the zoning and subdivision code are inconsistent with the character of surrounding neighborhoods, variances, or Planned Unit Developments (PUD) that maintain consistent village/town character should be encouraged.			X
4.3 Zoning, subdivision, and other applicable ordinances shall provide for and protect open space areas.	X		
4.4 Support mechanisms, such as Planned Unit Development and Cluster Plan Development, that cluster density to preserve open space, recreational areas, or scenic viewsheds.	X		
4.5 Discretionary permit applications for uses that may impact view planes to and along the coastline, and areas of natural beauty should take into consideration visual impact assessments and propose conditions to mitigate scenic impacts where appropriate.	X		
4.6 In the review of discretionary permits, consider land use compatibility to ensure proximate compatible and complementary uses and appropriate mitigation measures.	X		
4.7 Power distribution should be placed underground when and where practical.			X
4.8 Encourage developers of new urban areas to place utilities underground.			X

4.9 Route selection for high-voltage transmission lines should include consideration for setbacks from major thoroughfares and residential areas. Where feasible, delineate energy corridors for such high-voltage transmission lines.			X
Objective 5: Increase the integration of natural systems planning.			
Policies			
5.1 Protect and enhance Hawai'i's shoreline, open spaces, and scenic resources.	X		
5.2 During discretionary permit applications, the Planning Director may require a pedestrian, equestrian, and/or bicycle path when it is possible and safe to connect to existing or future drainage or active living corridors.			X
5.3 Proposed discretionary permits for large development projects (200+ units) in the North Kohala, South Kohala, North Kona, South Kona, and Ka'ū Districts should be designed to be as water neutral as reasonably possible through water conservation, recharge, and reuse measures to reduce the water footprint.			X
Objective 6: Increase equitable planning and decision-making processes.			
Policies			
6.1 Ensure there is necessary and adequate on-site infrastructure for development projects.	X		
6.2 Ensure affordable housing requirements that meet the demand created by the development.			X
6.3 The County may impose incremental and conditional zoning that would be based on performance requirements that focus on addressing the impacts of the proposed development.	X		
Objective 7: Reduce the threat to life and property from natural hazards and disasters. Enforce zoning and environmental laws in order to conserve natural resources and the shoreline.			
Policies			
7.1 Enact additional land use and building structure regulations in areas vulnerable to severe damage due to the impact of waves or inundation.	X		
7.2 Review land use policy as it relates to floodplains, high surf, and tsunami hazard areas.	X		
7.3 Consider natural hazards in all land use planning and permitting.	X		
7.4 Discourage intensive development in areas of high volcanic hazard.			X
7.5 Discourage public investment/infrastructure that supports increases in density, while allowing such investment to support existing residents and facilities.	X		
7.6 Reduce development intensity in identified high-risk hazard areas.	X		

7.7 Incorporate hazard mitigation strategies into policies and planning decisions using the most conservative models in delineating hazard areas.	X		
Objective 8: Increase the use of Smart Growth principles to focus development within existing urban centers.			
Policies			
8.1 Encourage flexibility in the design of residential sites, buildings, and related facilities to achieve a diversity of socio-economic housing mix and innovative means of meeting the market requirements.			X
8.2 Prioritize increase in density, rehabilitation, and redevelopment within existing zoned urban areas already served by basic infrastructure, or close to such areas.			X
8.3 Incentivize rehabilitation and adaptive reuse of existing buildings rather than demolition in urban areas characterized by vacant, abandoned, and underutilized older buildings.			X
8.4 Encourage the rehabilitation and/or utilization of maximum density in multi-family residential areas.			X
8.5 Rezonings that promote infill are encouraged and should be conditioned to ensure connectivity to the surrounding developments and, where applicable, to provide mixed-use opportunities to make the area more pedestrian-oriented.			X
8.6 The establishment of urban types of zoning may include additional acreages to account for acreages utilized for public benefits, such as historic sites, public access, parks, and open space.			X
8.7 Within the "high- and medium-density" area, commercial development shall be focused on major streets, while interior blocks should be zoned primarily for small lot single-family and multifamily residential use.			X
8.8 Focus on medium and high-density residential and commercial uses in communities that can sustain a higher intensity of uses and where these residential and commercial uses are consistent with the existing town character.			X
8.9 Support the rezoning of land to multiple residential near places of employment, shopping facilities, educational, recreational, and cultural facilities, and public facilities and utilities.			X
8.10 Development of TODs and TNDs are encouraged within locations of the centers shown on the General Plan Land Use Map. These locations are approximate and become fixed during rezoning.			X
8.11 Plan for and identify appropriate areas for business incubation/innovation districts and industrial/business parks.			X
8.12 Urban renewal, rehabilitation, and/or redevelopment programs should be undertaken in cooperation with communities, businesses, and governmental agencies.			X
8.13 Support master planning of present and proposed public and private institutions with an emphasis on TOD, affordable housing, and mixed-use development.			X

8.14 Low- to medium-density residential development and/or low-impact office uses within urban areas should serve as transitional densities between lower-density neighborhoods and more intensive commercial and residential uses.			**X**
8.15 Encourage the use of more innovative types of housing development with respect to geologic and topographic conditions, such as zones of mix and cluster and planned unit developments.			**X**
8.16 Lots within proposed single-family residential subdivisions should not have direct vehicular access from major collector streets or larger roadway types.			**X**
8.17 Ensure flag lots are designed to support optimal density.			**X**
8.18 Large, oversized blocks in new subdivisions should be avoided in favor of smaller blocks and enhanced pedestrian networks. The determination of block size should be based on land use and the urban or rural character of the area.			**X**
8.19 Promote the redevelopment of aging and high-vacancy shopping centers, or strip-type developments into mixed-use developments with housing and public recreation facilities.			**X**
8.20 Encourage the concentration of commercial uses within and surrounding a central core area adequately served by transportation, utilities, and other essential infrastructure.			**X**
8.21 Infrastructure and design elements shall be incorporated into the review of commercial developments.			**X**
8.22 Encourage a mix of uses near affordable housing and access to commercial and recreational opportunities.			**X**
8.23 Industrial and commercial mixed-use districts may be provided in urban centers.			**X**
8.24 Distribution of commercial areas shall meet the demands of neighborhood, community, and regional needs.			**X**
8.25 Discourage strip or spot commercial development on the highway outside of the Urban Growth Areas.			**X**
8.26 Discretionary permit applications for regional retail uses, including big box and regional shopping centers located adjacent to areas designated for low-density residential and rural uses, should be buffered to mitigate impacts.			**X**
8.27 Encourage small-scale manufacturing and processing within retail establishments that enhance and are consistent with the surrounding community.			**X**
8.28 Support the flexible design of commercial spaces to allow for transitional uses that serve the evolving needs of its users.			**X**
8.29 Discretionary permit applications for new commercial developments adjacent to or within existing industrial designated lands shall be reviewed for the criteria of conversion of industrial lands.			**X**

8.30 Industrial development shall be in areas adequately served by transportation, utilities, and other essential infrastructure or adjacent to unique resources/projects.			**X**
8.31 Support the creation of industrial uses in appropriate locations as part of mixed-use districts/developments.			**X**
8.32 Support Industrial Project District zoning and flexibility of uses and lot sizes, depending on the needs of the industries and the communities.			**X**
8.33 Encourage Industrial Project Districts and Innovation Centers within the Urban Growth Area.			**X**
8.34 Industrial-commercial mixed-use districts should serve as transitional areas.	**X**		
8.35 Support land uses that locate industrial and warehouse sites near major transportation corridors and airports and harbors.	**X**		
8.36 Support the development of cottage recycling operations near transfer stations and County landfills.			**X**
8.37 Industrial uses may be permitted outside Urban Growth Areas through Special Permits when there is a clear community benefit or consistent with County, State, and Federal sustainability objectives.	**X**		
8.38 Encourage the rehabilitation of existing service-oriented industrial areas.	**X**		
8.39 Mitigate impacts of industrial development on surrounding uses by requiring landscaping, open spaces, buffer zones, and other appropriate conditions.	**X**		
8.40 Future land uses in the vicinity of industrial areas, including airports, should have an adequate open space buffer and/or be compatible with the anticipated aircraft noise exposure levels for that vicinity.			**X**
8.41 Resort development shall be in areas adequately served by transportation, utilities, and other essential infrastructure.			**X**
8.42 Promote and prioritize the rehabilitation and the optimum utilization of resort areas that are presently serviced by basic facilities and utilities before allowing new resorts.			**X**
8.43 Coastal resort developments shall provide public access to and parking for beach and shoreline areas.			**X**
8.44 The development or designation of new resort areas should complement the character of the area; protect the environment and natural beauty; respect existing lifestyles, cultural practices, and cultural resources; and provide shoreline public access.			**X**
8.45 Do not allow new Resort (V) zoning development along the ocean side of Aliʻi Drive.			**X**
8.46 Resort development should be in balance with the social and physical goals as well as the economic desires of the residents of the area.			**X**
8.47 Encourage new developments to be water neutral and balance water supply and demand.			**X**

8.48 Provide for the establishment of new Retreat Resort areas in appropriate locations.			X
8.49 On-site affordable housing and workforce units shall not be included in visitor unit counts for existing and new resort developments			X
Objective 9: Maximize the alignment and use of Rural designated lands to preserve rural character and lifestyle.			
Policies			
9.1 Support the rezoning and State Land Use reclassification to Rural in alignment with the General Plan Rural designation.			X
9.2 Support reclassification/rezoning of appropriate General Plan Rural designated areas where an intermediate land use and a well-defined buffer between Urban and Productive Agricultural areas are consistent with the surrounding uses and rural character.			X
9.3 Support General Plan amendments and rezoning applications for the development of new Rural Neighborhood Centers with adequate infrastructure, as necessary, in or near presently underserved subdivisions, beginning with those experiencing higher rates of population growth.			X
9.4 Rural-style residential-agricultural developments, such as new small-scale rural communities or extensions of existing rural communities, should be incentivized to cluster in appropriate locations.			X
9.5 Support the development of small-scale visitor accommodations with heritage, agriculture, wellness, or similar themes in rural areas and near points of interest.			X
9.6 Provide flexibility in discretionary permit applications to maintain health and safety for rural small-scale visitor accommodations not serviced by public infrastructure.			X
Objective 10: Support the active use of Productive Agricultural lands.			
Policies			
10.1 Development in Productive Agriculture and Extensive Agriculture areas should include agricultural uses, related economic infrastructure and cottage industries, compatible renewable energy, open area recreational uses, and community facilities.			X
10.2 Special permit applications within Productive Agriculture designated land should support primary agriculture use	X		
10.3 Encourage buffer zones or compatible uses between Productive Agriculture and adjacent uses of land.	X		
10.4 Preserve agricultural character, including the open space preserved by agricultural land.	X		
10.5 Support the development of small-scale visitor accommodations that directly promote the agriculture industry, health and wellness industry, or are near points of interest			X

10.6 Any subdivision or farm labor housing complex developed on Productive Agricultural Lands should be clustered to minimize impact.			**X**
10.7 Encourage and aid the agricultural industry in continuing to provide farm labor housing.			**X**
10.8 Encourage the use of agriculture, ranch, and forestry land preservation programs.			**X**
10.9 Promote the preservation and restoration of indigenous agricultural systems.	**X**		
10.10 Provide flexibility to allow for adjacent compatible uses for large-scale agriculture with industrial components, such as carbon sequestration.	**X**		
Discussion: The Proposed Action will support the goals, objectives, and policies outlined in the County of Hawaiʻī Draft General Plan relating to Land Use. The existing land use in the Project Area includes residential, agricultural, and undeveloped land. The Project Area is located within the Urban and Agricultural State Land Use Districts (SLUD). The WWTP site is entirely located within the Agricultural SLUD. As such, the Proposed Action would be required to comply with the regulations set forth in the State Land Use Law (HRS, Chapter 205). Furthermore, the County of Hawaiʻi General Plan calls for the preparation of community development plans (CDPs) "to translate the broad General Plan statement to specific actions as they apply to specific geographical areas." The Kaʻū CDP is one of nine CDPs for the County of Hawaiʻī. Section 5 of the CDP prioritizes improvements in the infrastructure, facilities, and services, including Section 5.8 applicable to Environmental Management which states: "Policy 120 Extend the primary wastewater collection lines in Pāhala and Nāʻālehu so that infill development projects can connect wastewater systems built for new subdivisions to the County systems." The Proposed Action has been designed not to preclude expansion to accommodate the future needs of the Nāʻālehu community. Future subdivisions would be accommodated, as capacity allows, on a first-come, first-served basis.			
Transportation Goal Each community is connected by a multimodal and modernized transportation network that provides a system for safe, efficient, and comfortable movement of people and goods.			
Objective 11: Achieve a transportation system that is consistent with and will accommodate planned growth.			
Policies			
11.1 Encourage transportation systems that serve to accommodate the present and future development needs of communities.			**X**
11.2 Encourage safe and convenient use of low-cost, energy-efficient, non-polluting means of transportation.			**X**
11.3 Encourage the diversification of transportation modes and infrastructure to promote alternate fuels and energy efficiency.			**X**

11.4 Transportation and land use planning shall be integrated to optimize the use, efficiency, and accessibility of existing mass transportation systems and future demand.			**X**
11.5 Establish a framework of transportation facilities that will influence desired land use and promote multimodal options.			**X**
11.6 Provide for present traffic and future demands, including the programmed development of mass transit programs for high-growth areas by both the private and public sectors.			**X**
11.7 Implement procedures for County departments to collaborate on defining short- and long-term transportation CIP projects in terms of scope, timing, proposed funding, and project performance measures required to optimally achieve transportation ambitions stated in County plans, standards, and laws.			**X**
11.8 Prioritize CIP investments consistent with General Plan goals and objectives and demands for roadway repaving, rehabilitation, and reconstruction. This prioritization should align with the six-year planning horizon and should include a long-term roadmap for future investments.			**X**
11.9 Support designing all transportation facilities, including airport, harbor, mass-transit stations, etc., to reflect local and/or Hawaiian architecture.			**X**
11.10 Identify and evaluate transportation strategies to address energy and climate issues.			**X**
11.11 Prioritize public and private transportation investments to expand the multimodal transportation system.			**X**
11.12 Require new developments to contribute their pro rata share of local and regional infrastructure costs.			**X**
11.13 There shall be coordinated planning of transportation systems for the funding of projects in areas of anticipated growth and to meet program goals of the other elements such as historic, recreational, environmental quality, and land use.			**X**
Objective 12: Increase transportation connectivity.			
Policies			
12.1 Ensure Native Hawaiian access rights are clearly expressed in County code, policies, and procedures.			**X**
12.2 Programmatically support the open space network concept with a methodology that includes criteria for establishing County department and other agency responsibilities, mapping requirements, financing strategies for implementation and maintenance, and standards for facilities that enhance the community experience.			**X**
12.3 Prior to disposing of, leasing, or transferring public lands through County Property Management procedures, the County shall assess, document, and protect access to existing active living corridors that are located on County-owned parcels.			**X**

12.4 Land use applications shall identify as early as possible any existing or potential active living corridors that should be incorporated into the County's open space network.			**X**
12.5 Ensure that existing active living corridors that are publicly owned or available by easement are properly identified and that their access elements are secured and documented. a) Primary examples include but are not limited to historic trails and roads, roads-in-limbo, 'paper roads', former sugar cane roads, train infrastructure remnants (Rails to Trails), and pedestrian and bicycling paths. b) "Acceptance" by the County of the responsibilities detailed in the grant of easements should require County Council action and a dedicated funding source.			**X**
12.6 Provide public pedestrian access opportunities to scenic places and vistas.			**X**
12.7 Establish public access to historic and modern active living corridors and facilities that provide an island-wide route and connect to major destinations.			**X**
Objective 13: Increase mass transit ridership by 50 percent.			
13.1 Ensure transit routes connect with other modes of active transportation consistent with the County Street Design Manual.			**X**
13.2 Provide more equitable mobility for youth, low-income, elderly, and people with disabilities.			**X**
13.3 Maximize regular and paratransit service to the following: a) Town centers, commercial districts, and employment centers. b) Airports and cruise ship terminals. c) University and adult education centers. d) Accommodate school schedules such as after-school activities and sports.			**X**
13.4 Bus maintenance facilities shall be developed at or near appropriate transit hubs.			**X**
13.5 Adopt Hub and spoke system including alternative first and last mile or door-to-door services.			**X**
13.6 Transit infrastructure (e.g., bus stops, bus pullouts, waiting benches and shelters, and signs) shall be adequate and upgraded along existing and future transit routes.			**X**
13.7 Data shall be collected and analyzed to optimize mass transit planning, operation, and overall performance.			**X**
13.8 Improve and expand public transportation in communities with the highest socioeconomic needs.			**X**

13.9 The County's public transit system assets shall be available to assist in transportation in emergency situations.			X
Objective 14: Reduce vehicle miles traveled (VMT).			
14.1 Encourage collaboration between the Planning Department, the Department of Public Works, the Department of Parks and Recreation, and the Mass Transit Agency to define the scope and priority of capital investment projects that achieve active transportation objectives and goals.			X
14.2 Increase arterial capacity through prioritization of alternative means of transportation, such as mass transit, bicycle, and pedestrian systems.			X
14.3 Incorporate bicycle routes, lanes, and paths within road rights-of-way in conformance with The Bikeway Plan for the County of Hawai'i.			X
14.4 Increase mobility for minors, non-licensed adults, low-income, elderly, and people with mobility limitations through prioritization of alternative means of transportation.			X
14.5 Roadway designs and improvements made by the Department of Public Works shall accommodate pedestrian-friendly, multimodal design, and on-street parking evaluations, when practical and feasible.			X
14.6 Use traffic demand management to aid in reducing traffic congestion by targeting an increase of active transportation mode share to 10 percent (bicycling, walking, micromobility).			X
14.7 Apply zoning reviews for concurrency that achieve sustainability and demand management goals and that prioritize reduction in vehicle miles traveled over impacts to the level of service.			X
Objective 15: Achieve a transportation system that employs all modes of transportation at a community scale.			
Policies			
15.1 Encourage flexibility in applying the County of Hawai'i Street Design Manual when necessary to preserve the rural character of an area while maintaining a pedestrian-friendly design and desired landscaping solutions.			X
15.2 Allow for private, non-dedicated cul-de-sac and alley designs that are in accordance with national road standards.			X
15.3 In planning, designing, and constructing new roadways or modernizing improvements, transportation agencies should balance the conservation of the area's natural, historic, and scenic qualities with transportation objectives for traffic speed, safety, and traffic calming.			X
15.4 Support and provide technical assistance to assist in the development of road improvement districts to finance road improvements.			X

15.5 Preserve the unique character of an area by allowing flexibility in existing roadway improvements and maintenance while seeking a pedestrian-friendly design and desired landscaping solutions.			**X**
15.6 Incentivize subdivision roadway connectivity.			**X**
15.7 A corridor planning/management program shall be maintained to help prioritize various active transportation projects.			**X**
Objective 16: Incorporate green infrastructure to reduce stormwater runoff.			
Policies			
16.1 Incorporate low-impact development (LID), green infrastructure strategies, and pollution prevention procedures to address drainage in roadway design and update the operation and maintenance of these solutions to retain integrity.			**X**
16.2 Prioritize roadway drainage improvements in flood-prone areas.			**X**
16.4 Maintain an Adopt-a-Street program to encourage civic participation where moderate landscaping and roadside cleaning can be done by community groups.			**X**
16.5 At a minimum, the County shall plan, site, and develop roads, bridges, and highways to: a) Protect areas that provide important water quality benefits or are particularly susceptible to erosion or sediment loss; b) Limit land disturbance such as clearing, grading, and cut and fill to reduce erosion and sediment loss; and c) Limit disturbance of natural drainage features and vegetation, including mitigating impacts of stream crossings.			**X**
Objective 17: Increase transportation safety for transportation's most vulnerable users and reduce traffic fatalities.			
Policies			
17.1 Human life and public health are prioritized within all aspects of the transportation system.			**X**
17.2 Solutions should be prioritized in areas with the most vulnerable populations.			**X**
17.3 Engage communities in defining issues and developing solutions for their community, with a particular focus on engaging disadvantaged and vulnerable populations.			**X**
17.4 Prioritize interdepartmental coordination and accountability of traffic safety through education, enforcement, engineering, encouragement, and evaluation. Focus on policies, practices, staffing, and programs to improve road and pedestrian safety.			**X**

17.5 Incorporate traffic-calming features into arterial road and street designs to include vertical deflections, horizontal shifts, roadway narrowing, and closures to reduce speeding and increase safety. These may include techniques such as roundabouts, median barriers, speed humps, raised intersections, and other transportation industry practices.			**X**
17.6 Commit to an equitable approach and outcomes, including prioritizing engagement and investments in traditionally under-served communities and adopting equitable traffic enforcement practices.			**X**
17.7 Develop roadway standards to accommodate emerging technology for connected and automated vehicles.			**X**
17.8 Maintain dedicated roadway standards that are appropriate to roadway type and achieve active transportation and safety goals.			**X**
17.9 Engage and collaborate with the owners of private roads and local community groups to help identify and develop road management agreements that mitigate road closures to provide emergency.			**X**
Objective 18: Adequately maintain public transportation systems.			
Policies			
18.1 Maintain an Asset Management Program aimed at utilizing maintenance plans for pavement, bridges, and other road infrastructure to prolong the life of our transportation system as well as reduce its whole-life cost.			**X**
18.2 Maintain the unique features of historic bridges, while balancing safety needs and preserving historic and scenic character.			**X**
18.3 Prioritize the replacement of deficient and inadequate bridges and maintain pedestrian/bicycle access across bridges.			**X**
18.4 Design new bridges and bridge improvements to accommodate and not negatively impede identified scenic resources.			**X**
18.5 Evaluate freight routes identified in the State Freight Masterplan for required improvements to meet roadway standards.			**X**
Objective 19: Improve accessibility to airports, harbor systems, and support facilities.			
Policies			
19.1 Encourage the programmed improvement of existing terminals, including adequate provisions for control of pollution and appropriate and adequate covered storage facilities for agriculture products.			**X**
19.2 The State Department of Transportation should continue to implement its plans for transportation terminals and related facilities to promote and follow desired land use policies.			**X**

19.3 Transportation terminals should be developed in conjunction with the different elements of the overall transportation system.			X
19.4 Encourage maximum use of the island's airport and harbor facilities.			X
19.5 Encourage the development, maintenance, and enhancement of Hilo and Kawaihae Harbors as detailed within the State's Hawaiʻi Commercial Harbors 2035 Master Plan.			X
19.6 Support the State's objectives to acquire rights within the runway clear-zones, limit heights within approach zones, and restrict noise-sensitive uses within designated noise contours determined by the State.			X
19.7 Future land uses in the vicinity of airports and harbors should have an adequate open space buffer and/or be compatible with the anticipated noise exposure and industrial nature in the vicinity.			X
19.8 Encourage pedestrian-oriented connectivity around harbors and small boat harbors.			X
19.9 Explore and encourage appropriate reuse of former airport facilities.			X
19.10 Encourage master planning of small boat harbors to accommodate commercial fishing and recreational fishing, tour boats, as well as residential and business activity, that balance economic vitality and environmental sensitivity.			X
Discussion: The Proposed Action will not impact the goals, objectives and policies outlined in the County of Hawaiʻi Draft General Plan relating to transportation. Nāʻālehu is served by a network of roadways which are under the jurisdiction of the County and include Māmalahoa Highway and local roads in Nāʻālehu is generally low, reflecting the rural nature of the area. Limited vehicular traffic contributes to the low levels of congestion and a relatively peaceful road environment.			
Public Utilities Goal Communities are adequately served by sustainable and efficient public infrastructure, utilities, and services based on existing and future growth needs, sound design principles, and effective maintenance practices.			
Objective 20: Improve the efficiency, reliability, and sustainability of essential infrastructure systems.			
Policies			
20.1 Public utility facilities shall be designed at a scale that meets the needs of future development.	X		
20.2 Provide utilities and service facilities that minimize total cost to the public and effectively serve the needs of the community.	X		
20.3 Utility facilities shall be designed to complement adjacent land uses and minimize pollution or disturbance of the natural environment and natural resources.	X		
20.4 Improvement of existing utility services shall be encouraged to meet the needs of users.	X		

20.5 Encourage the clustering of developments to reduce the cost of providing utilities.	X		
20.6 Develop short- and long-range capital improvement programs and plans for public utilities within its jurisdiction that are consistent with the General Plan.	X		
Objective 21: Strive towards energy self-sufficiency.			
Policies			
21.1 Increase partnerships and interagency collaboration to ensure that energy facility production and distribution is adequate, efficient, and dependably available to each community to support present and future demands.			X
21.2 Promote and encourage the creation of a modern grid to support the use of distributed generation such as private photovoltaic systems connected to the grid.			X
21.3 The County shall remove barriers to energy systems that improve independence and resiliency, such as microgrids, combined heat and power (CHP), backup generation and storage, and other decentralized electricity systems.			X
21.4 Maintain tax incentives for renewable energy improvements and continue to revise incentives as energy technologies progress.			X
21.5 Continue to participate at the State level to provide feedback on all energy-related initiatives and proposed revisions to comprehensive Integrated Resource Plans.			X
21.6 Advocate to the Public Utility Commission (PUC) in support of the following types of strategies and initiatives: a) Programs and fee structures that promote renewable energy b) Consumer incentives to utilize renewable alternatives c) Social Equity analysis of proposed energy projects to ensure residents are protected as energy consumers regarding rates, grid planning, utility compensation, and energy project siting			X
Objective 22: Advance policies, programs, and initiatives for public and/or private investment in broadband and telecommunications infrastructure.			
22.1 Treat broadband access as a basic utility that is available to all communities.			X
22.2 Develop and support a program of free, public-use broadband services at appropriate County-owned facilities, mass transit facilities, and other community anchor institutions.			X
22.3 Collaborate with utility companies to incentivize the underground siting of electrical and telecommunications facilities within public rights-of-way.			X
22.4 Continuously improve the use of broadband communications and digital technology to educate and provide public services with a focus on digital access			X

22.5 Siting of new communications facilities shall comply with performance standards and site co-location as stated in HCC, Section 25-4-12 Note: HCC update will include details			**X**
22.6 Support projects that address service gaps in Hawai'i's broadband infrastructure.			**X**
22.7 Advocate for connectivity to businesses to protect the viability of businesses and the livelihoods of residents.			**X**
22.8 Promote and incentivize the landing of transpacific submarine fiber optic cables.			**X**
22.9 Alleviate barriers and assist broadband projects with navigating through the regulatory permitting process.			**X**
22.10 Maintain and improve cyber security and informational security of telecommunication facilities.			**X**
22.11 Advocate for service diversity, redundant network capacity, and provide improved communications to outlying rural areas and other underserved or unserved communities.			**X**
22.12 Plan for broadband infrastructure to support smart grid development.			**X**
Objective 23: Increase the protection of existing and potential sources of drinking water.			
Policies			
23.1 All public water systems shall be designed and built to the Department of Water Supply dedication standards. All other systems shall meet all relevant health and safety regulations and be designed and constructed by a licensed engineer			**X**
23.2 Water sources shall be adequately protected to prevent depletion and contamination from natural and man-made occurrences or events.	**X**		
23.3 A coordinated effort by County, State, and private interests shall be developed to identify sources of additional water supply and be implemented to ensure the development of sufficient quantities of water for existing and future needs of high-growth areas and agricultural production.			**X**
23.4 Installation or rehabilitation of water distributions shall be sized to adequately meet fire protection.			**X**
23.5 Ensure the highest quality of water is reserved for the most valuable end-use.	**X**		
23.6 Proposed discretionary permits for large development projects (200+ units) in the North Kohala, South Kohala, North Kona, South Kona, and Ka'ū Districts should be designed to be as water neutral as reasonably possible through water conservation, recharge, and reuse measures to reduce the water footprint.			**X**

23.7 Promote best practices in sustainable water collection and use for private water systems	X		
23.8 Water system improvements, including exploratory wells, shall correlate with the County's desired land use development pattern.			X
23.9 The Department of Water Supply shall prioritize infill development and focus source development to serve designated Urban Growth Areas.	X		
23.10 Water demand projections shall include all consumptive and non-consumptive demands.	X		
23.11 The Department of Water Supply and the Planning Department shall coordinate priorities before the adoption of any new water development or County land use plans.	X		
23.12 All County potable water systems should have backup standby sources			X
23.13 Treat all water as a valuable resource in community design, and integrate designs for drinking water, stormwater, and recreational water needs.	X		
23.14 Manage water, stormwater, and wastewater as the same natural resource in collaboration with DWS, DEM, DPW, DOH, etc.	X		
23.15 New developments should be designed to reduce water demand, retain runoff, decrease flooding, and recharge groundwater.	X		
23.16 Support localized, small-scale solutions to water reuse and onsite systems.	X		
Objective 24: Planned and developed municipal sewer capacity is expanded to serve our Urban Growth Areas and reduce sewage-related impacts on water quality.			
Policies			
21.1 A Sewerage Study for All Urban Areas, including appropriate water quality management strategies, shall be completed and used as guides for the general planning of sewerage disposal systems.			X
24.2 Private treatment systems shall be installed by land developers for major resorts and other developments along shorelines and sensitive higher inland areas, except where connection to nearby treatment facilities is feasible and compatible with the County's long-range plans, and in conformance with State and County requirements			X
24.3 Immediate steps shall be taken to designate treatment plant sites, sewerage pump station sites, and sewer easements according to the facility plans to facilitate their acquisition.	X		
24.4 The county shall obtain State and Federal funds to finance the construction of proposed sewer systems and improve existing systems.	X		
24.5 Plans for wastewater reclamation and reuse for irrigation and biosolids composting (remaining solids from the treatment of wastewater are processed into	X		

a reusable organic material) shall be utilized where topographically feasible and needed for landscaping purposes.			
24.6 Pollution shall be prevented, abated, and controlled at levels that will protect and preserve public health and wellbeing through the enforcement of appropriate Federal, State, and County standards.	**X**		
24.7 Ensure municipal wastewater systems serve designated Urban Growth Areas with the capacity to accommodate projected population growth.	**X**		
24.8 Average Daily Flow (ADF) for residential shall be 70 gallons per day per capita within any dwelling. For commercial and industrial uses (for example laundromats, food or beverage processing plants, et cetera) the ADF must be calculated based on the type of fixtures, number of fixtures, usage, and occupancy.	**X**		
24.9 The Department of Environmental Management and the Planning Department shall coordinate priorities before the adoption of any new wastewater development or land use plans.	**X**		
24.10 Prioritize developing a multipronged approach to wastewater infrastructure funding, including proactively seeking grant funding for wastewater system expansion, improvements, and new development.	**X**		
24.11 Ensure wastewater fees reflect actual costs for service, maintenance, and future improvements.	**X**		
24.12 Ensure that wastewater systems and improvements are designed and functioning to maximize system efficiencies, prevent accidental leaks or spills, and provide sanitary, reliable wastewater treatment that is not negatively impacting natural resources.	**X**		
24.13 Strive for an integrated approach to stormwater and wastewater, and water resource management that is comprehensive and as efficient as possible.			**X**
24.14 Encourage on-site water reuse solutions for large developments.			**X**
24.15 Encourage and incentivize the collection of rainfall for non-potable use.			**X**
24.16 Prioritize the use of gray water in areas connected to county water and not connected to county wastewater.			**X**
Objective 25: Increase green infrastructure practices.			
Policies			
25.1 Design to collect stormwater from streets, sidewalks, and other hard surfaces before it can enter the sewer system or cause local flooding; reduce the amount of stormwater that flows into the Sewer System.	**X**		
25.2 Control stormwater by using it as a resource rather than a waste.			**X**

25.3 The "Drainage Master Plan for the County of Hawai'i" should be updated every 20 years for urban centers to incorporate new studies and reflect newly identified priorities.			X
25.4 Encourage grassed shoulder and swale roadway design where climate and grade are conducive.			
25.5 Where applicable, natural drainage patterns shall be improved/restored to increase their capacity with special consideration for the practices of proper soil conservation, and grassland and forestry management.	X		
25.6 Implement nature-based solutions that manage stormwater onsite to reduce the burden on the storm sewer system and reduce flooding.			X
25.7 Prioritize drainage and flood studies for high-risk urban areas within the Urban Growth Area.			X
25.8 Drainage standards shall incorporate cumulative upslope development patterns.	X		
25.9 Develop an island-wide stormwater management program compatible with the NPDES MS4 Phase II program.			X
25.10 The County shall ensure sites are planned, designed, and developed to: a) Protect, restore, or mimic the natural water cycle within built environments by retaining, detaining, and/or treating stormwater runoff. b) Mitigate direct impacts of the land development process through the use of green infrastructure or low-impact site planning techniques. c) Protect areas that provide important water quality benefits and/or are particularly susceptible to erosion and sediment loss. d) Optimize the integration of the existing landscape into green infrastructure solutions. e) Manage post-construction stormwater runoff rates, through the use of green infrastructure or low-impact development stormwater management practices.	X		
25.11 The County shall ensure that golf course developments develop and implement grading and site preparation plans to: a) Develop nutrient management guidelines appropriate to Hawai'i for qualified superintendents to implement so that nutrients are applied at rates necessary to establish and maintain vegetation without causing leaching into ground and surface waters. b) Develop and implement an integrated pest management plan. Follow EPA guidelines for the proper storage and disposal of pesticides. c) Develop and implement irrigation management practices to match the water needs of the turf.			X

25.12 The County shall minimize impervious areas on County property, development sites, and parking areas and promote the use of permeable surfaces and landscaped areas in project designs including: a) Porous materials b) Natural drainage c) Filtration pits d) Infiltration basins, vegetated bioswales, permeable/porous paving			X
Discussion: The Proposed Action will support the goals, objectives, and policies outlined in the County of Hawai'i Draft General Plan relating to Public Utilities. The Proposed Action will ensure the safe and efficient closure of the three LCCs in the Nā'ālehu community and provide a new, reliable collections system and WWTP. The WWTP shall be designed to accommodate future growth in the Nā'ālehu community. Future expansions would be accommodated, as capacity allows, on a first-come, first-served basis. The Proposed Action will also incorporate drainage improvements to accommodate potential runoff. In the short-term, the on-site drainage plan, as per Hawai'i County Code, Chapter 27, Section 20, would ensure that runoff caused by the construction activities in the WWTP project site area and effluent disposal area would need to account for expected one-hour, ten-year storm event, is retained within the site boundaries. Landscape buffers with dirt berms would act as secondary containment during large storm events, further safeguarding against adverse impacts on adjacent or downstream properties. In the long-term, the proposed WWTP is anticipated to involve drainage improvements including the realignment of the vegetated drainage diversion channel and relocation of the drainage outlet which is considered to be a long-term impact. The drainage improvements shall be designed in accordance with the County Department of Public Works (DPW) drainage standards and will not alter existing stormwater discharge from the property.			
Public Facilities and Services Goals Our communities are safe and protected, and residents have access to quality, integrative health, education, and social services to support a high quality of life for residents of all ages. Our communities are adequately served by sustainable and efficient public infrastructure and services based on existing and future growth needs, sound design principles, and effective maintenance practices.			
Objective 26: Adequately maintain public facilities.			
Policies			
26.1 Maintain an Asset Management Program aimed at utilizing maintenance plans to prolong the life of our facilities as well as reduce whole-life costs.	X		
26.2 Maintain the unique features of historic structures, while balancing maintenance and safety needs	X		
26.3 Prioritize the replacement of deficient and inadequate facilities.	X		
26.4 Encourage the adoption of innovative materials and methods that improve facility resilience.	X		

26.5 The development of County facilities should be designed to fit into the locale with minimal intrusion while providing the desired services. Implement protocols for receiving community input during Capital Improvement Project siting and design.	**X**		
Objective 27: Protect the health and wellbeing of residents and visitors			
27.1 Police and fire stations should be co-located whenever feasible.			**X**
27.2 The establishment of a police/fire facility shall consider site size and locations that permit quick and efficient vehicular access.			**X**
27.3 Strategically plan and locate volunteer fire facilities, which may include co-existing with fulltime Fire/EMS stations.			**X**
27.4 Police headquarters shall be near the geographic center of the service area and near concentrations of commercial and industrial use.			**X**
27.5 Hardened shelters shall be located within reasonable proximity to population centers.			**X**
27.6 Lifeguard stations should be located at all County and State beach parks.			**X**
27.7 Support and expand volunteer fire facilities and capacity.			**X**
27.8 Adequately support and fund the volunteer fire department and stations.			**X**
27.9 Maintain a level of service for response time that is consistent with National Fire Protection Association (NFPA) standards.			**X**
27.10 Ensure Hazardous Material service for both the windward and leeward sides of the island.			**X**
27.11 All fire stations should provide Emergency Medical Services (EMS).			**X**
27.12 Stations in rural areas should be based on the population to be served and response time rather than on geographic districts.			**X**
27.13 Accommodate flexibility in design and provisions for alternate water sources for fire protection when adequate public water is not available.			**X**
27.14 Incentivize the development of large, dedicated catchment tanks for firefighting access.			**X**
27.15 The Fire Department shall participate with other related governmental agencies and the involved landowners in the preparation of fire protection and prevention plans.			**X**
27.16 Crime Prevention through Environmental Design (CPTED) should be incorporated into planning and design.			**X**

27.17 Business Improvement Districts or other organizational tools, such as partnerships with local businesses, should be used to enhance security and orderliness in downtown areas.			**X**
27.18 Support bicycle patrol programs in urban areas.			**X**
27.19 Encourage the further development and expansion of community policing programs, school resource officers, and neighborhood/farm watch programs.			**X**
27.20 Ensure adequate training and capacity building for emergency response.			**X**
27.21 Prioritize hazard mitigation projects in the Capital Improvements Program.			**X**
27.22 County public expenditures within Volcanic Hazard Zones 1&2 should be limited to the restoration or enhancement of natural resources and parklands or expenditures required to serve existing development or necessary for public health and safety. However, other expenditures may be warranted based on a cost-benefit analysis.			**X**
27.23 Continue to participate in the National Flood Insurance Program (NFIP) Community Rating System (CRS) to the maximum extent possible and shall seek to improve its current CRS Class rating (to the maximum extent feasible to reduce insurance costs).			**X**
27.24 Ensure emergency warning sirens and communications coverage is adequate for each community.			**X**
27.25 All emergency response critical facilities and communication systems shall be designed and maintained to be resilient and remain operational during hazard events.			**X**
27.26 All new emergency facilities shall be designed to minimize and prevent loss.			**X**
27.27 In collaboration with State agencies, maintain shelter capacity and condition records to ensure that evacuation shelters are adequate for each community.			**X**
27.28 Increase public education related to hazard zones, including evacuation routes and procedures for visitor accommodations.			**X**
27.29 Develop the capacity for hazard preparedness of non-governmental organizations, businesses, and neighborhood groups.			**X**
27.30 Partner with government, private and nonprofit agencies, and other stakeholders to assess and plan for alternative routes and possible relocation of coastal roads.			**X**
Objective 28: Achieve Zero Waste in Hawaiʻi County by 2045			
Policies			

28.1 Appropriately designed and cost-effective solid waste transfer station sites shall be located in areas of convenience and easy access to the public.			**X**
28.2 Implement waste stream technology, such as recycling and upcycling and waste-to-energy to reduce the flow of refuse deposited in landfills.			**X**
28.3 Proactively pursue funding that will ensure continued progression toward zero-waste goals.			**X**
28.4 Optimize recoverable material diversion from landfill disposal by increasing percentage rates for diversion through waste reduction, recycling, and reuse.			**X**
28.5 Encourage and support composting at farms.			**X**
28.6 Encourage salvage and reuse of building materials and elements when demolition is necessary or appropriate.			**X**
28.7 Continue to develop and implement a green waste recycling program.			**X**
28.8 Incentivize opportunities for a circular economy, primarily upcycling and waste reuse by incorporating Resource Recovery Parks.			**X**
28.9 Ensure that redesign plans for landfill and transfer stations provide adequate space for Resource Recovery (RR) Stations.			**X**
28.10 Ensure waste and resource recovery facilities and equipment do not harbor, spread, or introduce harmful or invasive species.			**X**
28.11 Site new solid waste/resource recovery facilities in appropriate areas that serve the needs of population centers but that do not negatively impact the environment or surrounding neighborhood.			**X**
28.12 Reduce illegal dumping and littering.			**X**
28.13 Minimize the amount of waste generated by County facilities.			**X**
Objective 29: Each community has access to a wide range of educational opportunities.			
Policies			
29.1 Ensure educational facilities meet the needs of Hawaiʻi County.			**X**
29.2 In proposed communities, sufficient acreage, as determined by the Board of Education enrollment guidelines, shall be reserved for school facilities.			**X**
29.3 Sites shall be free from flooding and drainage problems, and excessive slope and shall incorporate appropriate street and driveway design and location to minimize traffic interference, pedestrian hazard, and enable safe and easy access for vehicles, bicycles, and pedestrians.			**X**
29.4 Continuous joint pre-planning of educational facilities shall be coordinated with the County, Department of Education, and the University of Hawaiʻi to ensure compatibility with public services, supporting infrastructure, and equitable mobility			**X**

access so that facilities are community-centered, designed for multiple uses, and serve as anchor institutions in the community.			
29.5 School facilities, such as playgrounds and gyms, should be combined with county parks to allow for afterschool use by the community for recreational, cultural, and other compatible uses.			**X**
29.6 The Hawai'i State Library System should co-locate public library facilities in public school libraries where a separate public library may not be feasible, promoting intentional proximity to other community facilities and assets that contribute to a high quality of life.			**X**
29.7 School buildings should be designed, or at times retrofitted, to serve as emergency shelters.			**X**
29.8 The County should facilitate the use of libraries to disseminate public information and engage civic participation. 29.9 Advocate to the State and private agencies to use educational facilities to offer placebased and distance education opportunities to adults.			**X**
29.10 Educational programs should be developed to provide opportunities in diversified industries and develop practices in sustainability and resiliency.			**X**
29.11 Encourage the State to provide student, faculty, and staff housing around University of Hawai'i sites.			**X**
29.12 Support the continued expansion of the University of Hawai'i at Hilo, Hawai'i Community College, and Pālamanui campuses, as well as encourage continuing education programs throughout the community.			**X**
29.13 Support and encourage the strengthening of the University of Hawai'i at Hilo through the transfer of appropriate colleges and departments from the University of Hawai'i at Mānoa to the University of Hawai'i at Hilo.			**X**
29.14 Encourage and support the active implementation of State and University of Hawai'i plans for post-secondary educational facilities, including the "Research and Technology Park," on Hawai'i Island.			**X**
29.15 Encourage the expansion of digital access and equity through the resilient buildout of broadband infrastructure and facilities.			**X**
29.16 Prioritize active transportation through the development of sidewalks, pedestrian walkways, and bike paths to and from educational facilities to increase walkability and pedestrian safety.			**X**
29.17 Require new developments in the vicinity of schools to provide safe pedestrian facilities and additional school zone signage.			**X**
Objective 30: Park facilities are located within a 10-minute walk in urban areas and a 10-minute drive in rural communities.			
Policies			**X**

30.1 Diversify funding sources for recreational facilities.			X
30.2 State and County Capital Improvement Programs should continue to be coordinated to reflect recreational priorities.			X
30.3 Equitably allocate park dedications and in-lieu fees among the districts relative to the population.			X
30.4 Continue to improve parks and recreation outreach efforts to ensure program and facility information is adequately available, promoted online through accessible websites and other mediums, and kept up to date to facilitate maximum community participation.			X
30.5 Recreational facilities shall reflect the natural, historic, and cultural character of the area.			X
30.6 Equitably allocate facility-based parks among the districts relative to population, with public input to determine the locations and types of facilities.			X
30.7 Existing and new parks should be designed with features that accommodate and encourage meaningful levels of physical activity according to the level of service criteria.			X
30.8 Recreational facilities shall be assessed for dual use as emergency shelters and hardened as needed.			X
30.9 Establish, in cooperation with the State Department of Education, joint use of schoolyards, County parks, and other public facilities for community use for recreational, cultural, and other compatible uses.			X
30.10 Recreational facilities should be planned and located where they will best facilitate and support active-living communities.			X
30.11 Recreational sites should be planned and located within a 10-minute walk from residences in population centers, and serve with a minimum of five acres of land for park purposes per 1,000 resident population in non-population centers of Hawaiʻi Island.			X
30.12 Facilitate and prioritize the co-location of schools, parks, and senior centers to promote interactivity between community members of all ages.			X
30.13 Public lands with unique recreational and natural resources shall be maintained for public use.			X
30.14 Maintain and/or improve park facilities and programs based on community needs assessments to ensure County services are meeting the social, recreational, and activity needs of our communities.			X
30.15 Implement a proactive maintenance program to ensure that park facilities and trails are safely maintained for optimum usage.			X
30.16 Prioritize maintenance and necessary improvements at existing park facilities over developing new park facilities within each district (this does not preclude accepting lands for future park development or acquiring properties for the intent of			X

preserving open space, scenic areas, natural hazard areas, or cultural/historic areas from development).			
30.17 Combine recreation facility improvement projects with other needed facility improvements (e.g., ADA improvements with facility hardening, etc.)			**X**
30.18 Provide facilities and a broad recreational program for all age groups, with special considerations for the handicapped, the elderly, and young children.			**X**
30.19 Prioritize park acquisition and improvements that involve under-represented open recreation and healthy living activities (outside the scope of organized sports), such as: a) Walking and biking trails b) Skate/roller blade parks c) Dog-friendly parks d) Parks that offer camping opportunities e) Botanical and community garden parks, pocket and art parks f) Equestrian/rodeo arenas g) Archery and shooting ranges h) ATV and motorized recreation areas i) Other types of active and passive recreation that enhance the quality of life for visitors and residents			**X**
30.20 Support and enhance recreational facilities by developing additional recreational offerings in underutilized areas of County properties, such as the Panaʻewa Recreation Complex.			**X**
30.21 Continue to improve parks and recreation outreach efforts to ensure program and facility information is adequately available, promoted online through accessible websites and other mediums, and kept up to date to facilitate maximum community participation..			**X**
30.22 Private and public cemeteries shall be compatible with surrounding land uses and provided with adequate access and drainage systems			**X**
Objective 31: Each community has access to healthcare facilities, programs, or community-based care.			
Policies			
31.1 Ensure regular health service assessments identify and address the unique needs of the medically underserved population, especially in rural areas.			**X**
31.2 Partner with government, private and nonprofit agencies, and other stakeholders to ensure equitable access to healthcare services.			**X**

31.3 Ensure healthy communities through aligned land use and infrastructure policies.			X
31.4 Active living considerations should be integrated into the design of communities.			X
31.5 Advocate to the State to continue the operation of the rural hospitals.			X
31.6 Support the establishment of centrally located, 24-hour, full-service medical facilities, with trauma care, to service rural areas.			X
31.7 Hospitals should be on sites capable of handling moderate expansion of facilities. Quiet surroundings, convenient and adequate access, and compatibility with adjoining uses shall be required.			X
31.8 Hospitals shall be served by a public sewerage system or have selfcontained sewerage systems.			X
31.9 Ensure that hospitals are sufficiently hardened to remain in effective use through natural disasters.			X
31.10 Establish a comprehensive network of health and wellness services.			X
31.11 Integrate community health concerns in community planning.			X
31.12 Advocate for programs serving the elderly, disabled, and homeless persons.			X
31.13 Improve coordination and integration of services.			X
31.14 Support the establishment of home and community-based services (HCBS) that operate consistent with community character.			X
31.15 Increase opportunities and support for home-based care for aging in place.			X
Discussion: The Proposed Action will not directly impact the goals, objectives and policies outlined in the County of Hawaiʻi Draft General Plan relating to public facilities and services. The WWTP and collection system will be maintained by the COH-DEM and will provide improved wastewater treatment services to the Nāʻālehu community. Educational, recreational, healthcare, and emergency services in the community may indirectly benefit from the Proposed Action, but the policies and objectives outlined above will not be impacted by the Proposed Action.			
Housing Goal Residents have access to adequate and affordable housing to meet the needs of the population and provide equitable opportunities for household flexibility and mobility.			
Objective 32 (Diversify and Expand Housing): Increase the number and variety of newly constructed housing units for rent and sale that addresses a range of Area Median Income (AMI).			
Policies			

32.1 County departments shall collaborate to identify and prioritize infrastructure requirements and public-private partnerships that support the desired density of housing types near mixed-use centers and transit centers in urban areas.			X
32.2 Incentivize a mix of diverse housing types, including missing middle housing and mixed-income communities.			X
32.3 Prioritize new housing including the missing middle in or near mixed-use developments, urban growth areas with infrastructure, and near existing and proposed transit centers.			X
32.4 Support experimental housing, energy efficiency, and compact housing communities in accordance with HRS 46-15.			X
32.5 Incentivize the use of universal design principles in new construction to create physically accessible housing for children, the aging, and those with mobility limitations.			X
32.6 Vacant lands in the urban growth boundary (UGB) should be prioritized for residential uses before additional agricultural lands outside the UGB are converted into urban uses.			X
32.7 Incentivize smaller housing options.			X
Objective 33 (Manage Existing Housing): Monitor, conserve, and improve the existing housing stock.			
Policies			
33.1 Enable data-driven research to support and maintain a housing inventory program to monitor existing housing inventory.			X
33.2 Incentivize the use of universal design principles for the rehabilitation of existing housing to create physical accessibility for those with mobility limitations.			X
33.3 Encourage the adaptive reuse of non-residential spaces for residential purposes in urban growth areas where supporting infrastructure exists.			X
33.4 Identify and support federal, State, and local housing assistance programs to rehabilitate existing housing for very low- to moderate-income residents.			X
Objective 34 (Create Housing Affordability): Prioritize providing quality affordable housing for Hawai'i's residents.			
Policies			
34.1 Support affordable housing developments for all users including but not limited to the following groups: middle-income workforce, elderly, minimum wage workers, agriculture workers, individuals with special needs, individuals with disabilities, homeless, and retired individuals.			X
34.2 Support innovative and experimental housing types that address homelessness located near services, job centers, and transit hubs, while providing support services such as rent assistance..			X

34.3 All affordable housing projects that receive development benefits from the County, such as land use/zoning approvals, special approvals (including 201-H), conditional uses, and density bonuses, shall be required to maintain the affordable rental units for not less than 20 years pursuant to deed restrictions or other mechanisms specified in the HCC.			**X**
34.4 Reduce the cost and time of processing land use and construction applications, particularly for affordable housing projects.			**X**
34.5 Allow for and apply property tax and land use regulations to incentivize and encourage private property owners to provide affordable housing rental units in mixed-use and urban areas and to disincentivize the land banking of unimproved properties.			**X**
34.6 Encourage public agencies and private organizations to participate in federal, state, and private programs to provide new and rehabilitated housing and rental opportunities for low- and moderate-income households.			**X**
34.7 Enable housing programs that implement a land trust strategy for publicly owned parcels.			**X**
34.8 Encourage the development of workforce housing within or near urban growth areas and employment centers and require large new developments that create a demand for housing to provide affordable workforce housing.			**X**
34.9 Enable and encourage the development of affordable retirement communities and aging-in-place opportunities that are located near services and activities for seniors			**X**
Discussion: The Proposed Action will not impact the goals, objectives, and housing outlined in the County of Hawaiʻi Draft General Plan relating to housing. The collection system and WWTP will serve the existing C. Brewer lots and lots identified for potential future connection. While the Proposed Action will not directly impact the objectives and policies related to housing, the facilities shall be designed to accommodate future growth and expansion of the Nāʻālehu community.			
Integrated Systems Goal We are governed by integrated systems that are efficient, equitable, and organized to facilitate coordination and collaboration.			
Objective 35: Increase collaboration and cooperation for efficiency, effectiveness, and responsiveness.			
Policies			
35.1 Maintain and adequately fund County government services at the level necessary to be effective.	**X**		
35.2 Ensure that government attitudes, actions, and services are sensitive to community needs and concerns.	**X**		
35.3 Sufficiently fund, and facilitate the timely preparation, maintenance, and update of public policies and plans to guide County programs and regulatory responsibilities.			**X**

35.4 Expand the adoption of technology across all County agencies to achieve greater efficiency, accessibility, and accountability to the general public throughout government operations.			X
35.5 Continue to seek ways of improving public service through the coordination of service and maximizing the use of personnel and facilities.	X		
35.6 Promote alignment and consolidation of State and County functions whenever more efficient and effective delivery of government programs and services may be achieved.			X
35.7 Collaborate with appropriate State agencies for the provision of public facilities to serve the needs of the community	X		
Objective 36: Maintain fiscal integrity, responsibility, and efficiency.			
Policies			
36.1 Provide a balanced budget.			X
36.2 Allocate fiscal resources to efficiently implement the objectives of the General Plan in addition to essential government operations.	X		
36.3 Ensure accountability in government operations.			X
36.4 Calculate the cost of the different County services provided.	X		
36.5 Continue regular review of the County fee and fine schedules.			X
36.6 Maintain a debt financing plan to schedule bond authorization.			X
36.7 Leverage multiple sources of funding as part of the Capital Improvement Program (CIP).	X		
36.8 Encourage financing tools like Community Facilities Districts (CFD) to help fund off-site infrastructure improvements.			X
36.9 Develop short and long-range capital improvement programs and operating budgets for public facilities and services.			X
36.10 Capital projects shall be analyzed for overlapping scopes.	X		
36.11 Projects involving more than one Department's assets shall be coordinated to define scoping, design, and construction needs.			X
36.12 Improve the effectiveness of the Capital Improvement Program to maintain transparency of the status of all County CIP projects.			X
Objective 37: Achieve equitable outcomes for County programs, policies, and allocation of resources.			
Policies			

37.1 Promote policies that actively address and reduce disparate outcomes for historically underserved communities.			**X**
37.2 Seek equitable distribution of County investments towards promoting employment opportunities, infrastructure, and other community benefits.	**X**		
37.3 Provide resources for County employees to understand and actively advance equity solutions within all agencies of County government.			**X**
Discussion: The Proposed Action will not directly impact the goals, objectives, and housing outlined in the County of Hawaiʻi Draft General Plan relating to integrated systems. As part of the EID / EA process, identified agencies, organizations, and stakeholders will be provided opportunities to comment on and respond to the Proposed Action. As such, the Proposed Action, as undertaken by the COH-DEM, shall consider community needs and concerns. The Proposed Action is anticipated to utilize funding from the Clean Water State Revolving Fund (CWSRF). The selection of a preferred alternative will take into account capital costs associate with operation and maintenance of the Proposed Action. The August 2023 PER provides an evaluation of costs associated with each of the four identified alternatives.			
Economic Goal **Our economy is diverse, regenerative, and innovative, improving and maintaining the financial wellbeing of our residents with a focus to increase local economic opportunities.**			
Objective 38: Improve access at all levels fir education and training.			
Policies			
38.1 Support all levels of and forms of education.			X
38.2 Support programs and infrastructure that enables employees to telecommute or work in satellite locations.			X
38.3 Support apprenticeships and workforce training to strengthen leadership and entrepreneurial skillsets and networks..			X
38.4 Support County apprenticeships, fellowships, and internships to strengthen skillsets, networks, and innovation.			X
Objective 39: Increase the growth and health of small businesses.			
Policies			
39.1 Establish Hawaiʻi Island as a business-friendly place.			**X**
39.2 Streamline regulatory processes associated with starting and operating a business.			**X**
39.3 Shared workspaces, including certified kitchens and industrial co-work buildings shall be supported.			**X**

39.4 Initiate and/or support programs to revitalize town centers and increase demand for local-serving businesses.			X
39.5 Maintain strong partnerships and effective communication with the business community to identify barriers and actions to improve the business climate.			X
39.6 Support creation of shared facilities and resources that can be utilized by multiple opportunity clusters, such as creative industries and technical services.			X
39.7 Promote creative industries through collaboration with local artists on the design and creation of public, livable spaces.			X
39.8 Support programs and initiatives that encourage manufacturing and support Hawaiʻi Island's small-scale independent manufacturers.			X
39.9 Support business development programs by reducing underwriting risks for the private sector such as industrial development bonds, tax abatement, and low-interest loan programs.			X
39.10 Support access to capital for small businesses and start-ups.			X
39.11 Promote the use of the incentives offered by federal and state programs such as opportunity zones and enterprise zones partnership programs to attract businesses.			X
39.12 Encourage the development of the Technology, Creative, Agribusiness, Health and Wellness, and Education targeted sectors.			X
Objective 40: Incorporate resiliency, diversity, and innovation in County programs, plans, and research to support healthy economic development and revitalization.			
Policies			
40.1 Increase County resources and actions devoted to strategic planning, interagency coordination, training and expertise, and capital improvements.			X
40.2 Capital improvements program shall improve and increase the capacity of existing and future commercial and industrial areas.			X
40.3 Maintain a program for updating zoning code to accommodate emerging industries and technologies consistent with other goals, objectives, and policies of the General Plan.			X
40.4 Support lease terms and extensions on State and DHHL lands that provide opportunities to improve or rehabilitate existing commercial and industrial zoned areas.			X
40.5 Encourage land uses that allow for small-scale manufacturers in retail establishments that enhance and are balanced with the County's natural, cultural, and social environments.			X

40.6 Maintain plans and programs to foster sustainable business development opportunities focusing on regenerative agriculture, green technologies and building, innovation and technology, creative industries, and regenerative tourism.			**X**
40.7 Improve opportunities for multi-modal transit that improve the quality of existing job centers.			**X**
40.8 Provide technological infrastructure that increases the competitiveness of businesses and allows them to thrive in all parts of the island.			**X**
40.9 Expand opportunities for innovation and tech-based businesses.			**X**
40.10 Promote a distinctive brand for the island of Hawaiʻi including distinctive, regional identities as an entity unique within the State of Hawaiʻi.			**X**
40.11 Encourage the development of economic opportunities through the utilization of byproducts from various industries.			**X**
40.12 Continue to encourage the research, development, and implementation of advanced technologies and processes.			**X**
40.13 Promote Hawaiʻi Island as a center for natural scientific research.			**X**
Discussion: The Proposed Action will not directly impact the goals, objectives, and housing outlined in the County of Hawaiʻi Draft General Plan relating to the economy. The Proposed Action is anticipated to create short-term jobs during the construction phase and provide long-term operational and maintenance job opportunities as the WWTP and collection system become operational. The Proposed Action will not impact educational, local small-business, or research opportunities within the Nāʻālehu community.			
Agriculture and Food Systems Goal Agriculture is a robust, diversified sector that achieves food security and includes a broad range of agricultural-based businesses that highlight value.			
Objective 41:			
Policies			
41.1 Support urban agriculture uses including on-site home occupation sales.			**X**
41.2 Support innovative agriculture demonstration projects.			**X**
41.3 Assist in the expansion of the agricultural industry through the efficient use of productive agricultural lands, capital improvements, and continued cooperation with appropriate State and Federal agencies.			**X**
41.4 Assist in the promotion of Hawaiʻi Island branding for local produce and agriculture products.			**X**
41.5 Collaborate across County departments to engage in food systems planning, including the elimination of food deserts.			**X**

41.6 Assist in cooperative marketing and distribution endeavors to expand opportunities for local agricultural products for the local market as well as for exports.			**X**
41.7 Explore opportunities and methods to utilize local materials and byproducts from agriculture, agroforestry, silviculture, and aquaculture.			**X**
41.8 Support the research and development of the agriculture technology industry in collaboration with agriculture applications to optimize production.			**X**
41.9 Support regenerative agricultural practices and restoration of traditional knowledge and practices that offer multiple benefits, such as by improving agriculture and food system waste management that can reduce County greenhouse gas (GHG) emissions.			**X**
41.10 Support the development of private, County, and State agricultural parks to make land available and distributed equitably and proximate to infrastructure and housing.			**X**
41.11 Partner with government, private and nonprofit agencies, and other stakeholders for programs, training, and building community capacity in the promotion of the agricultural industry.			**X**
41.12 Increase public-private partnerships to develop and support community-based food systems.			**X**
41.13 Support the development of farm labor housing.			**X**
Objective 42: Increase interagency coordination, programs, and policy initiatives that improve local agriculture infrastructure.			
Policies			
42.1 Support the creation of water cooperatives supported with financial sources, such as CFDs. Cooperative users should be responsible for the development, maintenance, and repair of agricultural non-potable water systems.			**X**
42.2 Where the County has replaced surface water sources with groundwater sources to meet Safe Drinking Water standards, the County should consider repurposing the surface water sources for agricultural use where the allocation is supportive of the ecosystem.			**X**
42.3 Advocate for more flexible and innovative wastewater systems to serve agriculture facilities.			**X**
42.4 Support the adaptive reuse or rehabilitation of existing infrastructure or buildings for agricultural processing, including but not limited to the development of commercial kitchens, processing, storage, or distribution facilities.			**X**
42.5 Promote the development of a locally grown building material industry through streamlined permitting or building code flexibility.			**X**
42.6 Support research and development that promotes local produce while removing interstate marketing restrictions.			**X**

42.7 Encourage the use and optimization of the export capacity of airports and harbors for local goods.			**X**
42.8 Support research and development of viable biofuel projects that will supply renewable transportation fuels or power for Hawai'i Island in ways that are community-supported, sustainable, ecologically sound, and complementary to food production.			**X**
42.9 Support the continued operation of the USDA's Daniel K. Inouye U.S. Pacific Basin Agricultural Research Center facility.			**X**
42.10 Support the development of processing and manufacturing facilities.			**X**
Discussion: The Proposed Action will directly impact the goals, objectives, and housing outlined in the County of Hawai'i Draft General Plan relating to agriculture and food systems. the proposed WWTP and the collection system are located in "not rated" lands which is assigned to developed communities. Construction of the collection system within the County roads would not affect agricultural lands. Abandonment of the three LCCs would reduce the potential for contamination of groundwater that is used for irrigation of agricultural lands. Otherwise, abandonment of the LCCs and the existing wastewater collection system would not affect agricultural lands within the affected areas.			
Visitor Industry Goal A high quality of life for residents is maintained when a regenerative visitor industry balances the preservation of natural and cultural resources with responsible visitation.			
Objective 43:			
Policies			
43.1 Continue to monitor and adopt trends and standards for regenerative tourism.			**X**
43.2 County departments should integrate economic development, equity, and sustainability outcomes into their annual goals and reports to the Mayor.			**X**
43.3 Identify partnerships and resources with the visitor industry to ensure balance with the social, physical, and economic goals of the County.			**X**
43.4 Prioritize the maintenance of County properties and establish appropriate protocols for protection of wahi pana.			**X**
43.5 Ensure and expand equitable access to interpretive information about our wahi pana.			**X**
43.6 Support the coordination, collaboration, and improvement in public transportation services as well as eco-friendly options.			**X**
43.7 Support the coordination, collaboration, and improvement of public accessibility to natural resources with State agencies and private landowners.			**X**

43.8 Support partnerships to evaluate visitor industry impacts, develop mitigation strategies, and incorporate educational programs on native Hawaiian and community-based pono practices.			X
Objective 44: Increase authentic Hawai'i Island visitor experiences.			
Policies			
44.1 Integrate ʽāina based and place-based values into Hawaiʽi Island's identity.			X
44.2 Strengthen the accessibility of creative industries and Hawai'i Island-made products such as fashion, food, and the arts to the visitor industry.			X
44.3 Sustain a visitor industry that promotes small business development.			X
44.4 Encourage eco-tourism and agricultural tourism as regional opportunities.			X
44.5 The visitor industry shall promote a high quality of life for residents.			X
44.6 Collaboratively create initiatives and improve existing efforts to provide social benefits through transportation, community assets, and housing.			X
44.7 Support the promotion and development of community-based programs, festivals, and events that celebrate our communities.			X
44.8 Maintain efforts to continue dialogue among stakeholders and tie ʽāina-based and place-based values to Hawaiʽi Island's brand.			X
Environmental Goal Our natural and cultural resources are thriving and sustainably managed, preserved, and restored to maintain our unique and diverse environment.			
Objective 45: Increase the biodiversity and resilience of native habitats.			
Policies			
45.1 Minimize and mitigate significant impacts, such as degradation, incompatible uses, or other threats, to native Hawaiian habitats and public trust resources.	X		
45.2 Strive to improve the health of our island's forests, watersheds, nearshore environments, and coral reefs.			X
45.3 Encourage the preservation and restoration of natural landscape features, such as coral reefs, beaches and dunes, forests, streams, floodplains, and wetlands, or aquifer recharge areas that have the inherent capacity to avoid, minimize, or mitigate the impacts of climate change.	X		
45.4 Maintain the shoreline for recreational, cultural, educational, and/or scientific uses in a manner that is protective and respectful of resources and is of the maximum benefit to the general public.	X		

45.5 Increase collaborative efforts to improve coordination to conserve and manage wetlands, streams, and watersheds.			X
45.6 Encourage the preservation of native vegetation during development activities.	X		
45.7 Improve the use of native or non-native plants of cultural or environmental importance.	X		
45.8 Prioritize native landscaping for all (CoH) public projects.	X		
45.9 Limit the establishment of invasive or alien species.	X		
45.10 Maintain a continuing program to identify and protect exceptional trees, groves or stands of tree.			X
45.11 Encourage and incentivize green belts, tree plantings, and landscape plans and designs in urban areas.			X
45.12 Increase collaborative efforts to create and maintain community forests, food forests and other ‘agroforestry’.			X
45.13 Pursue the acquisition of lands for the protection of natural resources.			X
45.14 Partner with government, private and nonprofit agencies, and other stakeholders to: a) Implement the Hawai�process State Wildlife Action Plan (SWAP) b) Better understand and model carrying capacities of the island’s habitats and resources c) Improve the inventory of forested lands and associated ecosystem services d) Encourage the continued identification and inclusion of unique wildlife habitat areas of native Hawaiian habitat within the Natural Area Reserve System e) Anticipate future habitat migration, especially wetlands and coastal ecosystems f) Prioritize quantitative wetland assessment to identify wetlands g) Expand native/endemic forest cover h) Improve enforcement for illegal activities that harm or degrade endemic habitats			X
45.15 Discretionary permit applications shall inventory the following and include appropriate mitigation measures of any impacts on the subject property: a) Groundwater recharge areas above 3,000 feet elevation b) Intact native habitats c) Critical habitat areas as identified by federal or state agencies	X		

d) Exceptional trees e) Historic, archaeological, or cultural sites or properties			
45.16 Any development shall be designed to not adversely impact the following resource asset(s): a) Rivers, streams, springs, and other naturally flowing surface water bodies b) Anchialine pools and estuaries c) Shoreline setback areas, beaches, and dunes	**X**		
45.17 Maintain shoreline setbacks to: a) Protect natural shoreline vegetation; b) Protect marine turtle nesting beaches/areas; c) Protect water quality; d) Protect structures from the effects of long-term sea level rise; e) Protect beaches and shorelines from erosion; and f) Allow redevelopment of existing waterfront commercial structures consistent with the existing community character and preserve overwater views.			**X**
45.18 Landscaping and irrigation shall be designed to maximize water use efficiency and native plants.	**X**		
Objective 46: Preserve the health of the watersheds by improving water quality and reducing runoff.			
Policies			
46.1 Engage in comprehensive watershed planning to protect all watersheds and identify priority watershed areas to develop or complete watershed management plans and projects.			**X**
46.2 Address water best management practices and implement plans for non-point source discharges, such as irrigation flows, agricultural or urban runoff.	**X**		
46.3 Within mauka areas of high rainfall/fog-drip belt, ground disturbing activities such as excessive soil compaction and excessive removal of vegetative cover should be minimized and mitigated consistent with management strategies that encourage the retention of existing forested and pasture areas, reforestation, minimal coverage by impervious surfaces and other strategies that encourage effective infiltration to groundwater.	**X**		
46.4 Strengthen best management practices for wildfire management (erosion reduction, sediment control, fire management, storm water management, and natural riparian buffers along perennial and intermittent streams).	**X**		

46.5 Maintain participation in the development and implementation of the Ocean Resources Management Plan (ORMP), marine zoning plan(s), Marine Managed Areas (MMA's) or other appropriate tool(s).			**X**
46.6 Partner with government, private and nonprofit agencies, and other stakeholders to: a) Implement a comprehensive conservation plan that identifies priority watershed areas for habitat restoration and enhancement. b) Inventory lands considered necessary for the protection of watersheds, water sources and water supplies. c) Review and designate forest, river corridors, and watershed areas into the conservation district during State land use boundary comprehensive reviews. d) Monitor impacts to coral reefs and nearshore environments and address land-based sources of impacts. e) Restore wetlands and riparian corridors to decrease erosion, increase sediment management, groundwater infiltration, nutrient/pollutant uptake, soil moisture retention, stormwater abatement, and cultural/community connections. f) Restore stream flows (volumes) to meet public trust purposes or where environmental quality could be improved. g) Develop reasonable standards to improve stream and coastal water quality monitoring and encourage local communities to develop such projects. h) Achieve a net increase in nearshore water quality with more AA designations, and/or fewer impaired inland freshwater bodies and impaired marine/coastal waterbodies. i) Prioritize water quality monitoring activities in areas of existing and potential urban growth. j) Document pollutant loads for Hawai'i Island streams and coastal waters.			**X**
Objective 47: Increase direct community restoration and collaborative efforts to conserve and nourish the island's biocultural resources.			
Policies			
47.1 Encourage an overall conservation ethic in the use of Hawaii's resources by protecting, preserving, and conserving our critical and significant natural resources.			**X**
47.2 Foster recognition of the importance and value of the land, air, and water resources to Hawaii's people, their cultures, and visitors.	**X**		
47.3 Integrate progressive strategies incorporating indigenous and contemporary knowledge and practices to maintain environmental quality at the highest standards, address a changing climate, protect natural resources, and restore ecosystem health for the benefit of present and future generations.	**X**		

47.4 Protect the reasonable exercise of customarily and traditionally exercised rights of Hawaiians to the extent feasible.	X		
47.5 Promote resource management that is sustainable, responsible, and data driven.			X
47.6 Require the management of natural resources in a manner that fully minimizes adverse effects on the environment and depletion of energy and natural resources.	X		
47.7 Ensure that activities authorized or funded by the County do not irretrievably damage natural resources.	X		
47.8 Increase public pedestrian access opportunities to scenic places and vistas.			X
47.9 Increase community stewardship partnerships that focus on management responsibilities and promote community education or shared learning.			X
47.10 Improve Community Planning capacity building efforts toward coordination, leadership, effective action, connectivity, and impact.	X		
47.11 Contribute to programs of collection and dissemination of data concerning cultural or natural resources.			X
47.12 Partner with government, private and nonprofit agencies, and other stakeholders to: a) Protect special areas, structures, and elements that are an integral and functional part of Hawaiʻi's ethnic and cultural heritage. b) Identify and protect wahi pana. c) Promote the preservation and restoration of significant natural and historic resources. d) Aid in programmatic education concerning historic sites. e) Maintain the shoreline for recreational, cultural, educational, and/or scientific uses in a manner that is protective of resources and is of the maximum benefit to the public. f) Encourage the documentation and preservation of traditional ecological knowledge, identifying best management practices for integration.			X
Objective 48: The historical integrity, character, scenic assets, and open spaces of our communities are protected, restored, and treated as unique assets with significant social and economic value and managed in perpetuity.			
Policies			
48.1 Require both public and private developers of land to provide historical and archaeological surveys and cultural assessments, where appropriate, prior to the clearing or development of land when there are indications that the land under consideration has historical significance.	X		

48.2 Public access to significant historic sites and objects shall be acquired, where appropriate.	X		
48.3 Encourage the restoration of significant sites on private lands.			X
48.4 Signs explaining historic sites, buildings and objects shall be in keeping with the character of the area or the cultural aspects of the feature.			X
48.5 Historic Preservation shall represent the full range and diversity of the multi-cultural heritage of Hawaiʻi Island.			X
48.6 Maintain an inventory of significant cultural and historic sites and districts compatible with that of the State Historic Preservation Division.	X		
48.7 Ensure that projects requiring preservation plans are identified on subdivision maps and plan approval site plans.			X
48.8 The County shall develop a comprehensive management plan for historic and cultural resources that are on County owned properties or on properties managed by the County.			X
48.9 The County shall use and promote the use of interpretive signage and/or other appropriate methods to recognize landscapes, sites, buildings, and objects of significant historical and cultural importance.			X
48.10 Maintain the character of County-owned historic structures and bridges, as appropriate.			X
48.11 Outstanding natural or cultural features, such as scenic resources, water courses, fine groves of trees, heiau, and historical sites and structures, shall be identified and preserved during subdivision.	X		
Objective 49: Protect, restore, and enhance our communities' unique scenic character.			
Policies			
49.1 Consider structural setback from major thoroughfares and highways and establish development and design guidelines to protect important view planes.	X		
49.2 Preserve transportation corridors that have important scenic, historic, recreational, cultural and/or natural resources that enhance the character and scenic resources of communities.			X
49.3 Protect the views of areas endowed with natural beauty by carefully considering the effects of proposed construction and compatibility during all land use reviews.			X
49.4 Encourage the design of developments and activities that complement the natural beauty of the island.			X
49.5 Maintain a continuing program to identify and protect viewing sites on the island.	X		

49.6 Preserve and protect significant lava tubes, caves, or other geologic features determined to be significant by a governmental agency or plan.	X		

Discussion: The Proposed Action will support the goals, objectives and policies outlined in the County of Hawai'i Draft General Plan relating to the environment. Chapter 4 of this EID / EA discusses the existing conditions and potential impacts to the natural, cultural, and historical resources identified in the Project Area. Various mitigation measures and BMPs as outlined in Chapter 4 will be implemented to ensure that long-term impacts as a result of the Proposed Action are avoided.

As presented in the EID / EA, two biological surveys have been undertaken in the Project Area. As a result, floral and faunal resources in the Project Area are not expected to be impacted by the Proposed Action. The DOH initiated consultation with the U.S. Fish and Wildlife Service (FWS) pursuant to Section 7 of the Endangered Species Act (See Appendix C). The consultation requested the FWS' concurrence with the determination that the Proposed Action "may affect, but is not likely to adversely affect" federally listed species. In a letter dated June 21, 2024, the FWS provided concurrence with this determination. Additionally, the FWS provided avoidance and minimizations to be implemented to avoid adverse effects

Additionally, an archeological inventory survey was completed for the Project Area. The survey identified four previously documented and seven newly documented historic properties in the Project Area. In accordance with federal regulations (36 CFR 800.5), the results of the AIS are intended to support a future determination of "no adverse effect" by the Hawai'i State Department of Health (DOH) on behalf of the Environmental Protection Agency (EPA). Additionally, in accordance with HAR §13-275-7, the Hawai'i State DOH and County of Hawaii Department of Environmental Management (COH-DEM) are expected to determine the project effect as "effect, with proposed mitigation commitments."

As proposed through the AIS, the identified properties have been thoroughly documented mitigating any possible effects which no further work being proposed. Although historic properties have been determined to require no further work, the County will consider further communication and coordination with identified stakeholders to develop feasible and reasonable accommodations on either preserving historic properties or alternatives that integrate the broader preservation goals of the Waikapuna property.

5.2.2 General Plan Land Use Pattern Allocation Guide and Zoning

The General Plan Land Use Pattern Allocation Guide Map (LUPAG) delineates broad-brush boundaries that are graphic expressions of the General Plan policies, particularly those relating to land uses. The land use pattern in a broad, flexible design intended to guide the direction and quality of future developments in a coordinated and rational manner. These maps delineate a number of land use categories for each area.

Discussion:

The General Plan Land Use Pattern Allocation Guide (LUPAG) designation for the project area includes Single-Family Residential District, Village Commercial District, Limited Industrial District, Multiple-Family Residential District, Agricultural District, and Open District designations. The existing and proposed use of the project area is consistent with the current LUPAG designation. The existing and proposed use of the project area is a permitted use for areas within the County zoning districts.

5.2.3 Ka'ū Community Development Plan

The County of Hawai'i General Plan calls for the preparation of community development plans (CDPs) "to translate the broad General Plan statement to specific actions as they apply to specific geographical areas." The Ka'ū CDP is one of nine CDPs for Hawai'i County. In October 2017, the

Kaʻū CDP was adopted as Ordinance No. 2017-66. The purpose of CDPs is to implement the broad goals within the General Plan on a regional basis and to translate the broad General Plan statements into specific actions. CDPs are the forum for community input into managing growth and coordinating the delivery of government services to the community. CDPs designate detailed development patterns and direct physical development and public improvements by detailing land use policies and infrastructure priorities.

The CDP Land Use Policies are designed to preserve the preferred future settlement pattern and achieve the Community Objectives as Kaʻū grows. There are Land Use Policies designed to protect coastal areas, agricultural lands, mauka forests, scenic areas, sensitive ecosystems, cultural resources, and public access.

The Proposed Action is consistent with land use policies as the improvements are designed to serve the designated areas shown in the Land Use Policy map which classifies the Project Area as primarily low and medium density urban. The WWTP will partially be constructed within lands classified as extensive agriculture. The collection system and the wastewater treatment and disposal facility will be consistent with the policy related to infill of commercial development within the Nāʻālehu community. The collection system improvements are consistent with the policy to maintain the community character as the improvements will retain the existing pavement, including retention of streets, shoulders, and drainage systems.

The collection system will be consistent with the CDPs policies which prioritize improvements in infrastructure, facilities, and services as the improvements for the Proposed Action been designed not to preclude expansion to accommodate the Nāʻālehu community. Similarly, the wastewater treatment and disposal facility has been designed not to preclude expansion to accommodate the future needs of the Pāhala community. Future subdivisions would be accommodated, as capacity allows, on a first-come, first-served basis.

5.2.4 County of Hawaiʻi Special Management Area

Pursuant to the Hawaiʻi CZM Program, HRS Chapter 205A, the counties have enacted ordinances establishing Special Management Areas (SMAs) that are in close proximity to the shoreline. Any "development" within the SMA requires an SMA Use permit administered by the County of Hawaiʻi Planning Department. Through the SMA permit system, the County assesses and regulates developments proposed for areas located within the SMA. The Proposed Action is located within the Nāʻālehu community which lies about two miles from the shoreline area and is not located within an SMA. As such, the project will not be subject to the requirements of an SMA Use permit.

5.3 List of Permits and Approvals

State of Hawaiʻi Department of Health

- Approval to Construct
- Approval to Use
- National Pollutant Discharge Elimination System Construction Stormwater Permit
- Underground Injection Well Abandonment
- Noise Permit
- Noise Variance (only if required)

County of Hawaiʻi

- Special Permit
- Plan Approval
- Grading Permit
- Building Permit
- Electrical Permit
- Plumbing Permits
- Fence Permit
- Sign Permit (only if required)
- Permit to Work Within County Right-of-Way

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CHAPTER 6: LEGAL FRAMEWORK AND REGULATING AUTHORITIES

6. Legal Framework and Regulatory Authorities

As previously described, the County may use Clean Water State Revolving Fund (CWSRF) Program for construction of the Nāʻālehu Large Capacity Closure project. Since the State Revolving Fund receives annual funding from EPA, the National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. §§ 4321 – 4347), requires a federal agency proposing to undertake a project to consider the potential environmental impacts of the proposed project. Use of federal funds for a project is among the criteria set forth in NEPA that require preparation of environmental review documentation under NEPA and procedural requirements at 40 Code of Federal Regulations (CFR) Parts 1500-1508 (Council on Environmental Quality (CEQ) regulations), and 40 CFR Part 6 (U.S. Environmental Protection Agency (EPA) regulations). This EID / EA has been prepared under these guidelines.

The following regulatory requirements apply to this EID / EA and to federal cross cutting regulations necessary for compliance with the CWSRF program.

6.1 National Environmental Policy Act (NEPA) of 1969 (as Amended)

NEPA was passed in 1969 "to assure that all branches of government give proper consideration to the environment prior to undertaking any major federal action that significantly affects the environment." NEPA requires all federal agencies to prepare Environmental Information Documents (EIDs), Environmental Assessments (EA) and/or Environmental Impact Statements (EISs) to assess environmental impacts from project alternatives.

The purpose of NEPA is "to declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man, to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality," Sec. 2 [42 USC § 4321].

According to NEPA, it is the continuing responsibility of the federal government to use all practicable means, consistent with other essential considerations of national policy, to improve and coordinate federal plans, functions, programs, and resources. NEPA, as amended in 1970, requires federal agencies to: (a) utilize a systematic, interdisciplinary approach which will ensure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision making which may have an impact on man's environment; (b) identify and develop methods and procedures, in consultation with the Council on Environmental Quality established by Title II of this Act, which will ensure that presently un-quantifies environmental amenities and values may be given appropriate consideration in decision-making along with economic and technical considerations; and (c) include in every recommendation a detailed statement on the environmental impact of the Proposed Action; any adverse environmental effects which cannot be avoided should the proposal be implemented; alternatives to the Proposed Action; the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and; any irreversible and irretrievable commitments of resources which would be involved in the Proposed Action should it be implemented, Sec. 102 [42 USC § 4332].

This project may be funded by federal funds provided by U.S. Environmental Protection Agency (EPA) through the State of Hawaiʽi's Clean Water State Revolving Fund (CWSRF) Program. As such, the State of Hawaiʽi Department of Health (DOH) must conduct an environmental review of projects funded under the CWSRF as required under the Code of Federal Regulations (CFR), using the EPA-approved State Environmental Review Process. In addition, the State must comply with the federal cross-cutting authorities set forth in 40 CFR § 35.3145 for the CWSRF.

The CWSRF requirements are set forth as "cross cutters" described as follows.

In addition to the cross cutters required by the EPA-approved State Environmental Review Process, EPA guidance for conducting environmental reviews, and the Clean Water Act have been included.

6.2 Archaeological and Historic Preservation Act (54 U.S.C. § 312502)

The Archaeological and Historic Preservation Act (AHPA), also known as the Archaeological Recovery Act and the Moss-Bennett bill, was passed and signed into law in 1974. It amended and expanded the Reservoir Salvage Act of 1960. The AHPA built upon the national policy, set out in the Historic Sites Act of 1935, "*to provide for the preservation of historic American sites, buildings, objects, and antiquities of national significance.*" The AHPA expanded the policy by focusing attention on significant resources and data but does not require that they be shown to be of "national" significance. The AHPA required that federal agencies provide for *"...the preservation of historical and archeological data (including relics and specimens) which might otherwise be irreparably lost or destroyed as the result of...any alteration of the terrain caused as a result of any Federal construction project of federally licensed activity or program*."

54 United States Code (U.S.C.) § 312502 (a)(1) states: "When any Federal agency finds, or is notified, in writing, by an appropriate historical or archeological authority, that its activities in connection with any Federal construction project or federally licensed project, activity, or program may cause irreparable loss or destruction of significant scientific, prehistorical, historical, or archeological data, the agency shall notify the Secretary, in writing, and shall provide the Secretary with appropriate information concerning the project, program, or activity."

54 U.S.C. § 312502 (b)(1) states: "When any Federal agency provides financial assistance by loan, grant, or otherwise to any private person, association, or public entity, the Secretary, if the Secretary determines that significant scientific, prehistorical, historical, or archeological data might be irrevocably lost or destroyed, may, with funds appropriated expressly for this purpose-

(A) Conduct, with the consent of all persons, associations, or public entities having a legal interest in the property, a survey of the affected site; and
(B) Undertake the recovery, protection, and preservation of the data (including analysis and publication)."

As discussed in Section 4.7 of this EA / EID, a Draft AIS Report was completed by Cultural Surveys Hawaiʻi in May 2024. The AIS is was designed to be compliant with both Federal and Hawaiʻi State environmental and historic preservation review legislation. The AIS was conducted to assess any historic properties for integrity and site significance in accordance with HAR §13-275-6. This report is also intended to support any project-related historic preservation consultation with consulting parties, such as state and county agencies and interested Native Hawaiian Organizations (NHOs) and community groups, if applicable.

The AIS identified four previously documented and seven newly documented historic properties in the Project Area. In accordance with federal regulations (36 CFR 800.5), the AIS results support the determination made by the Hawaiʻi State DOH on behalf of the EPA of "no adverse effect." In accordance with HAR §13-275-7, the Hawaiʻi State DOH and COH-DEM have determined the project effect is "effect, with proposed mitigation commitments." As stated in the AIS, the identified sites have been fully documented, mitigating any potential effect, and no further work is recommended.

Although historic properties have been determined to require no further work, the County will consider further communication and coordination with identified stakeholders to develop feasible and reasonable accommodations on either preserving historic properties or alternatives that integrate the broader preservation goals of the Waikapuna property.

Archaeological monitoring is recommended during all project ground-disturbing activities to facilitate identification for information purposes, especially of any subsurface lava tubes that may contain historic properties. Archaeological monitoring will proceed under an archaeological monitoring plan that meets the requirements of HAR §13-279-4, which will be submitted to the SHPD for review and acceptance prior to project initiation.

The contract drawings will state that, should archaeological sites such as walls, platforms, pavements or mounds, or remains such as artifacts, burials, concentrations of shell or charcoal be encountered during construction activities, work shall cease immediately and the find shall be protected from further damage. The contractor shall immediately contact the State Historic Preservation Division (SHPD), who will assess the significance of the find and recommend an appropriate mitigation measure, if necessary.

In addition to the AIS, the County is obligated to comply with the National Historic Preservation Act (NHPA). On June 3, 2024 the DOH, on behalf of the County, initiated consultation for this project in accordance with Section 106 of the NHPA. Consultation letters were sent to various Native Hawaiian Organizations inviting comments from organizations that may attach religious or cultural significance to properties affected by the proposed actions. NHPA Section 106 consultation correspondence can be found in Appendix F of this EA / EID. The SHPD has not yet responded to the consultation request. As such, any future consultation with the SHPD shall be incorporated into the Final EID / EA.

6.3 Bald and Golden Eagle Protection Act (16 U.S.C. § 668-668c)

The Bald Eagle Protection Act (16 U.S.C. § 668-668c) prohibits any act to take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or in any manner any bald eagle commonly known as the American eagle or any golden eagle, alive or dead, or any part, nest, or egg thereof of the foregoing eagles.

No bald or golden eagles are found in Hawaiʿi.

6.4 Clean Air Act (42 U.S.C. § 7401 et seq.)

Over the years, there has been a series of legislations affecting air quality and a number of amendments adopted related to air quality. The Air Pollution Control Act of 1955 was the first federal legislation involving air pollution and was followed by the Clean Air Acts of 1963 and 1970. The Clean Air Act of 1970 (1970 CAA, 42 U.S.C. § 7401 et seq.) authorized the development of comprehensive federal and state regulations to limit emissions from both stationary (industrial) sources and mobile sources.

The 1970 CAA set forth four major regulatory programs affecting stationary sources: the National Ambient Air Quality Standards (NAAQS), State Implementation Plans (SIPs), New Source Performance Standards, and National Emission Standards for Hazardous Air Pollutants. In Hawaiʿi, the DOH, Clean Air Branch, Air Quality program is defined by Hawaiʿi Administrative Rules (HAR) 11-60.1 and serves as the SIP approved by EPA.

The State DOH maintains 10 air monitoring stations on the island of Hawaiʿi. Established in 2007, the DOH maintains a monitoring station on the grounds of the N Elementary School to monitor SO_2 and $PM_{2.5}$ (in terms of micrograms per cubic meter (µg/m3)) from emissions from volcanic activities.

The quality of air in the general Nāʿālehu area is considered "Good" due to the typical flow of fairly constant northeasterly trade winds that disperse pollutants seaward. The rural nature of the Nāʿālehu area has no major stationary sources of air pollution. Existing sources of air pollution are emissions from motor vehicles traveling along Māmalahoa Highway and on the streets in the community; the low level of vehicle traffic tends to limit mobile sources of emissions.

Potential short-term effects from dust and exhaust due to construction activities will be minimized with BMPs such as water sprinkling and proper equipment maintenance. No long-term impacts on air quality resulting from operation of the collection system, the wastewater treatment and disposal facility, or the IWS are anticipated.

The DOH operates a network of air quality monitoring stations at various locations around the State. In September 2023, the DOH issued the Annual Summary 2022 Air Quality Data report (the most recent report) which provides the results from the network of air quality monitoring stations. The DOH maintains a monitoring station on the grounds of the Nāʻālehu. Established August 2007, the station was placed to monitor SO_2 and $PM_{2.5}$ from volcanic emissions. In 2022, Hawaiʻi was in attainment of the state annual SO2 standard. In 2015, Hawaiʻi was in attainment with the annual NAAQS for particulate matter with a diameter of 2.5 micrometers or less (PM2.5).

Volcanic eruptions are considered natural events and therefore EPA may exclude the exceedances of the 1-hour NAAQS from attainment determinations.

Potential short-term effects from dust and exhaust due to construction activities will be minimized with BMPs such as water sprinkling and proper equipment maintenance. No long-term impacts on air quality resulting from operation of the collection system, the wastewater treatment and disposal facility, or the IWS are anticipated.

6.5 Coastal Barrier Resources Act (16 U.S.C. § 3501)

In 1982, Congress passed the Coastal Barrier Resources Act (CBRA) (16 U.S.C. § 3501) to minimize the loss of human life; wasteful expenditure of federal revenues; and the damage to fish, wildlife, and other natural resources associated with the coastal barriers along the Atlantic and Gulf coasts and along the Great Lakes by restricting future federal expenditures and financial assistance which have the effect of encouraging development of coastal barriers, such as federal flood insurance through the National Flood Insurance Program.

The Coastal Barrier Resources Reauthorization Act of 2000 reauthorized the CBRA and directed the U.S. Fish and Wildlife Service (FWS) to complete a Digital Mapping Pilot Project that includes digitally produced draft maps for up to 75 John H. Chafee Coastal Barrier Resources System (CBRS) areas and a report to Congress that describes the feasibility and costs for completing digital maps for all CBRS areas.

Based on its location, the CBRA is not applicable to Hawaiʻi.

6.6 Coastal Zone Management Act (16 U.S.C. § 1451)

The Coastal Zone Management Act of 1972 (CZMA) (16 U.S.C §§ 1451-1464) was passed to establish a national policy to preserve, protect, develop, and where possible, restore or enhance, the resources of the Nation's coastal zone for this and succeeding generations and to encourage coastal states to develop and implement coastal zone management (CZM) programs. Each federal agency activity within or outside the coastal zone that affects any land or water use or natural resource of the coastal zone shall be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved state management programs. Each federal agency carrying out an activity subject to the Act shall provide a consistency determination to the relevant state agency designated under § 1455(d)(6) of this title at the earliest practicable time.

In 1977, Hawaiʻi enacted HRS 205A (Coastal Zone Management). The CZM area encompasses the entire state, including all marine waters seaward to the extent of the state's police power and management authority, including the 12-mile U.S. territorial sea and all archipelagic waters. The objective and policies of the CZM Program and the Proposed Action's conformance are detailed in Table 6-1 below:

Table 6-1 Hawai'i Coastal Zone Management Act	S	NS	N/A
Recreational Resources			
Objective: Provide coastal recreational opportunities accessible to the public.			
Policies:			
(A) Improve coordination and funding of coastal recreational planning and management; and			**X**
(B) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:			**X**
i. Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;			**X**
ii. Requiring restoration of coastal resources that have significant recreational and ecosystem value including, but not limited to, coral reefs, surfing sites, fishponds, sand beaches, and coastal dune, when these resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when restoration is not feasible or desirable;			**X**
iii. Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;			**X**
iv. Providing an adequate supply of shoreline parks and other recreational facilities suitable public recreation;			**X**
v. Ensuring public recreational uses of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;			**X**
vi. Adopting water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;			**X**
vii. Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and			**X**
viii. Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and county authorities; and crediting such dedication against the requirements of section 46-6.			**X**
Discussion: All project locations are at least 2 miles from the shoreline and, as such, the Proposed Action will not affect coastal recreational resources under any of the Proposed Alternatives.			
Historic Resources			
Objective: Protect, preserve, and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.			
Policies:			
(A) Identify and analyze significant archaeological resources;	**X**		
(B) Maximize information retention through preservation of remains and artifacts or salvage operations; and			**X**
(C) Support state goals for protection, restoration, interpretation, and display of historic resources.			**X**
Discussion: All project locations are at least 2 miles from the shoreline and, as such, the Proposed Action will not affect coastal historic resources under any of the Proposed Alternatives.			
Scenic and Open Space Resources			
Objective: Protect, preserve, and, where desirable, restore or improve the quality of coastal scenic and open space resources.			
Policies:			
(A) Identify valued scenic resources in the coastal zone management area;			**X**

Table 6-1 Hawai'i Coastal Zone Management Act	S	NS	N/A
(B) Ensure that new developments are compatible with their visual environment by designing and locating those developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;			X
(C) Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and			X
(D) Encourage those developments that are not coastal dependent to locate in inland areas.			X
Discussion: All project locations are at least 2 miles from the shoreline and, as such, the Proposed Action will not affect coastal recreational resources under any of the Proposed Alternatives.			
Coastal Ecosystems			
Objective: Protect valuable coastal ecosystems, including reefs, beaches, and coastal dunes, from disruption and minimize adverse impacts on all coastal ecosystems.			
Policies:			
(A) Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;			X
(B) Improve the technical basis for natural resource management;			X
(C) Preserve valuable coastal ecosystems, of significant biological or economic importance, including reefs, beaches, and dunes;			X
(D) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and			X
(E) Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.	X		
Discussion: All project locations are at least 2 miles from the shoreline and, as such, the Proposed Action will not affect coastal recreational resources under any of the Proposed Alternatives.			
Economic Uses			
Objective: Provide public or private facilities and improvements important to the State's economy in suitable locations.			
Policies:			
(A) Concentrate coastal dependent development in appropriate areas;			X
(B) Ensure that coastal dependent development and coastal related development are located, designed, and constructed to minimize exposure to coastal hazards and adverse social, visual, and environmental impacts in the coastal zone management area; and			X
(C) Direct the location and expansion of coastal developments to areas designated and used for such developments and permit reasonable long-term growth at those areas, and permit coastal development outside of presently designated areas when:			X
i. Use of presently designated locations is not feasible;			X
ii. Adverse environmental effects and risks from coastal hazards are minimized; and			X
iii. The development is important to the State's economy;			X
Discussion: All project locations are at least 2 miles from the shoreline and, as such, the Proposed Action will not affect coastal recreational resources under any of the Proposed Alternatives.			
Coastal Hazards			
Objective: Reduce hazard to life and property from coastal hazards.			
Policies:			
(A) Develop and communicate adequate information about the risks of coastal hazards;			X
(B) Control development, including planning and zoning control, in areas subject to coastal hazards;			X
(C) Ensure that developments comply with requirements of the National Flood Insurance Program; and	X		

Table 6-1 Hawai'i Coastal Zone Management Act	S	NS	N/A
(D) Prevent coastal flooding from inland projects.			X
Discussion: All project locations are at least 2 miles from the shoreline and at least 600 feet above mean sea level (msl). Based on the location, the Proposed Action will not be subject to (and will not exacerbate) coastal hazards and do not include improvements related to tsunami, storm waves, stream flooding erosion, subsidence, and pollution under any of the Proposed Alternatives.			
Managing Development			
Objective: Improve the development review process, communication, and public participation in the management of coastal resources and hazards.			
Policies:			
(A) Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;			X
(B) Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements; and			X
(C) Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.	X		
Discussion: A total of five community outreach sessions to discuss the Revised AOC were conducted in the Pahala and Naalehu communities between March 2022 and September 2023. In late October 2023, public preference surveys to gather input on the four feasible options were mailed out to 194 lot owners in the LCC closure area. A public meeting was held November 16, at the Nāʻālehu Community Center to engage with the public to solicit feedback on the options explored in the PER, and to provide a general overview of the EID being prepared. A second round of surveys was mailed out to owners of affected lots in February 2024. A semi-annual community informational meeting was held on February 29, 2024 in Pāhala and the next semi-annual community informational meeting will be held in August 2024 in Nāʻālehu. The Project Area is located at least 2 miles from the coast, at least 600 feet above msl, and do not involve management of coastal resources and hazards under any of the Proposed Alternatives.			
Public Participation			
Objective: Stimulate public awareness, education, and participation in coastal management.			
Policies:			
(A) Promote public involvement in coastal zone management processes;			X
(B) Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities; and			X
(C) Organize workshops, policy dialogues, and site-specific mitigation to respond to coastal issues and conflicts.			X
Discussion: A total of five community outreach sessions to discuss the Revised AOC were conducted in the Pahala and Naalehu communities between March 2022 and September 2023. In late October 2023, public preference surveys to gather input on the four feasible options were mailed out to 194 lot owners in the LCC closure area. A public meeting was held November 16, at the Nāʻālehu Community Center to engage with the public to solicit feedback on the options explored in the PER, and to provide a general overview of the EID being prepared. A second round of surveys was mailed out to owners of affected lots in February 2024. A semi-annual community informational meeting was held on February 29, 2024 in Pāhala and the next semi-annual community informational meeting will be held in August 2024 in Nāʻālehu.			
Beach Protection and Coastal Dune Protection			
Objective: (A) Protect beaches and coastal dunes for; i. Public and recreation; ii. The benefit of coastal ecosystems iii. Use as natural buffers against coastal hazards; and, iv. Coordinate and fund beach management and protection.			
Policies:			

Table 6-1 Hawai'i Coastal Zone Management Act	S	NS	N/A
(A) Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;			X
(B) Prohibit construction of private shoreline hardening structures including seawalls and revetments, at sites having sand beaches and at site where shoreline hardening structures interfere with existing recreational and waterline activities; and			X
(C) Minimize the construction of public shoreline hardening structures including seawalls and revetments, at sites having sand beaches and at sites where shoreline hardening structures interfere with existing recreational and waterline activities;			X
(D) Minimize grading of and damage to coastal dunes;			X
(E) Prohibit private property owners from creating a public nuisance by inducing or cultivating the private property owner's vegetation in a beach transit corridor; and			X
(F) Prohibit private property owners from creating a public nuisance by allowing the private property owner's unmaintained vegetation to interfere or encroach upon a beach transit corridor.			X
Discussion: All project locations are at least 2 miles from the shoreline. The Proposed Action does not include improvements that would affect public use of beaches under any of the Proposed Alternatives.			
Marine and Coastal Resources			
Objective: Promote the protection, use, and development of marine and coastal resources to assure their sustainability.			
Policies:			
(A) Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;			X
(B) Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;			X
(C) Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone;			X
(D) Promote research, study, and understanding of ocean and coastal processes, impacts of climate change, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how coastal development activities relate to and impact ocean and coastal resources; and			X
(E) Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.			X
Discussion: All project locations are at least 2 miles from the shoreline. The Proposed Action does not include improvements that would affect development of marine and coastal resources under any of the Proposed Alternatives.			

6.7 Endangered Species Act (16 U.S.C. § 1531)

On December 28, 1973, the Endangered Species Act (16 U.S.C. § 1531) was passed and, over the years, has been amended a number of times. The stated purpose of the original Act was to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of various related treaties and conventions. The provisions of the Act are administered by the FWS and the National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS). The FWS has primary responsibility for terrestrial and freshwater organisms, while NOAA/NMFS is mainly responsible for marine wildlife.

Section 7 of the Act, Interagency Cooperation (16 U.S.C. § 1536), states each federal agency shall, in consultation with and with the assistance of the Secretary of the Interior, ensure that any action authorized, funded, or carried out by such agency (an "agency action") is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined, after consultation as appropriate with affected states, to be critical, unless such agency has been granted an exemption for such action.

As discussed in Section 4.6 of this EA/ EID, two biological surveys were conducted on the sites: one in 2012 and one in 2021; both surveys were conducted by AECOS Inc. (AECOS, 2021). During the botanical, avian, and mammalian resources surveys no listed or proposed-for-listing species under federal statutes was recorded. The assessment observed avian diversity and densities present within the Project Area and its surrounding vicinity.

Based on the findings of the botanical and biological field surveys, construction activities associated with the new collection system and wastewater treatment and disposal facility are not anticipated to result in adverse impacts to botanical and faunal resources in the Nāʻālehu area. Mitigation measures and BMPs as recommended by the FWS and AECOS will be implemented during construction and following build out to ensure that the project minimizes all impacts to listed species to the maximum extent practicable.

On May 31, 2024, the DOH initiated consultation with the U.S. Fish and Wildlife Service (FWS) pursuant to Section 7 of the Endangered Species Act (See Appendix C). The consultation requested the FWS' concurrence with the determination that the Proposed Action "may affect, but is not likely to adversely affect" federally listed species. In a letter dated June 21, 2024, the FWS provided concurrence with this determination. Additionally, the FWS provided avoidance and minimizations to be implemented to avoid adverse effects (See Appendix D).

6.8 Environmental Justice Executive Order 12898

Executive Order 12898, Environmental Justice (full title Federal Actions to Address Environmental Justice to Minority and Low Income Populations), was signed on February 11, 1994. The intent of Executive Order 12898 is to avoid disproportionately high adverse human health or environmental effects of projects on minority and low income populations. Executive Order 12898 also requires federal agencies to ensure that minority and low-income communities have adequate access to public information related to health and the environment.

The 2022 American Community Survey (ACS) (5-Year Estimates) is the most recent information related to socioeconomic conditions in the state and County. The 2022 ACS includes Hawaiʻi Geographic Area Profiles – Census Designated Places: Neighbor Islands. The ACS noted it is the Census Bureau's Population Estimates Program that produces and disseminates the official estimates of the population for the nation, states, counties, cities and towns and estimates of housing units for states and counties.
For purposes of this assessment, and to correspond with the available ACS demographic characteristics data, "low income" is defined as having a household income of less than $24,999;

"minority" is defined as any race population other than White; and "children" is defined as the "Under 5 to 19" age category.

The Project Area is located within the Nāʻālehu Census Designated Place (CDP). The 2022 American Community Survey (ACS) was reviewed for the Nāʻālehu CDP and Hawaiʻi County in Section 4.14 of the EA.

6.9 Farmland Protection Policy Act (7 U.S.C. § 4201)

The Agriculture and Food Act was passed in 1981 and contained the Farmland Protection Policy Act (FPPA) (7 U.S.C. § 4201). The stated purposes of the FPPA are to: 1) minimize the extent to which federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses; and 2) assure that federal programs are administered in a manner that, to the extent practicable, will be compatible with state, unit of local government, and private programs and policies to protect farmland. "Farmland" subject to FPPA requirements does not have to be currently used for cropland.

The FPPA is administered by the U.S. Department of Agriculture (USDA), National Resources Conservation Service (NRCS). "Farmland", as used in the FPPA, includes prime farmland, unique farmland, and land of statewide or local importance, as defined by the State of Hawaiʻi Department of Agriculture.

Per the Agricultural Lands of Importance to the State of Hawaiʻi (ALISH) Classification System, all Project locations are located in "not rated" lands which is assigned to developed communities. Construction of the collection system within the County roads would not affect agricultural lands.

6.10 Fish and Wildlife Coordination Act (16 U.S.C § 661)

The Fish and Wildlife Coordination Act (16 U.S.C § 661), enacted on March 10, 1934, was amended on August 12, 1958. The purpose of the Act is to recognize the vital contribution of wildlife resources to the Nation, the increasing public interest and significance, and to provide that wildlife conservation shall receive equal consideration and be coordinated with other features of water-resource development programs through the effectual and harmonious planning, development, maintenance, and coordination of wildlife conservation. The Act defines wildlife and wildlife resources as birds, fishes, mammals and all other classes of wild animals, and all types of aquatics and land vegetation upon which wildlife is dependent (16 U.S.C. § 666b).

The Secretary of the Interior is authorized (1) to provide assistance to, and cooperate with, federal, state, and public or private agencies and organizations in the development, protection, rearing, and stocking of all species of wildlife, and their habitat; in controlling losses of the from disease or other causes; in minimizing damages from overabundant species; and in providing public shooting and fishing areas, including easements across public lands; (2) to make surveys and investigations of the wildlife of the public domain, including lands and waters acquired or controlled by any agency; and (3) to accept donations of land and contributions of funds in furtherance of the purposes of the Act.

Specifically, the Act states that "whenever the waters of any stream or other body of water are proposed or authorized to be impounded, diverted, the channel deepened, or the stream or other body of water otherwise controlled or modified for any purpose whatever, including navigation and drainage, by any department or agency of the United States, or by any public or private agency under Federal permit or license, such department or agency first shall consult with the United States Fish and Wildlife Service" (16 U.S.C. § 662(a)). The consultation may result in a report of recommendations by FWS that should be adopted to prevent the loss of or damage to wildlife resources. The provisions of the Act do not apply to impoundments of water less than 10 acres.

The Proposed Action does not include any impoundment of water and therefore a Fish and Wildlife Coordination Act review and/or consultation pursuant to 16 U.S.C. § 662 is not required under any of the Proposed Alternatives.

6.11 Floodplain Management (Executive Order 11988, as amended by Executive Orders 12148 and 13690)

Executive Order 11988, Floodplain Management, dated May 24, 1977 requires federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.

In accomplishing this objective, "each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities."

The Proposed Action is not located within a 100-year floodplain area, will incorporate stormwater BMPs to manage runoff in accordance with state requirements, and will be designed to ensure sufficient capacity for assimilation of peak effluent flow rates and precipitation from the design storm event. The Proposed Action therefore will not have an adverse impact on floodplains and will minimize the risk of flood-related impacts on surrounding properties under any of the Proposed Alternatives.

6.12 Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801)

The 1996 Sustainable Fishery Act amendments to the Magnuson-Stevens Fishery Conservation and Management Act and subsequent Essential Fish Habitat (EFH) Regulatory Guidelines (NOAA, 2002) describe provisions to identify and protect habitats of federally managed marine and anadromous fish species. Under the various provisions, federal agencies that fund, permit, or undertake activities that may adversely affect EFH are required to consult with the NMFS.

Congress defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." EFH is further defined by the existing regulations (NOAA-NMFS, 2007; NOAA, 2002). "Waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle.

All project locations are at least 2.5 miles from the shoreline. The Proposed Action will not adversely impact EFH under any of the Proposed Alternatives.

6.13 Marine Mammal Protection Act (16 U.S.C. §§ 1361 et seq.)

The Marine Mammal Protection Act (MMPA) (16 U.S.C. §§ 1361 et seq.), protects all marine mammals. The MMPA includes a general moratorium on the taking and importing of marine mammals, and prohibits, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the U.S. Jurisdiction for MMPA is shared by the FWS and NMFS. The FWS Branch of Permits is responsible for issuing take permits when exceptions are made to MMPA. Under the exception for incidental taking, the FWS or the NMFS must find that the total taking over the five-year period will have a "negligible impact" and will not adversely affect the availability of the marine mammal species or stock for subsistence use by natives.

All project locations are at least 2.5 miles from the shoreline. The Proposed Action will not adversely impact marine mammal communities and will not encourage any "take" of marine mammals under any of the Proposed Alternatives.

6.14 Migratory Bird Treaty Act (16 U.S.C. §§ 703 et seq.)

The Migratory Bird Treaty Act (MBTA) and Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds) provide for the protection of migratory birds. The MBTA of 1918, as amended (16 U.S.C. §§ 703-712) makes it unlawful to, among other things, pursue, hunt, take, capture, kill, transport or import any species listed under the Act. The Act implements conventions between the U.S., Great Britain, Mexico, Japan, and the former Soviet Union.

Executive Order 13186 was issued to assist federal agencies with their efforts to comply with the MBTA. It should be noted that the Executive Order does not constitute any legal authorization that in any way supersedes the requirements outlined in the MBTA. The Executive Order directs federal agencies undertaking actions that have or are likely to have a measurable adverse impact on migratory bird populations to develop and implement a Memorandum of Agreement with the FWS addressing the conservation of these populations.

As described in Section 4.6 of this EA / EID, biological surveys conducted in 2012 and 2021 by AECOS recorded one indigenous migratory shorebird species in the Project Area. The Pacific Golden-Plover (*Pluvialis fulva*) is commonly seen across the state between late September and the end of April each year. This species migrates to Arctic breeding grounds in late April or the first week of May. Minimization measures discussed herein are intended to minimize any potential impacts on flora and fauna that could result from the construction and operations of the wastewater treatment and disposal facility and associated infrastructure. The proactive consultation with relevant authorities ensures compliance with regulations and protection of sensitive species.

6.15 National Historic Preservation Act (54 U.S.C. § 300101)

The National Historic Preservation Act (NHPA) of 1966 (54 U.S.C. § 300101) requires a federal agency undertaking an action/project consider of the effect of the project on any historic property defined as a district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places.

Section 106 of the NHPA (54 U.S.C. § 306108) requires a federal agency having direct or indirect jurisdiction over a federal or federally assisted undertaking to take into account the effect of the undertaking on any historic property. An "undertaking" includes a "project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency" (54 U.S.C. § 300320). Because the Nāʻālehu LCC Replacement Project will be funded using federal funds, it is considered an "undertaking" and is subject to the NHPA.

The Act requires the federal agency's preservation-related activities to be carried out in consultation with other federal, state, and local agencies, Indian tribes, Native Hawaiian organizations (54 U.S.C § 306102).

As discussed in Section 4.7 of this EA / EID, an AIS Report was completed by Cultural Surveys Hawaiʻi in May 2024. The AIS is was designed to be compliant with both Federal and Hawaiʻi State environmental and historic preservation review legislation. The AIS was conducted to assess any historic properties for integrity and site significance in accordance with HAR §13-275-6. This report is also intended to support any project-related historic preservation consultation with consulting parties, such as state and county agencies and interested Native Hawaiian Organizations (NHOs) and community groups, if applicable.

The AIS identified four previously documented and seven newly documented historic properties in the Project Area. In accordance with federal regulations (36 CFR 800.5), the AIS results support the determination made by the Hawaiʻi State DOH on behalf of the EPA of "no adverse effect." In accordance with HAR §13-275-7, the Hawaiʻi State DOH and COH-DEM have determined the project effect is "effect, with proposed mitigation commitments." As stated in the AIS, the identified sites have been fully documented, mitigating any potential effect, and no further work is recommended.

Although historic properties have been determined to require no further work, the County will consider further communication and coordination with identified stakeholders to develop feasible and reasonable accommodations on either preserving historic properties or alternatives that integrate the broader preservation goals of the Waikapuna property.

Archaeological monitoring is recommended during all project ground-disturbing activities to facilitate identification for information purposes, especially of any subsurface lava tubes that may contain historic properties. Archaeological monitoring will proceed under an archaeological monitoring plan that meets the requirements of HAR §13-279-4, which will be submitted to the SHPD for review and acceptance prior to project initiation.

The contract drawings will state that, should archaeological sites such as walls, platforms, pavements or mounds, or remains such as artifacts, burials, concentrations of shell or charcoal be encountered during construction activities, work shall cease immediately and the find shall be protected from further damage. The contractor shall immediately contact the State Historic Preservation Division (SHPD), who will assess the significance of the find and recommend an appropriate mitigation measure, if necessary.

In addition to the AIS, the County is obligated to comply with the NHPA. On June 3, 2024 the DOH, on behalf of the County, initiated consultation for this project in accordance with Section 106 of the NHPA. Consultation letters were sent to various Native Hawaiian Organizations inviting comments from organizations that may attach religious or cultural significance to properties affected by the proposed actions. NHPA Section 106 consultation correspondence can be found in Appendix F of this EA / EID. The SHPD has not yet responded to the consultation request. As such, any future consultation with the SHPD shall be incorporated into the Final EA / EID.

6.16 6-15Protection of Wetlands (Executive Order 11990 (1977), as amended by Exec6-15utive Order 12608 (1997))

Executive Order 11990, Protection of Wetlands, dated 1977 requires federal agencies to avoid, preserve, or mitigate effects of new construction projects on lands which have been designated wetlands. Executive Order 11990 states in order to avoid to the extent possible the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative, it is hereby ordered as follows: Section 1. (a) Each agency shall provide leadership and shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for (1) acquiring, managing, and disposing of federal lands and facilities; and (2) providing federally undertaken, financed, or assisted construction and improvements; and (3) conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

The National Wetlands Inventory (NWI) Wetlands Mapper and U.S. Geological Survey (USGS) topographic maps identify no wetland features or streams within the Proposed WWTP Site, at the three LCCs, or within the Proposed Collection System Area.

6.17 Rivers and Harbors (33 U.S.C. § 403)

Originally enacted on March 3, 1899, the Rivers and Harbors Appropriation Act of 1899 affects navigable waters of the U.S. Section 10 of the Act states the creation of any obstruction not affirmatively authorized by Congress, to the navigable capacity of any of the waters of the United

States is prohibited; and it shall not be lawful to build or commence the building of any wharf, pier, dolphin, boom, weir, breakwater, bulkhead, jetty, or other structures in any port, roadstead, haven, harbor, canal, navigable river, or other water of the United States, outside established harbor lines, or where no harbor lines have been established, except on plans recommended by the Chief of Engineers and authorized by the Secretary of the Army; and it shall not be lawful to excavate or fill, or in any manner to alter or modify the course, location, condition, or capacity of, any port, roadstead, haven, harbor, canal, lake, harbor or refuge, or enclosure within the limits of any breakwater, or of the channel of any navigable water of the United States, unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of the Army prior to beginning the same (33 U.S.C. § 403).

All project locations are at least 2 miles from the shoreline. According to USGS geologic maps, Honuʻapo Bay is located approximately 2.5 miles from the Nāʻālehu community. The nearest stream within the Project Area is Nāʻālehu Stream (See Figure 5-3). Nāʻālehu Stream is non-perennial which originates from flows that begin at Ka'ū Forest Reserve. Proposed Action will not affect navigable waters under any of the Proposed Alternatives.

6.18 Safe Drinking Water Act (42 U.S.C. § 300f)

The Safe Drinking Water Act (SDWA) of 1974 (42 U.S.C. § 300f) was established to protect the quality of all waters actually or potentially designed for drinking use from both underground and aboveground sources. The SDWA authorizes EPA to establish minimum standards to protect potable water with which all owners or operators of public water systems must comply; to oversee the agencies which can be approved to implement these rules on EPA's behalf, such as state governments; and to encourage attainment of secondary standards (nuisance-related). Section 1424(e) of the SDWA of 1974 (Public Law 93-523, 42 U.S.C. 300 et. seq also established the Sole Source Aquifer program which states that no commitment for federal financial assistance (through a grant, contract, loan guarantee, or otherwise) may be entered into for any project which the EPA Administrator determines may contaminate such aquifer through a recharge zone so as to create a significant hazard to public health.

The Proposed Action does not establish a drinking water system, and no Sole Source Aquifers are present on the Island of Hawaiʻi. The Proposed Action will provide the infrastructure necessary to enable the County to comply with the SDWA by replacing the existing outdated and federally banned wastewater systems that pose a threat to underground sources of drinking water.

6.19 Wild and Scenic Rivers Act (16 U.S.C. §§ 1271-1287)

The Wild and Scenic Rivers Act, 16 U.S.C. §§ 1271-1287, declares that certain selected rivers with their immediate environments, which possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historical, cultural, or other similar values, shall be preserved in their free-flowing condition for the enjoyment of present and future generations. The State of Hawaiʻi has no designated wild and scenic rivers.

The Wild and Scenic Rivers Act is not applicable to this project.

6.20 Clean Water Act (33 U.S.C. § 1251 et seq.)

The Clean Water Act established the basis for regulating discharges of pollutants into waters of the U.S. Enacted in 1948, it was originally called the Federal Water Pollution Control Act but became known as the Clean Water Act with the amendments of 1972. Section 404 of the Clean Water Act regulates the discharge of dredged or fill material into waters of the U.S. and adjacent wetlands from development, water resource projects, mining or other infrastructure projects. Activities are regulated through a permit process that is administered under the responsibility of the U.S. Army Corps of Engineers. Permits may be issued as either Individual Permits for projects with potentially significant impacts or general permits for projects with only minimal adverse effects.

The NWI Wetlands Mapper and USGS topographic maps identify no wetland features or streams within the WWTP Site, at the two LCCs, within the Proposed Collection System Area, or within the future IWS lots. Biological and archeological field survey reports do not indicate any standing water or evident wetland vegetation within the WWTP Site and Collection System Area.

As discussed in Section 4.6 of this EA / EID, no streams or wetlands occur in the Project Area, although the WWTP site itself is located within a shallow drainage swale and runoff flow will be directed around the WWTP infrastructure in a new channel. Biological surveys observed no indications of water flow in the swale at the Project site. A concrete drainage channel crossed by the proposed force main on Melia Street is similar in directing runoff through town into shallow swale further downslope. Neither of these drainageways direct flows to streams or outlets on the ocean shore. Annual rainfall in the Nāʽālehu area is on the order of 40 in (1020 mm) and the porous geology is not conducive to stream formation.

Because no wetland resources are present and no impacts to wetlands are anticipated due to the nature and design of the WWTP and collection, a Clean Water Act Section 404 permit is not required.

In addition to the above, the Clean Water Act was amended by the Federal Water Quality Act of 1987 which established provisions for a Clean Water State Revolving Fund (33 U.S.C. § 1383), a financial assistance program for water infrastructure projects. The program capitalizes on a partnership between EPA and states to provide loans to eligible recipients through state programs that act as environmental infrastructure banks providing low-interest loans. As stated in Section 2.1.2, the Naalehu LCC Replacement Project is being funded in part by the State of Hawaiʻi DOH Clean Water State Revolving Fund.

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CHAPTER 7: ANTICIPATED DETERMINATION OF FONSI

Potential impacts of the Proposed Action on a range of environmental resource criteria have been evaluated in accordance with the significance criteria outlined in § 11-200.1-13, HAR. Discussion of the Proposed Project's conformance to the criteria is presented as follows:

1) *Irrevocably commit a natural, cultural, or historic resource;*

The Proposed Action would not result in the loss or destruction of natural resources. The collection system will be constructed primarily within areas that were previously disturbed during the construction of existing County streets, plus two backyard easements.

An AIS Report was completed by Cultural Surveys Hawaiʻi in May 2024. The AIS is was designed to be compliant with both Federal and Hawaiʻi State environmental and historic preservation review legislation. The AIS was conducted to assess any historic properties for integrity and site significance in accordance with HAR §13-275-6. This report is also intended to support any project-related historic preservation consultation with consulting parties, such as state and county agencies and interested Native Hawaiian Organizations (NHOs) and community groups, if applicable.

The AIS identified four previously documented and seven newly documented historic properties in the Project Area. In accordance with federal regulations (36 CFR 800.5), the AIS results support the determination made by the Hawaiʻi State DOH on behalf of the EPA of "no adverse effect." In accordance with HAR §13-275-7, the Hawaiʻi State DOH and COH-DEM have determined the project effect is "effect, with proposed mitigation commitments."

Archaeological monitoring is recommended during all project ground-disturbing activities to facilitate identification for information purposes, especially of any subsurface lava tubes that may contain historic properties. Archaeological monitoring will proceed under an archaeological monitoring plan that meets the requirements of HAR §13-279-4, which will be submitted to the SHPD for review and acceptance prior to project initiation.

Although historic properties have been determined to require no further work, the County will consider further communication and coordination with identified stakeholders to develop feasible and reasonable accommodations on either preserving historic properties or alternatives that integrate the broader preservation goals of the Waikapuna property.

2) *Curtail the range of beneficial uses of the environment;*

The Proposed Action will not curtail the range of beneficial uses of the environment. The proposed use of the site is a continuation of this existing use, which is compatible with the surrounding uses. No new uses or improvements are being proposed that would significantly intensify the land use, alter the land, or commit resources that would curtail the range of future beneficial uses of the environment.

3) *Conflict with the State's environmental policies or long-term environmental goals established by law;*

The Proposed Action will not conflict with the long-term environmental policies, goals, and guidelines of the State of Hawai'i as noted throughout Chapter 5 of the EID/EA.

Moreover, short-term impacts associated with various construction activities will be mitigated through best management practices noted throughout Chapter 5 of the EA.

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 significant adverse effect on the economic welfare, social welfare, or cultural practices of the State as discussed in Chapters 5 and 6 of the EID /EA.

In the short-term, construction jobs will be created to develop the Proposed Action and construction expenditures will provide positive benefits to the local economy but not at a level that would generate any significant population expansion. Further, long-term facility maintenance and operational jobs would be created for the WWTP.

In the long-term, the Proposed Action is intended to allow the County to provide wastewater collection, treatment, and disposal facilities that meet the needs of the Nāʻālehu community. It will be an integral part of the infrastructure needed to maintain the health and welfare of the community. Therefore, implementation and long-term operation of the Proposed Action is not anticipated to have a substantial short- nor long-term adverse impacts on public health. Typical short-term construction-related impacts (e.g., noise and air quality) are anticipated; however, they will be temporary in nature and will comply with Federal, State, and County regulations as discussed in Chapter 5 of the EID/EA.

5) *Have substantial adverse effect on public health;*

The Proposed Action will involve the design, construction, and operation of wastewater collection, treatment, and disposal facilities that will maintain and enhance the public health of the Nāʻālehu community. Thus, the Proposed Action shall have a beneficial effect on public health.

6) *Involve adverse secondary impact, such as population changes or effects on public facilities;*

The Proposed Action involves the design, construction, and operation of wastewater collection, treatment, and disposal facilities within the Nāʻālehu community. The proposed use is consistent with current use of the area and compatible with surrounding uses. The Proposed Action is not anticipated to induce population growth and, therefore, no secondary impacts associated with population changes or effects on public facilities are anticipated with implementation of the proposed action.

7) *Involve a substantial degradation of environmental quality;*

The Proposed Action is not anticipated to substantially degrade environmental quality. Long-term impacts to air and water quality, noise levels and natural resources will be minimal. Typical short-term construction-related impacts (e.g., noise and air quality) are anticipated, but will be temporary and will comply with State and County regulations as discussed in Chapter 5 of the EID / EA.

8) *Be individually limited but cumulatively have substantial adverse effect upon the environment or involves a commitment for larger actions;*

The Proposed Action is not anticipated to have a considerable effect upon the environment as discussed in Chapter 4 of the EID / EA. There are no commitments for further action beyond the scope presented within this EID / EA.

9) *Have substantial adverse effect on rare, threatened, or endangered species, or its habitat;*

As discussed in Section 4.6 of this EID / EA, two biological surveys were conducted on the sites: one in 2012 and one in 2021; both surveys were conducted by AECOS Inc. (AECOS, 2021). During the botanical, avian, and mammalian resources surveys no listed or proposed-for-listing species under federal statutes was recorded. The assessment observed avian diversity and densities present within the Project Area and its surrounding vicinity.

Based on the findings of the botanical and biological field surveys, construction activities associated with the new collection system and wastewater treatment and disposal facility are not anticipated to result in adverse impacts to botanical and faunal resources in the Nāʽālehu area. Mitigation measures and BMPs as recommended by the FWS and AECOS will be implemented during construction and following build out to ensure that the project minimizes all impacts to listed species to the maximum extent practicable.

On June XX, 2024, the designated non-federal representative for consultations under Section 7 of the Endangered Species Act, on behalf of EPA and the County of Hawaiʻi, requested concurrence from the FWS that the Nāʻālehu LCC Closure Project is not likely to adversely affect federally listed threatened and endangered species or critical habitat located within the Project Area.

10) *Have a substantial adverse effect on air or water quality or ambient noise levels;*

No long-term significant impacts to air quality, water quality, or noise levels within the project site are anticipated as a result of the construction and operation of the Proposed Action.

Respective contractors will be responsible for minimizing air quality impacts during the various phases of construction. Exhaust emissions from construction vehicles are anticipated to have negligible impacts on air quality in the project vicinity as the emissions would be relatively small and readily dissipated.

No short or long-term significant impacts on surface and/or coastal waters in the project vicinity are anticipated during construction or operation of the proposed action. There are no streams or wetlands on or within close proximity to the project site. For proposed ground disturbing activities, applicable erosion control measures and best management practices will be implemented in order to mitigate any possible adverse effects relating to soil erosion and runoff. Permanent sediment control measures will be used once construction is completed.

Coordination will be undertaken with the appropriate agencies during permitting and construction to ensure that the proposed action will not result in significant impacts regarding surface and coastal waters. A NPDES permit for storm water runoff from construction activities would be required should individual and/or cumulative soil disturbances at the project site exceed one acre of land area. Any discharges related to project construction or operation activities will comply with applicable State Water Quality Standards as specified in HAR, Chapter 11-54 Water Quality Standards and Chapter 11-55 Water Pollution Control. Excavation and grading activities will be regulated by applicable provisions of the County's grading ordinance.

In the short and long-term, no significant impacts on noise levels are anticipated as a result of the construction and operation of the Proposed Action. Impacts from construction noise are not anticipated to be significant as the project site and much of the surrounding land uses are considered airport or industrial related. Any potential impacts would be mitigated by complying with the State DOH Administrative Rules, Title 11, Chapter 46 "Community Noise Control" regulations. Once construction has been completed, noise impacts would be consistent with existing conditions.

11) *Have substantial adverse effect on or be likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, sea level rise exposure area, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters;*

No short or long-term significant impacts are anticipated as the project site is not located within an environmentally sensitive area. The project site is located about 2 miles from the nearest coastline. The nearest stream within the Project Area is Nāʽālehu Stream, a non-perennial which originates from flows that begin at Ka'ū Forest Reserve. No impacts to these resources are anticipated.

The new facilities and other improvements would be designed in consideration of the potential hazards posed by hurricanes and other natural hazards to the extent practical. The project site is outside of the 500-year flood plain and outside of the tsunami evacuation zone, with only small portions within the collection system site are within the 500-year flood plain. The WWTP would be designed to accommodate anticipated increases in runoff. The final drainage system design would be coordinated with the County of Hawai'i Department of Public Works (DPW) prior to construction.

According to the FIRM, the project site is designated Zone X, an area of minimal flood hazard. A small portion of the collection system area is designated as Zone X – Other Flood Areas, indicating areas within the 0.2 percent annual chance (500-year) floodplain, or areas with a 1-percent annual chance of flooding with average flood depths less than

1-foot. Generally, runoff at the project site from rainfall currently sheet flows and percolates within the upper layers of the site. Some temporary ponding may occur at natural low points in the topography during and immediately after heavy rainstorm events. However, this water quickly infiltrates into the ground once heavy rains have subsided.

12) *Have substantial adverse effect on scenic vistas and view planes, during day or night, identified in County or State plan or studies; or*

The project site is not located near any Kau natural scenic sites. View planes of the project site from the surrounding area is generally obstructed by the surrounding vegetation that provides a visual barrier for the project site. Construction of the Proposed Action would not significantly alter the topography in such a way that would diminish the aesthetic value of the area.

13) *Require substantial energy consumption or emit substantial greenhouse gas.*

The Proposed Action involves the development of new wastewater treatment facilities that will be planned and designed to minimize use of electrical power. Thus, it will not create a substantial increase in energy consumption.
The construction and operation of the Proposed Action will not require a significant level of energy consumption. Implementation of the Proposed Action will result in the short term irrevocable release of GHGs from construction activities associated with the development of the proposed improvements. However, these activities will be temporary and the quantities of GHGs released will be negligible.

In the long-term, the Proposed Action is not expected to have a significant impact on traffic operation; therefore, no significant impacts on air quality due to an increase in greenhouse gases is anticipated. Due to the minimal impact of the Proposed Action, further mitigation of any potential long-term impacts is not anticipated to be required.

Based on the finding and the assessment of potential impacts, the Proposed Action does not require preparation of an Environmental Impact Assessment and an anticipated FONSI is determined.

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CHAPTER 8: CONSULTATION

8.1 Early Consultation

The Early Consultation process included efforts to inform the community and solicit input in scoping the EID for the Proposed Action. The Early Consultation Package for the Proposed Action was mailed out on March 29, 2024, to the following agencies, organizations, and stakeholders listed below in preparation of the EID/ EA. Parties that formally replied during the Early Consultation/Pre-Assessment process are indicated by a "✓" below. All written comments are reproduced in Appendix F.

Federal Agencies

US Army Corps of Engineers, Honolulu District
US Department of Agriculture Natural Resources Conservation Service
US Environmental Protection Agency
✓ US Fish and Wildlife Service
National Oceanic and Atmospheric Administration
US Department of Transportation Federal Aviation Administration

State Agencies

Department of Agriculture
✓ Department of Accounting and General Services
Department of Business, Economic Development & Tourism (DBED&T)
- DBED&T Land Use Commission
- DBED&T Office of Planning and Sustainable Development
- DBED&T State Energy Office

Department of Hawaiian Home Lands (DHHL)
- DHHL – East Hawaiʻi District Office

Department of Health (DOH)
- DOH – Clean Water Branch
- DOH - Environmental Management Office
- DOH – Hazard Evaluation and Emergency Response
- DOH – Safe Drinking Water Branch
- DOH – Wastewater Branch

Department of Land and Natural Resources (DLNR)
- DLNR State Historic Preservation Division
- DLNR Land Division
- ✓ DLNR Engineering Division
- ✓ DLNR Division of Forestry and Wildlife

Department of Transportation
Office of Hawaiian Affairs
University of Hawaiʻi

County of Hawaiʻi

Fire Department

✓ Police Department
Planning Department
Research and Development
Department of Public Works
Department of Parks and Recreation
Department of Water Supply
Environmental Management Commission
Office of the Corporation Council
Office of Housing and Community Development

Elected Officials
State Senator Dru Mamo Kanuha, Senate District 3
Representative Jeanne Kapela, House District 5
Councilmember Michelle Galimba, Council District 6

Public Utilities
✓ Hawaiian Electric Company
Hawaiian Telcom
Spectrum Hawaiʻi
Hawaiʻi Gas

Other Parties
Hawaiʻi State Library_
Nāʻālehu Public Library_
Hawaiian Civic Club of Ka'ū
Kaʻū CDP Action Committee
Kaʻū Calendar
ʻO Kaʻū Kākou

8.2 Community Outreach

The County has conducted numerous public information meetings during the course of designing and documenting the Proposed Action. A total of six community outreach sessions to discuss the Revised AOC were conducted in the Pahala and Naalehu communities between March 2022 and December 2023. In late October 2023, public preference surveys to gather input on the four feasible options were mailed out to 194 lot owners in the Nāʻālehu community. A public meeting was held November 16, 2023, at the Nāʻālehu Community Center to engage with the public to solicit feedback on the options explored in the PER, and to provide a general overview of the EID being prepared. In February 2024, a second round of surveys was mailed out to owners of affected lots in Nāʻālehu. The survey collection period remains open.

A semi-annual meeting community informational meeting regarding the closures of the Pāhala and Nāʻālehu LCCs was held on February 29, 2024 in Pāhala. The next semi-annual community informational meeting will be held in August 2024 in Nāʻālehu.

8.3 Additional Consultation

The publication of this Draft EID / EA shall be followed by 30-day public review period in which various agencies, organizations, and other stakeholders will be invited to provide comments on the Proposed Action for consideration in the Final EID / EA. Those consulted during the Early Consultation process and other identified stakeholders will be provided with a Notice of Availability once the Draft EID / EA is published in the ERP’s *The Environmental Notice.*

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CHAPTER 9: ALTERNATIVES

9.1 Selection of a Preferred Alternative

The Amended AOC (Docket No. SDWA-UIC-AOC-2017-0002, proposed February 14, 2024) LCC requirements for Naalehu outlines that an EID must be prepared by the County for US EPA approval to meet Federal Environmental Review Requirements. The Revised AOC requires evaluation of four feasible alternatives, evaluation of a No Action alternative, and the tentative selection of a preferred alternative. Further, pursuant to § 11-200.1-18, HAR, an EA is required to present a discussion of the consideration of project alternatives that could reasonably attain the goals and objectives of the Proposed Action.

In the process of identifying a preferred alternative, extensive community engagement has taken place, including numerous meetings and discussions with the EPA. Preliminary Engineering Reports have also been completed to assess the identified alternatives as discussed in Section 2 of this EID.

The PER initially recommended an IWS alternatives for cost-effectiveness as the alternatives involving a package plant were found to have overall higher capital costs. The Department of Environmental Management - Wastewater Division (DEM - WWD) has tentatively selected Alternative 1 as the preferred alternative based on further consideration of factors such as regulatory compliance, community preference, and perceived environmental impacts, outlined as follows:

9.1.1 Recommendation Factors

Regulatory Compliance

In the development of the PERs, public objections or legal ramifications were not considered in the recommendation of the IWS alternative. This includes barriers to property access for construction, existing agreements, and compliance with current County and State codes.

Obtaining Right of Entry (ROE) to private properties for various purposes, such as infrastructure development or land surveys, can present several challenging issues. The process often involves negotiation, legal considerations, and respect for property rights. Failing to clarify these issues can lead to legal disputes and project delays. The most straightforward way to gain ROE is through the voluntary consent and permission of property owners. However, some property owners may be unwilling to grant access due to concerns about privacy, property damage, or other reasons.

In addition, there is an existing agreement between the County and C. Brewer established on April 12, 2007, in which the County agreed to construct and maintain new improved community sewer systems, including new County treatment and disposal systems and elimination of large capacity cesspools. Following this agreement, the County Council has already approved, and resolutions (Resolution 72-05 and 290-06) have been obtained for pursuance of WWTP and new collection system per agreement.

Further, implementation of the IWS alternatives would require significant modifications to the County code. Current HRS and DOH administrative rules may not support the required modifications. As such, modification of multiple HRSs and HARs would likely be required, including County Council approval and obtaining of new resolutions which could have severe ramifications for the current project timeline.

Community Preference

The County has held multiple community meetings with the intention of gathering input and survey responses regarding the community's preferences regarding the LCC closures. Survey responses have indicated a strong community preference for the package plant option. In addition to the recent survey responses, it has been noted that previous efforts led by the County have promised to design and construct the Naalehu WWTP and collection system.

Environmental Risks

Under HAR 11-62-31.1(a), an IWS may be used as a temporary on-site means of wastewater disposal in lieu of wastewater treatment. In addition to being considered a temporary means of wastewater disposal, it is noted that the package plant facility and new collection system would provide higher level of wastewater treatment. The package plant facility would provide wastewater treatment and management within the community while the County remains protective of public health and safety.

9.1.2 Action Items Under the Preferred Alternative

Under the Preferred Alternative, the County of Hawaiʻi would perform the following actions:

1. Construct a new gravity sewer on Kaalaiki Road and Nāʻālehu Spur Road to the WWTP located on a portion of Tax Map Key (TMK) (3) 9-5-007:016, , as the current proposed approach to bring sewer to the WWTP location
2. Implement drainage improvements within the vicinity of the WWTP within TMKs (3) 9-5-007:016 and (3) 9-5-021:015.
3. Construct a new pump station located on a portion of TMK (3) 9-5-008:048, and construct a new force main, which crosses an existing storm drainage channel at Melia Street, to connect to the Kaalaiki Road gravity sewer.
4. Construct a new gravity sewer on Opukea Street and Ohai Road to intercept existing flows entering the LCCs and divert sewage to the wastewater pump station (WWPS) and transport flows to the gravity sewer along Kaalaiki Road.
5. Install gravity sewers within the streets to replace the existing collection system.
6. Close and abandon the three LCCs.
7. Accomodate future expansion of subsurface effluent disposal located within a portion of TMK (3) 9-5-022:001

The current action items involve seeking the Mayor's concurrence with the Wastewater Division Recommendation, approval from the DEM Director, and the establishment of a consultant selection committee. The chosen consultant will be tasked with completing the WWTP design and implementation plan within 6-7 months, followed by the wastewater collection system design within the same timeframe. The project aims to adhere to a 2-year construction schedule.

In summary, Alternative 1, which involves the construction of a package plant with a new collection system, has been selected based on regulatory compliance, community preference and an assessment of environmental risks.

9.2 Alternatives Design Schemes

9.2.1 Aerated Lagoons

Previous planning and design efforts for the Naalehu LCC Closure project had focused on an aerated lagoon secondary WWTP. The former design included the implementation of approximately four aerated lagoons which would utilize artificial aeration to promote the biological oxidation of wastewater. Ultimately, the County decided not to pursue this design scheme further as the community had not been receptive to the concept based on feedback gathered through community meeting and outreach.

9.2.2 Alternative Access Routes

Based on the selection of a preferred alternative, the design scheme currently involves the utilization of Naalehu Spur Road and a connection to a proposed access road to the WWTP site through TMK 9-5-007:016. As the design of the Proposed Action progresses, alternative access routes may need to be utilized. As such, the County has considered two alternative access routes which utilize TMKs 9-5-021:015 or 9-5-022:001. The proposed conceptual site plan of the WWTP is partially sited within all three of these parcels and the alternative access routes shall be discussed further with the respective landowners.

9.2.3 Alternative WWTP Site Configuration

As noted, the WWTP is anticipated to be sited within a 28.739 acre area within portions of TMKs: 9-5-007:016, 9-5-021:015 and 9-5-022:001. As the design phase progresses, modifications to the current conceptual site plan may occur. While the overall size of the structures is not anticipated to change significantly, adjustments to the site configuration could occur within the identified parcels.

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CHAPTER 10: REFERENCES

Atlas of Hawaiian Watersheds & Their Aquatic Resources, Island of Hawaii, Bishop Museum & Division of Aquatic Resources. 1262 p. (3 volumes). Parham, J.E., G. R. Higashi, E. K. Lapp, D.G. K. Kumolo, R. T. Nishimoto, S. Hau, J. M. Fitzsimons, D. A. Polhemus, and W. S. Devick. 2008.

Brown and Caldwell. Naalehu Large Capacity Cesspool Closure Project Revised Preliminary Engineering Report. August 2023

C. Brewer Company. Ka`ū Sewer System Evaluation Report. December 2004.

County of Hawai`i, Planning Department. County of Hawai`i Draft General Plan 2045. June 2024.

County of Hawai`i, Planning Department. County of Hawai`i General Plan. Ordinance No. 05-025. February 2005.

County of Hawai`i, Planning Department. Ka`ū Community Development Plan, Draft for Public Review. March 2015.

County of Hawai`i, Planning Department. 2017 Ka`ū Community Development Plan, Ordinance 2017-66. October 2017.

County of Hawai`i, Department of Environmental Management. Final Environmental Assessment – Finding of No Significant Impact, the Nā`ālehu-Pāhala Large Capacity Cesspool Conversion. August 2007.

Executive Order No. 11990, 42 FR 26961, 3 CFR, p. 121, 1977, as amended by Executive Order No. 12608, 52 FR 2923, 1987.

Executive Order No. 11988, 42 FR 26951, 3 CFR, p. 117, 1977, as amended by Executive Order Nos. 12148, 44 FR 43239, 3 CFR, p. 412, 1979 and 13690, 81 FR 57401, 44 CFR 9, p. 57401, 2016.

Executive Order No. 12898, 59 FR 7629. 1994.

Hawai`i County Code 1983 (2016 Edition, as amended). Chapter 21. Sewers.

Hawai`i County Code 1983 (2016 Edition, as amended). Chapter 25. Zoning.

Hawai`i Revised Statutes, Chapter 205, Land Use Commission. 2017.

National Oceanic and Atmospheric Administration (NOAA). 2002. Department of Commerce, National Oceanic and Atmospheric Administration. 50 CFR 600. Magnuson-Stevens Act Provisions; Essential Fish Habitat (EFH). *Federal Register* Volume 67, Number 12

National Oceanic and Atmospheric Administration – National Marine Fisheries Service (NOAA-

NMFS). 2007. Magnuson-Stevens Fishery Conservation and Management Act, Public Law 94- 265, as amended by the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (P.L. 109-479), an act to provide for the conservation and management of the fisheries, and for other purposes. 16 U.S.C. § 1801-1884.

State of Hawai'i. Department of Agriculture. U.S. Department of Agriculture, National Agriculture Statistical Service 2017 Census of Agriculture – County Data 2017.

State of Hawai'i. Department of Health. Annual Summary 2022 Air Quality Data. September 2023.

State of Hawai'i. Department of Health. Noise Reference Manual – Big Island Edition. Revised July 2017.

State of Hawai'i. Hawai'i Administrative Rules, Title 11 (Department of Health), Chapter 23 (Underground Injection Control). October 11, 2011.

State of Hawai'i. Hawai'i Administrative Rules, Title 11 (Department of Health), Chapter 46 (Community Noise Control). September 1996.

State of Hawai'i. Hawai'i Administrative Rules, Title 11 (Department of Health), Chapter 54 (Water Quality Standards). Revised November 15, 2014.

State of Hawai'i. Hawai'i Administrative Rules, Title 11 (Department of Health), Chapter 62 (Wastewater Systems). March 21, 2016.

University of Hawai'i at Hilo, Department of Geography. 1998. *Atlas of Hawaii*. Third Edition.

U.S. Census Bureau, 2022 American Community Survey 5 year Census Designated Place, Hawai'i County. U.S. Census Bureau's American Community Survey Office, September 13, 2023.

U.S. Department of Agriculture Soil Conservation Service. Ka'ū River Basin Study, County of Hawai'i. February 1994.

U.S. Environmental Protection Agency and County of Hawai'i, Department of Environmental Management. Final Environmental Assessment for the Pāhala Large Capacity Cesspool (LCC) Replacement Project, EPA Grant XP-96942401. February 2020.

U.S. Environmental Protection Agency (EPA). Process Design Manual: Land Treatment of Municipal Wastewater Effluents. EPA/625/R-06/016. Office of Research and Development. Cincinnati, Ohio. September 2006.

U.S. Environmental Protection Agency (EPA). Climate Resilience Evaluation and Awareness Tool (CREAT) Climate Scenarios Projection Map. Web. Accessed February 6, 2020.

U.S. Environmental Protection Agency. Region IX. Revised Federal Administrative Order on Consent EPA Docket No. SDWA-UIC-AOC-09-2017-0002, Pāhala and Nāʻālehu Large Capacity Cesspool Closure Projects Effective Date: August 22, 2022.

7 U.S.C. § 4201. 1981.

16 U.S.C. §§ 1271-1287. 1968.

16 U.S.C. §§ 1361 et seq. 1972.

16 U.S.C. §§ 1451-1464. 1972.

16 U.S.C. § 1531. 1973.

16 U.S.C. § 1801. 1976.

16 U.S.C. § 3501. 1982.

16 U.S.C. § 661. 1934.

16 U.S.C. § 668-668c. 1940. 16 U.S.C. § 703 et seq. 1918.

33 U.S.C. § 403. 1899.

33 U.S.C. § 1251 et seq. 1948.

42 U.S.C. § 300f. 1974.

42 U.S.C. § 7401 et seq. 1970.

54 U.S.C. § 300101. 1966.

54 U.S.C. § 312502. 1974.

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APPENDIX A:

Nāʻālehu Large Capacity Cesspool Closure Project

Revised Preliminary Engineering Report

Brown and Caldwell

Naalehu Large Capacity Cesspool Closure Project

Revised Preliminary Engineering Report

Prepared for

County of Hawaii, Department of Environmental Management

August 2023

2261 Aupuni Street, Suite 201
Wailuku, Maui, HI 96793

T: 808.244.7005

August 24, 2023

Ms. Brenda Iokepa-Moses
County of Hawaii Wastewater Division
108 Railroad Avenue
Hilo, HI 96720

153740.008

Subject: Naalehu Wastewater Treatment Plant Revised Preliminary Engineering Report

Dear Ms. Iokepa-Moses:

Brown and Caldwell (BC), in association with Engineering Partners, Inc. (EPI) is pleased to present the attached Revised Preliminary Engineering Report (PER) for the Naalehu Large Capacity Cesspool (LCC) Closure Project. Preparation of a Revised PER is required by the Revised Administrative Order on Consent (AOC) that became effective on August 22, 2022. The need for a Revised PER was precipitated by several items:

- A wastewater treatment process with a smaller and shallower footprint is preferable due to the presence of lava rock at the proposed wastewater treatment plant (WWTP) site. Mechanical treatment technologies in the form of package plants offer the opportunity to achieve these goals.
- The community, through community meetings and outreach, has not been receptive to the aerated lagoon technology that was formerly proposed.
- The Revised AOC allows the possibility of implementing individual wastewater systems (IWS) to close the LCCs.

The Revised AOC requires evaluation of four feasible options:

i. A package plant and new collection system.
ii. A package plant connected to the existing collection system.
iii. A maintenance contract model IWS program.
iv. An operating permit model IWS program.

This Revised PER consists of three parts:

- This introductory summary that provides comparisons of the four feasible options.
- Part A, by BC, which presents updated analysis of feasible options i and ii that are based on using a package plant based WWTP to service the Naalehu community and close the LCCs. BC is a nation-wide environmental engineering firm with local Hawaii offices located in Kamuela, Wailuku, and Honolulu. BC has been planning and designing WWTPs throughout the United States for over 75 years.
- Part B, by EPI, which presents a detailed analysis of feasible options iii and iv that are based on using IWS to service the Naalehu community and close the existing LCCs. EPI is a multi-discipline engineering and design firm based in Hilo. EPI has successfully designed IWS systems on Hawaii Island and is well-versed to address implementing IWS in the unique local soil and subsurface geological conditions in Naalehu.

Throughout this Revised PER the following terms are used:

"Feasible options" refers to the four specific options (i, ii, iii, iv) listed above and in paragraph V.A.31.a of the Revised AOC.

"Alternatives" and "project alternatives" refer to various combinations of systems or technologies that are evaluated within this Revised PER to determine preferences for the feasible options.

1. Comparison of Feasible Options

The four feasible options are compared below,

1.1 Protection of Human Health and the Environment

Table 1 compares the four feasible options with respect to protection of human health and the environment. The State of Hawaii Department of Health (DOH) regulates both WWTPs and IWS. All four feasible options are protective of human health and the environment when implemented in accordance with the applicable Hawaii Administrative Rules (HAR). Additional discussion is provided in Parts A and B.

Table 1. Protection of Human Health and the Environment

Feasible Option	Regulatory Authority	Variances	Protective of Human Health and the Environment?
i. Package plant and new collection system	HAR 11-62, Subchapter 2	Variance required by DOH for WWTP flow capacity	Yes
ii. Package plant connected to the existing collection system	HAR 11-62 Subchapter 2	Variance required by DOH for WWTP flow capacity	Yes
iii. A maintenance contract model IWS program	HAR 11-62, Subchapter 3	Variances may be required for some lots for setback distances, etc.	Yes
iv. An operating permit model IWS program	HAR 11-62, Subchapter 3	Variances may be required for some lots for setback distances, etc.	Yes

1.2 Capital Cost Comparison of Feasible Options

Table 2 summarizes the capital costs for the four feasible options. Details of the capital cost estimates are provided in Parts A and B. Note that the IWS capital costs per lot are presented as ranges; greater precision will not be available until designs are complete due to the site-specific nature of IWS implementation on existing developed properties.

Table 2. Capital Cost Comparison		
Feasible Option	**Capital Cost ($ million)**	**Cost per Lot**
i. Package plant and new collection system	$84.3	$413,000 [a]
ii. Package plant connected to the existing collection system	$74.2	$364,000 [a]
iii. A maintenance contract model IWS program	$5.8 - $29.1	$30,000 - $150,000 [b]
iv. An operating permit model IWS program	$5.8 - $29.1	$30,000 - $150,000 [b]

a. Based on a total of 204 lots in the WWTP service area.
b. Based on a total of 194 lots converted per the AOC.

As shown in the table, the IWS feasible options incur significantly lower capital costs than the package plant alternatives.

1.3 Long-Term Recurring Costs Comparison

Long-term recurring costs include operations and maintenance (O&M) costs; examples include labor, electricity, chemicals, and maintenance materials like spare parts. Another recurring cost is the need to replace and refurbish (R&R) equipment or systems when they reach the end of their useful life.

A summary of the long-term recurring costs for the four feasible options is presented in Table 3 for comparison. Additional detail is included in Parts A and B.

Table 3. Long-Term Recurring Costs Comparison		
Feasible Option	**Annual O&M Cost [a]**	**R&R Cost (after 20 years) [a]**
i. Package plant and new collection system	$886,000	$6,000,000
ii. Package plant connected to the existing collection system	$1,050,000	$6,000,000
iii. A maintenance contract model IWS program	$250,000	$5,800,000
iv. An operating permit model IWS program	$340,000	$5,800,000

a. Expressed in current (2023) dollars.

1.4 Life-Cycle Cost Comparison

An economic evaluation was prepared to assess the potential life-cycle costs associated with each project alternative. The economic evaluation consists of a net present value comparison. The net present value analysis includes capital, O&M, and R&R costs. An appropriate inflationary factor and discount rate are applied to obtain the net present value over a 30-year planning period. The net present value of an alternative represents the amount of money that would need to be set aside today (at a given interest rate) to pay the costs associated with the alternative over the entire planning period. The alternative with the lowest net present value is considered the most attractive from an economic perspective. Table 4 summarizes the life-cycle cost evaluation assumptions.

Table 4. Life-Cycle Economic Assumptions	
Description	**Value**
Year of analysis	2023
Planning period	30 years
Inflation rate	3.5 percent
Discount rate	5.0 percent
R&R cycle	20 years

Table 5 presents the life-cycle cost evaluation results.

Table 5. Life-Cycle Cost Evaluation Results			
Alternative	**Capital Cost ($M)**	**Net Present Value of O&M and R&R Costs ($M)**	**Life-Cycle Cost ($M)**
i. Package plant and new collection system	$84.3	$ 25.4	$ 109.8
ii. Package plant connected to the existing collection system	$74.2	$ 29.3	$ 103.5
iii. A maintenance contract model IWS program	$ 29.1	$ 10.2 a	$ 39.3
iv. An operating permit model IWS program	$ 29.1	$ 12.3 [a]	$ 41.4

a Includes replacement costs and IWS O&M costs paid directly by homeowners.

Figure 1 shows the results graphically. The IWS alternatives have significantly lower life-cycle costs than the package plant alternatives.

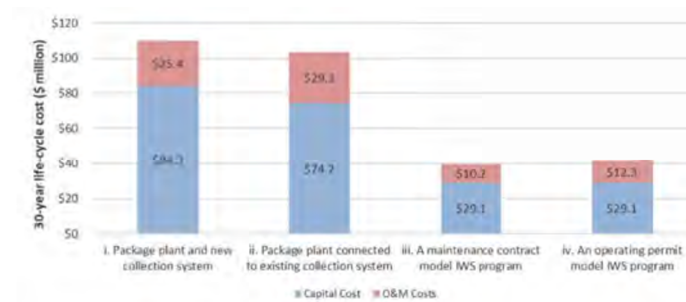

Figure 1. Life-Cycle Cost Comparison

Figure 2 shows the cumulative cash flow projections for the four feasible alternatives over the planning period, expressed in current (2023) dollars.

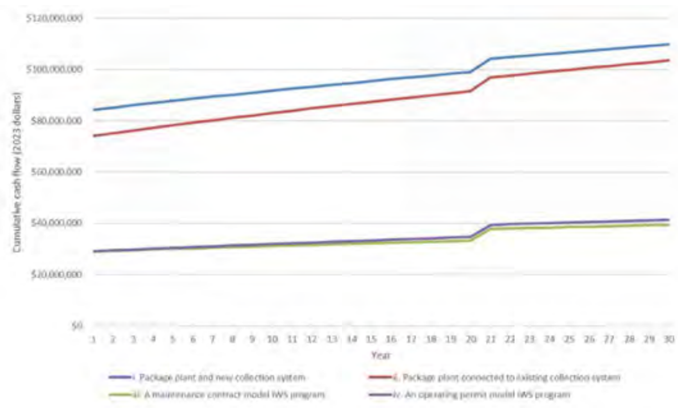

Figure 2. Cumulative Cash Flow Projections

1.5 Schedule

The Revised AOC requires the LCCs be closed no later than December 31, 2027. Parts A and B include preliminary assessments of implementation schedules. Table 6 provides a summary of the preliminary implementation schedule assessments. As discussed in Part A, it will be difficult to implement the WWTP approach to close the LCCs by the deadline, due to entitlement processes, environmental review, land acquisition, and materials supply challenges currently facing the Hawaii construction industry. A design/build approach could potentially reduce the implementation timeframe if equipment procurement and fabrication can occur in parallel with design. However, compliance with the Revised AOC deadline will be a significant challenge with Feasible Options i and ii without a schedule extension.

Per Part B, the IWS approach may be able to be implemented by the Revised AOC deadline. The IWS approach assumes that the County can address Hawaii Revised Statues (HRS) 343 environmental review requirement via an exemption, and that property access and any alterations to County regulations deemed necessary by the County are achievable within the timeframe.

Table 6. Summary of Preliminary Implementation Schedule Assessments

Description	Feasible Options			
	i. Package Plant New Collection System	ii. Package Plant Existing Collection System	iii. Maintenance Contract Model IWS Program	iv. Operating Permit Model IWS Program
Entitlements and permitting	Q4 2024	Q4 2024	Q2 2024	Q2 2024
Design and construction	Q3 2028	Q3 2028	Q2 2026	Q2 2026
Estimated LCC closure	Q3 2028	Q3 2028	Q3 2026	Q3 2026
Revised AOC LCC closure milestone	December 31, 2027			
Risk of missing Revised AOC LCC closure milestone	High	High	Moderate	Moderate

Note: Q = quarter

2. Revised AOC References

The Revised AOC paragraph V.30.A.a lists information that must be included in this Revised PER. Table 7 provides references to the information within.

Table 7. Revised AOC Paragraph V.30.A.a Checklist

Revised AOC Paragraph V.30.A.a Description	Report Reference Section for Feasible Options			
	i. Package Plant New Collection System	ii. Package Plant Existing Collection System	iii. Maintenance Contract Model IWS Program	iv. Operating Permit Model IWS Program
Description of project details for each feasible option	Part A, §2.3, §2.4, and §8	Part A, §2.3 and §8	Part B, §10	Part B, §10
Planning area description	Part A, Fig. 2-1	Part A, Fig. 2-1	Part A, Fig. 2-1	Part A, Fig. 2-1
Planning period	Part A, §7.2.3	Part A, §7.2.3	Part A, §7.2.3	Part A, §7.2.3
Description of planning phases	Part A, §7.2.3	Part A, §7.2.3	Part A, §7.2.3	Part A, §7.2.3
Owner and operator of facilities	Part A, §1-1	Part A, §1-1	County/In-house or 3rd-party service provider	Homeowner/3rd-party service provider
Location of facilities (including a map)	Part A, Fig. 2-1, Fig. 8-1	Part A, Fig. 2-1, Fig. 8-1	Part A, Fig. 2-1	Part A, Fig. 2-1
Design parameters for each feasible option	Part A, §2.3, §2.4, and §8	Part A, §2.3, and §8	Part B, Table 1.10	Part B, Table 1.10
Major unit processes:	Part A, §5	Part A, §5	Part B, §10	Part B, §10
Flow diagram	Part A, Fig. 8-2	Part A, Fig. 8-2	Part B, Fig. 1.1	Part B, Fig. 1.1
Pipe lengths, sizes, and locations	Part A, Appendix D	Part A, Appendix D	Part B, Appendix F	Part B, Appendix F
Design criteria	Part A, §8.3	Part A, §8.3	Part B, §6	Part B, §6
Project costs	Part A, §7	Part A, §7	Part B, §11, Appendix B	Part B, §11, Appendix B

3. Conclusions

From a technical perspective, all four feasible options represent viable ways to close the LCCs in Naalehu and will be protective of human health and the environment. The IWS feasible options (iii and iv) present significantly lower capital, long-term recurring, and life-cycle costs than the WWTP feasible options (i and ii). In addition, the IWS feasible options (iii and iv) offer greater potential to meet the LCC closure deadline contained within the Revised AOC. We anticipate that financing options, community engagement, burden on the Naalehu community, and alignment with County long term planning goals will need to be considered outside of this preliminary engineering report.

Brown and Caldwell appreciates that the County has requested our services in assisting with this project. Should you have any questions, please do not hesitate to call Craig Lekven at 808.442.3301.

Very truly yours,

Brown and Caldwell

Craig C. Lekven, P.E., Project Manager
Wailuku, Hawaii

PART A: WWTP Approach

Part A

Naalehu Wastewater Treatment Plant

Revised Preliminary Engineering Report

Prepared for

County of Hawaii, Department of Environmental Management

August 2023

THIS WORK (PART A) WAS PREPARED BY ME OR UNDER MY SUPERVISION

April 30, 2024

Signature | Expiration Date of the License

CRAIG CARSTEN LEKVEN ★ LICENSED PROFESSIONAL ENGINEER No. 13003-C HAWAII, U.S.A. ★

Brown AND Caldwell

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Brown AND Caldwell

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List of Abbreviations

AACE	Advancement of Cost Engineering International
AOC	Administrative Order on Consent
BC	Brown and Caldwell
BOD_5	5-day biochemical oxygen demand
CCH	City and County of Honolulu
CDP	Kau Community Development Plan
CWA	Clean Water Act
DB	design/build
DBA	District Boundary Amendment
DBB	design/bid/build
DNA	deoxyribonucleic acid
DOH	Hawaii Department of Health
ELLF	end-of-lamp-life
FAI	Fukunaga & Associates, Inc.
ft^2	square feet
ft^3	cubic feet
GAC	granular activated carbon
gpcd	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
H_2S	hydrogen sulfide
HAC	Hawaiian Agriculture Company
HAR	Hawaii Administrative Rules
I/I	Infiltration and inflow
L	Liter
lbs	pounds
LCCs	large capacity cesspools
LPHO	low pressure high output
LUC	Land Use Commission
MBR	membrane bioreactor
Mgal	million gallons
mgd	million gallons per day
mL	milliliter
MLSS	mixed liquor suspended solids
NaOCl	sodium hypochlorite
N	nitrogen
NPDES	National Pollutant Discharge Elimination System
NPV	net present value
NRCS	Natural Resources Conservation Service
O&M	operation and maintenance
PER	Preliminary Engineering Report
psi	pounds per square inch
PWWF	peak wet weather flow
RGF	recirculating gravel filter
RNA	ribonucleic acid
SBRs	sequencing batch reactors
SES	sand equivalent size
SR	slow rate
SRT	solids retention time
TMK	tax map key
TN	total nitrogen
TSS	total suspended solids
UIC	Underground Injection Control
USEPA	United States Environmental Protection Agency
USSC	United State Supreme Court
UV	ultraviolet
WQS	water quality standards
WWPS	wastewater pump station
WWRF	Wastewater Reclamation Facility
WWTP	Wastewater Treatment Plant

Section 1

Introduction

This section summarizes the project background and describes key elements of the existing Naalehu wastewater collection system.

1.1 Background

The town of Naalehu is located in the Kau district of the Island of Hawaii. According to the 2020 United States Census, the town population is approximately 1,007 persons.

The Naalehu community was established as the result of the sugar operations of the C. Brewer Company. A portion of the community is serviced by a sewer system that was privately built, owned, and operated by the C. Brewer Company, which merged with Hawaiian Agriculture Company (HAC) in 1972. The wastewater collected by the sewer system discharges into large capacity “gang” cesspools (LCCs). Many years after its establishment, the private sewer system ownership was conveyed to the County of Hawaii Department of Environmental Management.

In 1998, the U.S. Environmental Protection Agency, promulgated regulations, 40 Code of Federal Regulations 144.14, that require the elimination of LCCs. Options to close the LCCs include construction of a new sewer collection system located within public right-of-way and replacement of the existing LCCs with a wastewater treatment plant (WWTP) to address the wastewater treatment and disposal needs of the Naalehu community. These centralized WWTP options are the subject of this Preliminary Engineering Report (PER). A separate report is being concurrently prepared that evaluates additional options using individual wastewater systems in lieu of a new collection system and WWTP to close the LCCs.

This report revises the 2018 PER for the Naalehu WWTP and summarizes the proposed facilities needed to treat and dispose of wastewater flow currently discharged to the LCCs, plus additional sewer connections. The PER presents the existing and estimated future flows and loads to the treatment plant, describes the proposed treatment processes, recommends needed upgrades for the WWTP to meet the future treatment levels, and provides an initial opinion of the cost to construct, operate, and maintain the improvements project.

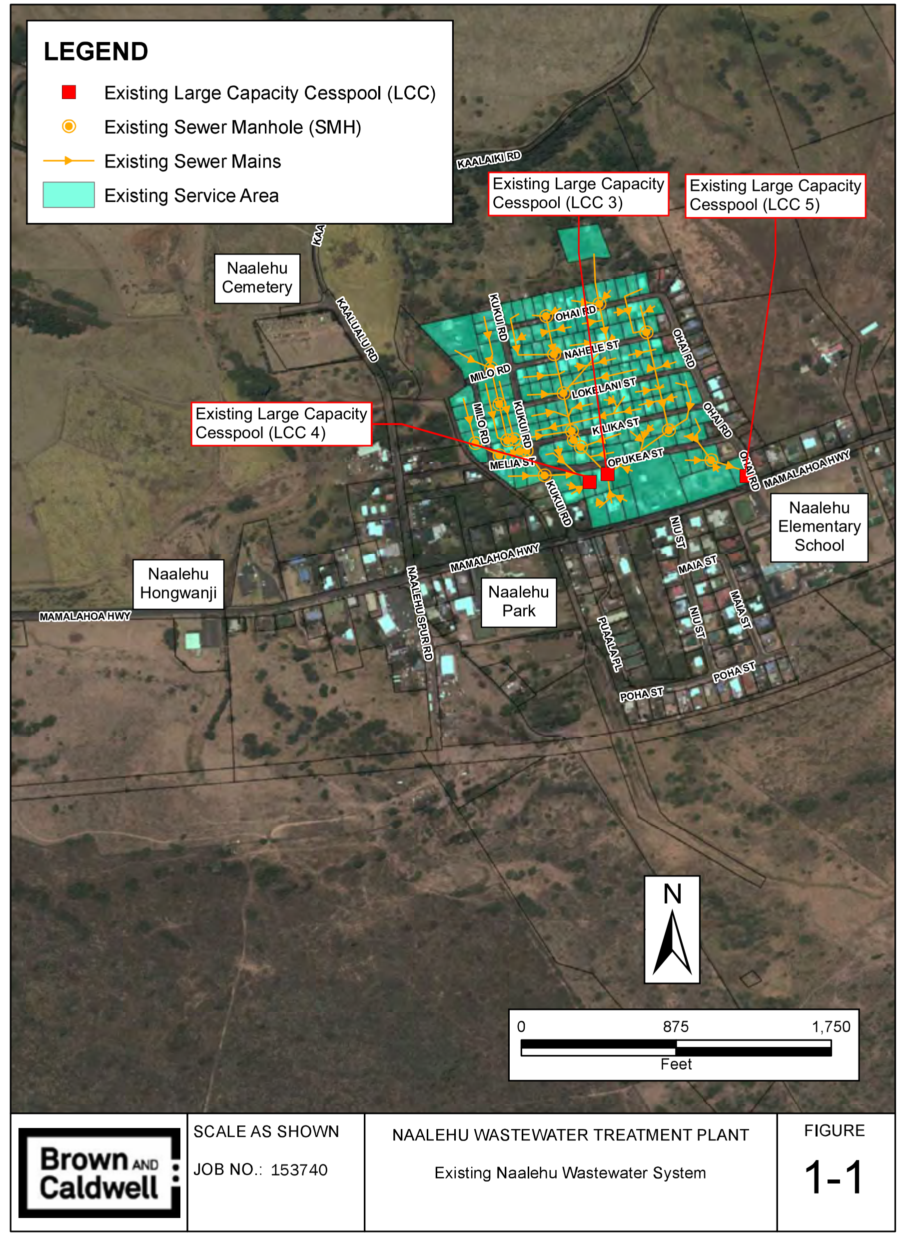
1.2 Existing System

The existing collection system is a network of gravity sewers that discharge to three existing LCCs. Figure 1-1 shows the existing Naalehu wastewater collection system and service areas for the LCCs. The LCCs in Naalehu are numbered 3, 4, and 5; LCCs 1 and 2 are located in the nearby town of Pahala. A detailed analysis of the existing wastewater collection system was completed by others (M&E Pacific, December 2004). The report concluded that the Naalehu community existing sewer system consists of approximately 5,288 linear feet of 6-inch-diameter and 15,500 linear feet of 4-inch-diameter pipelines. Residential laterals connect to 4-inch sewers that discharge into 6-inch sewer mains, predominately found in easements on private property, which transmit wastewater to the three LCCs. There are approximately eight manholes in the sewer system. More recently available information notes the size of piping to be between 3 and 8 inches with a few additional sewer manholes (Fukunaga and Associates, Inc., June 2013). There are no pump stations, and the system is not designed to collect stormwater.

1.3 Report Contents

The remainder of the revised PER is organized as follows:

- Section 2 describes the service area and collection system options.
- Section 3 describes flow and load projections for the new Naalehu WWTP.
- Section 4 evaluates potential options for effluent management and details the treatment requirements for the preferred option.
- Section 5 describes the evaluations conducted in support of the preliminary design of the Naalehu WWTP.
- Section 6 summarizes the solids management approach.
- Section 7 describes alternative treatment options under consideration.
- Section 8 provides a preliminary design for the proposed improvements.
- Section 9 presents the proposed implementation plan for the new WWTP.



Section 2

Collection System

This section summarizes the existing and new collection system options for the Naalehu service area (LCC Closure Project compliance area), which was investigated by Fukunaga and Associates, Inc. (FAI) in May 2020 in efforts to close the existing large-capacity cesspools (LCCs). The figures and collection system layouts included within this section are reproduced from the 2020 FAI report, which was prepared in accordance with the original 2017 AOC. Should a new WWTP be the preferred option for implementation, an update to the collection system layout is anticipated to finalize the service area in accordance with the 2022 Revised AOC. FAI's Naalehu report is provided in Appendix D.

2.1 Service Area

A concrete flood canal divides Naalehu into East (Hilo) and West (Kona) sides. The majority of the Hilo side properties are residential, while majority of Kona side properties are commercial. Within the town of Naalehu, there is an existing wastewater collection system that services approximately 164 former C. Brewer Company (Brewer Company) house lots on the mauka (mountain) side of Mamalahoa Highway. The collection system is currently located within easements in private properties and is discharged to three LCCs.

The Kau Community Development Plan (CDP) indicates the sewer system may eventually be expanded to service the entire community; however, the collection system and wastewater treatment plant (WWTP) presented in this report will service the former Brewer Company properties currently connected to the LCCs and properties adjacent to the new collection system, including three properties requesting connection. Therefore, the proposed service area constitutes the LCC Closure Project compliance area.

Figure 2-1 shows the service area for the new WWTP, including the newly accessible properties.

Figure 2-1. Naalehu WWTP Service Area

Table 2-1 provides a summary of the WWTP service area (LCC Closure Project compliance area) property types.

Table 2-1. Naalehu WWTP Service Area Summary

Property Type	Number of Parcels		
	Existing C Brewer	Newly Accessible	Total
Residential	159	25	184
Commercial	2	7	9
Church	1	1	2
Industrial	-	2	2
Agricultural	1	2	3
Residential/Commercial	1	1	2
Residential/Agricultural	-	1	1
Park	-	1	1
Total	164	40	204

Note: Service area = LCC Closure Project compliance area

2.2 Existing Collection System

In 2004, Brewer Company contracted M&E Pacific to perform a sewer system evaluation for the town of Naalehu. The results of this investigation determined that the existing sewer lines and manholes do not conform to the County sewer design standards. The existing sewer system was not constructed in the streets, but instead runs through easements located on private properties, with many collection lines running adjacent to or beneath the houses. The results of a smoke test performed during the 2004 sewer system evaluation identified at least 13 locations of line breaks and/or pipe defects and 12 household units with defective sewer vents. In addition, the existing sewer system is over 80 years old, long surpassing its expected lifespan, and will require extensive repair and rehabilitation if chosen to be reused.

The recommended alternative, which received overwhelming support from Naalehu voters in 2004, consists of constructing a new sewer system in the streets to meet the County sewer standards and to allow the collection system to be owned and operated by the County (M&E Pacific, December 2004).

Nearly 20 years have passed since the 2004 study was completed. In order to reuse the existing collection system into the future an updated condition assessment study is recommended to better identify system deficiencies. Substantial improvements will likely be necessary due to the age of the system. Reusing the existing collection system will require constructing the Phase 1 collection system scenario described below to connect to the proposed WWTP and close the LCCs.

2.3 Phase 1 Collection System Project

In efforts to close the existing LCCs, FAI conducted a collection system investigation in May 2020. The investigation recommends a two-phase approach. Phase 1 involves utilizing the existing collection system within the Brewer Company house lots and constructing new gravity sewers, wastewater pump station, and force main to transport sewage from the LCCs to the new WWTP. Phase 1 consists of the following:

1. Construct a new gravity sewer on Kaalaiki Road and Naalehu Spur Road to the WWTP located on a portion of Tax Map Key (TMK) (3) 9-5-007:016.
2. Construct a new pump station located on a portion of TMK (3) 9-5-008:048, and construct a new force main, which crosses an existing storm drainage channel at Melia Street, to connect to the Kaalaiki Road gravity sewer.
3. Construct a new gravity sewer on Opukea Street and Ohai Road to intercept existing flows entering the LCCs and divert sewage to the wastewater pump station (WWPS) and transport flows to the gravity sewer along Kaalaiki Road.

Figure 2-2 illustrates the transmission system layout established by FAI in May 2020 for the Phase 1 collection system.

Naalehu WWTP Revised PER Section 2

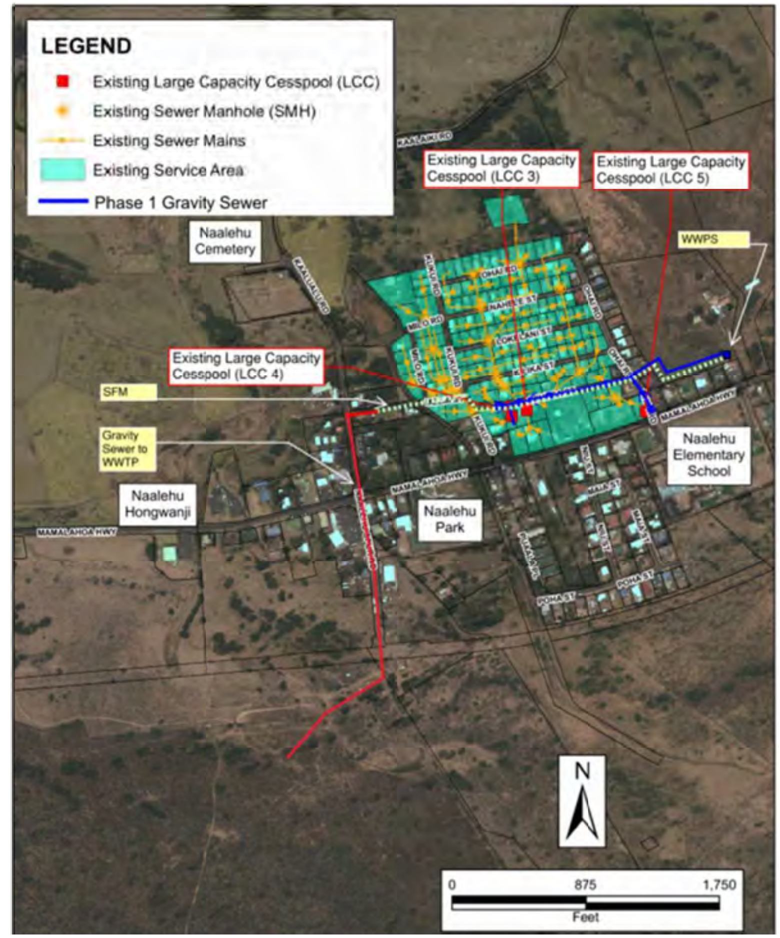


Figure 2-2. Naalehu Phase 1 Collection System Layout

2.4 Phase 2 Collection System Project

The Phase 2 collection system project consists of the installation of gravity sewers within the streets to replace the existing collection system. Figure 2-3 shows the former Brewer Company housing area Phase 2 collection system established by FAI in May 2020.

Figure 2-3. Naalehu Phase 2 Collection System Layout–Former Brewer Company House Lots

2.5 Collection System Alternatives

Two collection system alternatives were evaluated for Naalehu:

- **Phase 1 Only: Reuse Existing Collection System:** This alternative would construct the Phase 1 project to close the LCCs. The existing collection system would continue to be used.
- **Phase 1+2: All New Collection System:** This alternative would construct both Phase 1 and Phase 2 to create an all-new collection system for the community.

2.6 Collection System Costs

Table 2-2 summarizes the capital, operation and maintenance (O&M), equipment replacement, and life-cycle costs for the two collection system alternatives. The capital costs were calculated by FAI in their Naalehu Wastewater Collection System Improvements Technical Memorandum (Appendix D) conducted in May 2020, adjusted to current (June 2023) dollars.

Phase 1 capital costs include an additional $4.4 million from FAI's estimate to account for capital costs related to reusing the existing collection system, such as inspection, cleaning, and repairing of existing defects. Both scenarios include an estimated $400,000 WWPS equipment replacement cost after 20 years. The life-cycle costs consist of the 30-year net present value (NPV) of the capital, O&M, and 20-year equipment replacement costs. Additional detail is included in Appendix A.

Table 2-2. Collection System Alternatives Cost Summary

Collection System Alternative	Capital Cost ($M)	Annual O&M Cost ($/year)	WWPS Equipment Replacement (20-yr)	Life-Cycle Cost ($M)
Phase 1 Only: Reuse Existing Collection System	$30.0	$240,000	$400,000	$35.9
Phase 1+ Phase 2: All New Collection System	$40.2	$74,000	$400,000	$42.2

Table 2-3 provides a summary of capital cost assumptions used for the collection system cost analysis.

Table 2-3. Collection System Alternatives Capital Cost Estimating Assumptions

Description	Value
Estimate date	June 2023
Engineering News Record 20-Cities Average Construction Cost Index	13,345
Engineering, administration, and legal markup	25 percent
Estimating contingency for unknowns	20 percent

The life-cycle cost evaluation consists of a NPV comparison of the two alternatives. The NPV analysis includes capital, annual O&M, and periodic equipment replacement costs. The capital expenditure is assumed to occur in year 1, and annual O&M costs are incurred during years 2 through 30. A pump station equipment replacement project is assumed to occur in year 20. An appropriate inflationary factor and discount rate are applied to the cash flow projections to obtain the NPV over a 30-year planning period.

The NPV of an alternative represents the amount of money that would need to be set aside today (at a given interest rate) to pay the costs associated with the alternative over the entire planning period. The alternative with the lowest NPV is considered the most attractive from an economic perspective.

Table 2-4 summarizes the life-cycle cost evaluation assumptions.

Table 2-4. Life-Cycle Economic Assumptions

Description	Value
Year of analysis	2023
Planning period	30 years
Inflation rate	3.5 percent
Discount rate	5.0 percent
Equipment replacement cycle	20 years

The life-cycle costs are shown graphically on Figure 2-4. Reusing the existing Brewer Company collection system has the lowest capital and life-cycle costs.

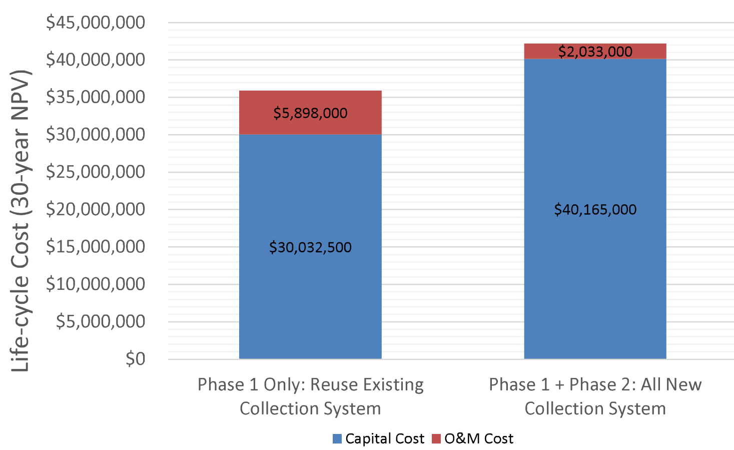


Figure 2-4. Life-Cycle Cost Comparison of Collection System Alternatives

2.7 Recommendation

Although reusing the existing collection system appears to incur lower life-cycle costs than constructing an all-new collection system, it is not recommended. Due to the advanced age of the existing collection system, the option would incur substantial financial, public health, and environmental risks to the County, as summarized below:

- The piping is at the end of its useful service life; catastrophic failures are likely to increase in frequency, resulting in greater risks to public health and the environment.
- Most of the system is located in backyard easements, making it difficult to access and maintain.
- System expansion to accommodate sewering additional areas of the town (in accordance with the Kau CDP) would not be feasible.
- The option does not address the Administrative Order on Consent requirement to connect additional properties that are currently not connected to the collection system to the WWTP.

A new conventional gravity sewer collection system constructed in the streets of the Brewer Company lot development (Phase 2) is a viable solution to meet the wastewater collection needs of the town of Naalehu. From a technical perspective, the Phase 1 + Phase 2 option is recommended for implementation should a new WWTP be constructed. It is anticipated that additional non-technical considerations such as financing options, community input, burden on the Naalehu community, and detailed alignment with County long term planning goals will be addressed outside of this preliminary engineering report.

Section 3

Flow and Load Projections

This section summarizes the wastewater flow and load projections for the new Naalehu wastewater treatment plant (WWTP).

3.1 Flow Projections Based on City and County of Honolulu Standards

Section 11-62-24(b) of the Hawaii Administrative Rules (HAR) requires Counties to use their adopted wastewater flow standards to develop flow projections for WWTPs. Counties are to use the City and County of Honolulu (CCH) flow standards if they have not adopted their own standards. The County of Hawaii has not adopted its own flow standards, so wastewater flow projections were developed using current CCH wastewater standards (2017). Table 3-1 summarizes the flow projections.

Table 3-1. Naalehu WWTP Flows Based on 2017 CCH Standards

Description	Value (gallons per day)	Peaking Factor
Average dry weather flow	225,000	1.0
Peak day dry weather flow	446,000	2.0
Peak day wet weather flow [a]	563,000	2.5
Peak hour wet weather flow	480 gallons per minute (691,000 gallons per day)	3.1

a. Peak day wet weather flow is not part of the CCH standards but is an important WWTP design parameter. Peak day wet weather flow estimate was developed using an appropriate peaking factor.

The CCH standards were established for a major metropolitan area that includes vast areas of residential, commercial, and industrial development, with significant proportions of service areas near sea level elevations. Wastewater generation rates are generally lower in rural areas than in urban areas. The County's experience with the CCH flow standards on other projects (e.g., Honokaa WWTP) has illustrated that the standards are very conservative for small rural communities located at higher elevations on Hawaii Island. Therefore, the current wastewater standards based on urban Honolulu are likely overly conservative for rural communities like Naalehu.

3.2 Reduced Flows Based on Potable Water Records

The amount of wastewater generated within a residence will not exceed the amount of potable water used by the occupants. Therefore, potable water use records can be used to estimate wastewater generation rates within existing communities where no combined sewers are present. The County of Hawaii Department of Water Supply provided potable water use records for the parcels located within the service area from November 2017 through October 2022. Evaluation of the potable water use data is discussed in Appendix B. Analysis of the potable water use records indicates that an 80,000 gallons per day (gpd) monthly wastewater generation rate would reflect the current needs of

the service area. Using a 2.5 peaking factor to estimate the maximum wastewater flow into the collection system results in a maximum wastewater flow of 200,000 gpd.

3.2.1 Dry Weather I/I Allowance

Groundwater can infiltrate into wastewater collection systems during dry weather, increasing flows to the WWTP. The 2017 CCH standards specify a dry weather infiltration and inflow (I/I) allowance of 35 gallons per capita per day (gpcd). The previous CCH standards (dated 1993) specified a dry weather I/I allowance of 5 gpcd for properties located above the groundwater table. Through the County's experience at Honokaa evaluating dry weather I/I for a rural collection system located in Hawaii Island's well-drained geology, at elevations hundreds of feet above sea level and a significant distance from the shoreline, we conclude that continued use of the 1993 standard for dry weather I/I is appropriate for Naalehu and using the 2017 standard would be overly-conservative. Further discussion is provided in Appendix B.

3.2.2 Wet Weather I/I Allowance

The 2017 CCH standards, which specify a wet weather I/I allowance of 3,000 gallons per acre per day, were used for all wet weather I/I calculations.

3.2.3 Reduced Flow Projections

Accurately quantifying flow projections for the Naalehu community is necessary to design an appropriately sized wastewater treatment and disposal facility. The WWTP design will provide sufficient capacity for the existing parcels within the service area, including newly accessible parcels, reflecting current development. This will allow the County to close the three LCCs. Furthermore, the design will provide sufficient area within the WWTP site for future expansion. Table 3-2 provides a summary of the calculated WWTP capacities for the reduced flow projections and for the flow projections for future development based on the 2017 CCH Standards.

Table 3-2. Naalehu WWTP Calculated Flow Capacity

Description	Reduced Flow Projections	Flow Projections Based on 2017 CCH Standards
Base sanitary flow	80,000 gpd	147,000 gpd
Peak hour sanitary flow	200,000 gpd	368,000 gpd
Dry weather I/I	12,000 gpd	78,000 gpd
Wet weather I/I	245,000 gpd	245,000 gpd
Average dry weather flow	92,000 gpd	225,000 gpd
Peak day dry weather flow	212,000 gpd	446,000 gpd
Peak day wet weather flow	322,000 gpd Peaking Factor = 3.5	563,000 gpd Peaking Factor = 2.5
Peak hour wet weather flow	317 gpm (457,000 gpd)	480 gpm (691,000 gpd)

HAR 11-62-23.1(i) requires the initiation of a facility planning process when the actual wastewater flows (measured at the WWTP) reach 75 percent of the design capacity of the WWTP, and implementation of the facility plan must be initiated when actual wastewater flows (measured at the WWTP) reach 90 percent of the design capacity. In anticipation of future development, we recommend the WWTP design be rated to treat an average dry weather flow of 125,000 gpd to avoid the potential of having to initiate a facility plan shortly after the project is constructed. Note that the

biological processes in the mechanical WWTP will need to be sized to treat the peak day dry weather flow of 212,000 gpd, not the average dry weather flow.

The proposed WWTP design capacity is based on actual water use data to establish wastewater generation rates, and rational assumptions to establish dry weather I/I allowances, and we believe it is appropriate for the existing conditions, while providing limited capacity for growth. Table 3-3 presents the recommended design capacity for the reduced flow projections.

Table 3-3. Recommended WWTP Capacity

Description	Value	Peaking Factor
Average dry weather flow	125,000 gpd	1.0
Peak day dry weather flow	212,000 gpd	1.7
Peak day wet weather flow	322,000 gpd	2.6
Peak hour wet weather flow	457,000 gpd (317 gpm)	3.7

3.2.4 Flow Variance

If the County pursues a WWTP approach (using the recommended capacity in Table 3-3) to close the LCCs then a DOH variance from HAR 11-62 requirements will be needed. The variance will need to be renewed every 5 years. The WWTP capacity needs should be re-evaluated upon application for the variance renewal.

3.3 Influent Characteristics

The properties within the existing service area are primarily residential, but do include several commercial, agricultural, and industrial zoned parcels. The wastewater characteristics of the WWTP influent are assumed to be similar to typical domestic wastewater. Table 3-4 provides a summary of the assumed influent characteristics.

Table 3-4. Summary of Assumed Influent Characteristics

Parameter	Value (mg/L)
5-day biochemical oxygen demand (BOD_5)	300
Total suspended solids (TSS)	300
Total nitrogen	40
Total phosphorus	7

3.4 Influent Mass Loads

Table 3-5 summarizes the projected loads to the WWTP, based on the proposed peak day dry weather capacity of 212,000 gpd and the influent characteristics presented above.

Table 3-5. Projected Peak Dry Weather Day Influent Mass Loads

Description	Value (lbs/day)
BOD_5	530
TSS	530
Total nitrogen	71
Total phosphorus	12

Section 4

Effluent Management Alternatives and Regulatory Requirements

Effluent management alternatives are evaluated in this section, followed by an assessment of regulatory requirements for the recommended effluent management system.

4.1 Effluent Management Alternatives

Effluent management alternatives are evaluated below.

4.1.1 Ocean Discharge

Ocean discharge of treated effluent is not considered a viable alternative for this small community due to the long distance to the shoreline (approximately 2 miles), high cost to construct an outfall, stringent receiving water quality standards, high receiving water monitoring cost, and difficulty and length of time required to secure the required permits. The coastal waters in the Naalehu area are classified as "AA" marine waters by State of Hawaii Department of Health (DOH). Hawaii Administrative Rules (HAR) 11-54 does not allow zones of mixing in waters up to a distance of 300 meters (1,000 feet) offshore if there is no defined reef area and if the depth is greater than 18 meters (10 fathoms). The water quality criteria for nutrients for Class AA embayments are listed in Table 4-1. If a mixing zone is not provided, then a WWTP discharging to the coastal waters would be required to treat water to meet the applicable water quality criteria. Treatment to the specified levels is not feasible with current technologies. Therefore, ocean discharge is not feasible without a mixing zone and an outfall at least 1,000 feet offshore would be required for Naalehu.

Table 4-1. Nutrient Water Quality Standards for Class AA Embayments

Parameter	Geometric mean not to exceed (µg/L)	Not to exceed the given value more than 10% of the time (µg/L)	Not to exceed the given value more than 2% of the time (µg/L)
Total nitrogen	200	350	500
Ammonia nitrogen	6	13	20
Nitrate + nitrate nitrogen	8	20	35
Total phosphorus	25	50	75

4.1.2 Subsurface Disposal via Injection Wells

Per HAR, Title 11, Chapter 23, disposal to groundwater via an injection well is not allowed mauka of the DOH Underground Injection Control (UIC) line. The UIC line in the Naalehu area is located along the shoreline. Since the town of Naalehu is located mauka of the UIC line, an injection well is not a viable alternative. In addition, per Environmental Protection Act 131, DOH is prohibited from issuing permits "for the construction of sewage wastewater injection wells unless alternative wastewater disposal options are not available, feasible or practical". Therefore, subsurface disposal via injection wells is not feasible.

4.1.3 Water Recycling

This section summarizes Brown and Caldwell's (BC's) evaluation of water recycling as the primary effluent management system.

4.1.3.1 Irrigation

An irrigation assessment was completed to determine the viability of water recycling as the primary effluent management system, assuming the recycled water would be used to irrigate nearby coffee trees or other agricultural crops.

Figure 4-1 presents a summary of the assessment, which shows there is typically no irrigation demand for 3 months of the year (November through January) due to high rainfall. In addition, the DOH requires that all water recycling programs have a 100 percent backup disposal system in place to handle flow that does not meet recycled water quality standards or when recycled water supply exceeds demand. Therefore, water recycling is not a viable primary or sole effluent management strategy for the community at this time. However, water recycling treatment, storage, and distribution systems could be added in the future. In addition to nearby irrigated agricultural reuse, the Naalehu Park and Naalehu Elementary School have significant areas of turf that could be considered for future irrigation with recycled water that meets the DOH "R-1" standards.

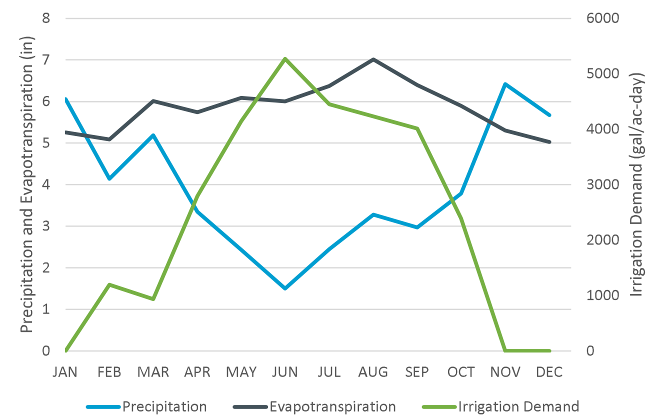


Figure 4-1. Irrigation Demand Assessment

4.1.3.2 Stock Water

The proposed WWTP site is located on a large ranch parcel. The County evaluated recycled water for stock watering purposes in November 2019 (BC, November 2019). The study concluded that recycled water that meets DOH R-1 standards could be used for stock watering purposes. The estimated peak stock water demand was 29,000 gallons per day (gpd), approximately 23 percent of the proposed average dry weather flow capacity of the WWTP. Stock water use appears to be feasible if a water recycling program is developed in the future.

4.1.4 Slow Rate Land Treatment

A potential project effluent management concept consists of Type 1 slow rate (SR) land treatment, which involves irrigation of vegetation with effluent. Type 1 slow rate land treatment differs from water recycling in that it is a disposal method, and effluent is typically applied in excess of the irrigation needs of the vegetation. The potential effluent management concept calls for grading the site to contain all precipitation and planting native Hawaiian trees within the effluent disposal area. Effluent would be applied using surface (flood) irrigation techniques.

The soils at the proposed WWTP location are suitable for SR land treatment. The proposed WWTP effluent management system will make use of an area containing Naalehu medial silty clay loam soil (Natural Resources Conservation Service [NRCS], 2018). This soil type is well drained with moderately high to high permeability. SR land treatment consists of irrigation of land and vegetation with effluent. Significant treatment is provided as the water percolates through the soil. The vegetation uses the nutrients in the effluent as fertilizer and transpires a portion of the applied water. SR land treatment serves as a means for final disposal of effluent.

4.1.5 Subsurface Drip Irrigation Disposal

Another effluent management concept is to retain the existing site topography along with the existing vegetation and use subsurface drip irrigation technology to apply the effluent within the effluent disposal area. The use of subsurface drip irrigation technology to disperse effluent at the site will allow the County to significantly reduce the amount of clearing, grubbing, and grading required to construct the facility, as compared to slow rate land treatment.

Drip irrigation technology has evolved to the point where non-clog emitters are available for subsurface applications of effluent. Non-clog subsurface emitters decrease the potential for the irrigation components to be clogged by roots.

Figure 4-2 illustrates the subsurface drip concept. Drip tubing with integral emitters is buried 6 to 9 inches below ground. Effluent emitters are typically designed to operate at a flow rate of 1 gallon per hour (gph) and are typically spaced every 2 feet along a drip line. Pressure compensating drip systems typically operate under pressures ranging from 10 to 45 pounds per square inch (psi).

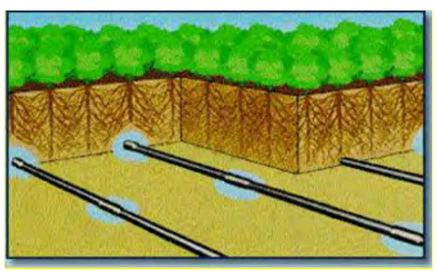


Figure 4-2. Subsurface Drip Irrigation Concept

(Courtesy of Geoflow, Inc.)

Subsurface drip irrigation technology incurs greater operation and maintenance than a surface irrigation system. The County would need to periodically flush the drip lines to remove debris. As described below, a significant number of drip lines are necessary to accommodate peak flow rates. In addition, periodic chlorination would be required to remove biological growth from the drip lines.

These O&M tasks would need to be completed on a regular schedule, because drip systems are buried and not readily accessible or observable. During periods of dry soil conditions, the County would need to inspect the disposal area for patches of wet soil that would indicate a localized failure that requires repair. Flow and pressure monitoring would also be useful tools for validating the status of the subsurface drip system. The disposal area would be divided into multiple irrigation zones, allowing a zone to be taken out of service for maintenance purposes. A fence would be constructed around the site to deter entry by humans and ungulates.

The subsurface drip system would slowly disperse effluent 6 to 9 inches below the ground surface, therefore operating as a subsurface disposal system similar to a leach field. Effluent is not intended to surface with a properly operating subsurface drip system. Precipitation falling on the site would either percolate into the soil or run off as surface drainage. The amount of runoff from the site would vary with the storm intensity; precipitation rates in excess of the infiltrative capacity of the site soils would result in runoff. The implementation of a subsurface disposal system will allow the existing grading to be retained, because stormwater runoff will not come into contact with, and therefore will not contain, effluent.

4.1.6 Leach Field

A leach field could potentially be constructed for subsurface disposal of treated effluent. Preliminary assessment of the concept based on the site soil characteristics (NRCS, 2018) and HAR 11-62 indicate approximately 14 acres of leach fields would be required to accommodate the anticipated flow, which includes a 100-percent redundant drain field per the DOH requirements. There is insufficient soil area available at the proposed WWTP site to construct a leach field of this size; therefore, this alternative is considered to be not feasible.

4.1.7 Ramifications of United States Supreme Court Opinion on County of Maui, Hawaii v. Hawaii Wildlife Fund et. al.

The United States Supreme Court (USSC) has published its opinion on the case of Hawaii Wildlife Fund, et al. vs. County of Maui regarding whether the injection wells at the Lahaina Wastewater Reclamation Facility (WWRF) are subject to regulation under the Clean Water Act (CWA) National Pollutant Discharge Elimination System (NPDES) program. The USSC ruled that a discharge of pollutants that originate from a point source but are conveyed to navigable waters by a nonpoint source (in the Lahaina situation, groundwater) are subject to regulation under the NPDES program if the nonpoint source is a “functional equivalent” of a point source discharge. Unfortunately, the term “functional equivalent” is not well defined at this time. The USSC decision offered two examples of what would and would not be considered functional equivalents to a direct discharge:

- A pipe ending a few feet from a navigable water and the pipe emits pollutants that travel those few feet through groundwater (or over the beach) to the navigable water would clearly be subject to NPDES regulation.
- If a pipe ends 50 miles from navigable waters and the pipe emits pollutants that travel with groundwater, mix with much other material, and end up in navigable waters only many years later, would not be subject to NPDES regulation.

The two examples represent the two extreme situations. The USSC also offered some vague guidance as to how situations between the two extremes could be handled. Specifically, seven relevant factors were listed that could be applied to specific situations:

1. Transit time.
2. Distance travelled.
3. The nature of the material through which the pollutant travels.
4. The extent to which the pollutant is diluted or chemically changed as it travels.
5. The amount of pollutant entering the navigable waters relative to the amount of the pollutant that leaves the point source.
6. The manner by or area in which the pollutant enters the navigable waters.
7. The degree to which the pollution (at that point) has maintained its specific identity.

The USSC opinion further states that “time and distance will be the most important factors in most cases, but not necessarily every case”. The USSC was not able to provide additional guidance as to what would constitute a functional equivalent to a direct discharge, leaving substantial regulatory uncertainty that requires resolution.

4.1.7.1 The Road to Regulatory Clarity

Regulatory clarity is important to public agencies tasked with protecting public health and the environment by managing wastewater from communities. Environmental protection projects are often costly, and it is important for public agencies to have a level of confidence that a project will meet regulatory requirements over the project lifecycle before public funds are expended. Unfortunately, the USSC opinion does not provide regulatory clarity. There are four potential ways that regulatory clarity can be achieved:

1. Regulatory guidance documents: The U.S. Environmental Protection Agency (USEPA) or State of Hawaii could issue regulatory guidance documents that establish criteria for determining if a particular discharge scenario is a functional equivalent to a direct discharge. Developing regulatory guidance documents would be the fastest way to address the problem but would also be the weakest approach because regulatory guidance documents aren’t subject to a public review process and don’t carry the authority of the options listed below.
2. Regulations: The USEPA and/or State of Hawaii could develop regulations that define conditions whereby a discharge is a functional equivalent to a direct discharge. Development of regulations takes longer than development of regulatory guidance documents because a public participation process is involved.
3. Legislation: The United States and/or State of Hawaii governments could enact legislation that defines what is functionally equivalent to a direct discharge.
4. Court rulings: The definition of what it means to be a functional equivalent to a direct discharge could be resolved via court cases. This would be the slowest pathway of the four.

Based on the above, it will likely take years to decades before the term “functional equivalent” is adequately defined to a point where agencies have regulatory clarity.

4.1.7.2 Complications of Discharges within the State of Hawaii

The USSC opinion is especially complicated for most forms of effluent discharge in the State of Hawaii, because of the unique hydrogeology of volcanic islands. Our islands are surrounded by the navigable waters of the Pacific Ocean, and water that percolates into the soil that does not evaporate or is not taken up by vegetation via evapotranspiration will eventually find its way to the

groundwater that moves mauka to makai and into the ocean. Therefore, any pollutants that percolate to groundwater will eventually find their way to navigable waters.

A further complication is the State of Hawaii’s water quality standards (WQS) that define ocean water quality criteria for discharge into the ocean. These standards are an order of magnitude lower (i.e., more restrictive) than what can be achieved with existing advanced treatment technology. Treatment technology is currently not available that can reliably produce effluent that meets the WQS. While technology is available that can purify wastewater to where it is safe to drink (at great expense), ironically that same purified water cannot not be discharged into the ocean in certain places or certain conditions because it would not meet the water quality standards the State has established for ocean waters.

4.1.7.3 United States District Court Ruling

Subsequent to the USSC decision, the U.S. District Court in Honolulu ruled the Lahaina WWRF injection wells are functionally equivalent to a direct discharge and are subject to the CWA and require an NPDES permit. The DOH is in the process of issuing an NPDES permit to the facility. The U.S. District Court Ruling establishes another data point in addition to the two provided by the USSC regarding whether a discharge is functionally equivalent to a direct discharge:

- The transit time from the Lahaina WWRF injection wells to the Pacific Ocean is a minimum of 84 days, reaches peak concentration in 9 to 10 months, and continues for 3 to 5 years after discharge to the injection wells. A dye tracer test was used to establish the transit time.
- The straight-line distance traveled from the injection wells to the Pacific Ocean is approximately 2,900 feet (0.55 miles), although the groundwater in the aquifer takes a non-linear route.

4.1.7.4 Functional Equivalent Risk

As discussed above, the USSC opinion establishes at least seven factors to be used to determine whether an indirect discharge is a “functional equivalent” to a direct discharge, and without regulatory action, legislative direction, or additional legal precedents, agencies that desire to implement an indirect discharge system are placed in a position of regulatory uncertainty. The risk can be eliminated by:

- Implementing a direct discharge system (e.g., ocean outfall) that is known to be subject to the NPDES program.
- Implementing a true zero-discharge system, i.e., evaporation.

All other forms of disposal carry risk of being a functional equivalent to a direct discharge. Site-specific factors need to be evaluated for each particular discharge system and location. However, each type of discharge system provides different degrees of treatment and environmental attenuation. Therefore, for a given site certain options present less risk than others.

Table 4-2 shows BC’s opinion of the risk of various effluent management systems that have been discussed in relation to each other, assuming disposal systems that provide more treatment present less risk than disposal systems that provide less treatment.

Of the indirect discharge systems, discharge to groundwater via injection wells is shown as having the highest risk of being functionally equivalent to direct discharge because treated effluent is added directly to the groundwater in a discrete area.

Leach fields are shown to have lower risk than injection wells because effluent is applied near the surface over a large area and treatment occurs as the applied water percolates through the unsaturated soil.

Table 4-2. Relative Risk of Being Functional Equivalent to Direct Discharge

Classification	Risk of Being Functional Equivalent to Direct Discharge	Effluent Disposal System
Direct discharge	Not applicable	Direct discharge to ocean
Indirect discharge	Highest risk	Discharge to groundwater via injection wells
		Leach fields
		Slow rate land treatment and subsurface drip disposal systems
	Lowest risk	Water recycling

Slow rate land treatment and subsurface drip disposal are shown as having lower risk because the effluent is applied over a large area at or near the surface, and the presence of managed vegetation allows a higher degree of treatment to occur before the water percolates to groundwater.

Water recycling in the form of irrigation carries the lowest risk because it produces the smallest volume of deep percolate of the options shown.

4.1.7.5 Functional Equivalent Risk at Naalehu

At the current time we believe the risk of any of the feasible effluent management alternatives for Naalehu (water recycling, slow rate land treatment, subsurface drip disposal, and leach field) being found to be the functional equivalent to a direct discharge are low due to the following considerations:

- The effluent management system(s) would be located at an elevation of approximately 680 feet above sea level, creating a large vadose zone that applied effluent would need to travel down before reaching the basal groundwater lens.
- The effluent disposal site is located nearly 2.5 miles from the shoreline, likely resulting in a long travel time.
- The effluent flows will be relatively small at this facility, and there are no documented groundwater quality problems in the area.

However, it must be noted that future court rulings, legal action, legislation, or regulatory actions could render the facility to be functionally equivalent to a direct discharge and subject to NPDES permitting requirements.

4.1.8 Recommendation

Subsurface drip irrigation system is the recommended method of effluent disposal for the Naalehu WWTP. Subsurface drip will incur lower capital cost and require less attention from WWTP operators with respect to vegetation maintenance than slow rate land treatment. Subsurface drip requires periodic maintenance chlorination to eliminate biofouling in the drip lines. Recommended design criteria for the subsurface drip irrigation system are presented in Table 4-3. The disposal system would be sized to handle the peak day wet weather flow of 322,000 gpd. An irrigation equalization and control tank are proposed to equalize higher peak flows and to allow discrete dosing of the irrigation zones.

HAR 11-62 requires a fully redundant subsurface disposal system. The design criteria listed in Table 4-3 are based on providing a subsurface drip system that is two times larger than needed in order to satisfy the HAR 11-62 requirement for redundancy. The drip system ould be divided into two separate systems so that the peak day wet weather flow can be disposed on the site using one system while the second system is out of service for maintenance.

Table 4-3. Recommended Subsurface Drip Disposal Design Criteria

Description	Value
Average dry weather flow	125,000 gpd (87 gpm)
Peak day wet weather flow	322,000 gpd (224 gpm)
Irrigation equalization and control tank volume	20,000 gallons
Disposal area	5.2 acres
Subsurface drip emitters	1 gallon per hour, pressure compensating
Number of emitters needed for peak day wet weather flow	13,417 emitters
Number of systems	2 (1 active, 1 redundant)
Number of emitters provided to provide 2x redundancy	26,833 total emitters
Emitter spacing	2 feet
Drip line length per system	26,833 feet
Total drip line length	53,667 feet
Drip line spacing	4 feet
Drip line depth	6 to 9 inches
Number of irrigation zones	4 (2 per system)
Length of drip line per zone	13,417 feet
Flow per irrigation zone	112 gpm
Irrigation system monitoring	Flow meter(s) and pressure indicators

During high flow conditions the irrigation control system would open multiple irrigation zones to accommodate the disposal needs. Additional drip lines will need to be added when the WWTP capacity is expanded. The minimum spacing between drip lines is 2 feet, so there will be sufficient space between the initial drip lines to add additional drip lines as part of future expansion project(s).

4.2 Treatment Requirements

The DOH regulates subsurface drip irrigation disposal as “land disposal” per HAR 11-62. Table 4-4 lists the applicable effluent requirements for land disposal applicable to the project in effect at the time this report was prepared.

Table 4-4. Applicable HAR 11-62 Land Disposal Requirements

Description	Value	HAR Reference
5-day biochemical oxygen demand (BOD_5)	30 milligrams per Liter (mg/L) monthly average 60 mg/L peak	11-62-26
TSS	30 mg/L monthly average 60 mg/L peak	11-62-26
Disinfection	Except for subsurface disposal systems, continuous disinfection of the treated effluent shall be provided.	11-62-24
Setbacks	Treatment units shall be not less than 25 feet from property lines nor less than 10 feet from any building.	11-62-23.1
Public accessibility control	6-foot-high fence surrounding treatment units	11-62-08

Section 5

Wastewater Treatment Evaluations

This section summarizes the evaluations conducted as part of developing the proposed wastewater treatment plant (WWTP).

5.1 Preliminary Treatment

The preliminary treatment system will include influent flow measurement, influent sampling equipment, screening, and grit removal.

5.1.1 Influent Flow Measurement

Influent flow measurement is recommended to allow assessment of flows and loads to the biological treatment process, and to assess the biological treatment process performance. A Parshall flume will be provided upstream of the screening system to continuously record influent flow rates. Parshall flumes work well for influent measurement because the flume can operate in an open-channel configuration, can accommodate wide ranges of flows, and is self-cleaning. A straight approach length of at least 20 times the flume throat width will be provided upstream of the flume to provide favorable hydraulic conditions.

5.1.2 Influent Flow Sampling

An automatic refrigerated composite sampler is recommended to allow influent composite samples to be collected. Influent composite samples, when combined with influent flow measurement, can be used to calculate influent mass loading rates to the WWTP to assess the treatment performance and optimization of aeration rates in the biological treatment process. Periodic influent sampling is also recommended to monitor for changes in the influent characteristics.

5.1.3 Screening

Screening is recommended to protect the downstream system operations from large objects, debris, wipes, and rags that can be present in wastewater. The industry trend is towards finer screening systems that remove greater amounts of debris from the waste stream; screens with 6-millimeter (1/4 inch) openings are frequently used for activated sludge treatment systems. Finer screens are used upstream of membrane bioreactors to remove hair that can foul the membranes. The screenings volume at the Naalehu WWTP is expected to be small, subsequently screenings disposal is expected to be infrequent; weekly at most. Therefore, the screenings must be washed of organic debris to prevent the accumulation of nuisance odors and flies in the screenings barrel or bag between screening disposal events.

5.1.3.1 In-Channel Cylindrical Screen

We recommend an in-channel cylindrical screen for this installation. The in-channel cylindrical screen combines screening, screenings washing, dewatering, compacting, and bagging/disposal within a single unit. The screening portion consists of an inclined screen basket inserted into the wastewater channel. The screening basket can consist of bars, perforated plates or sieves, depending on the application and clear opening required. The controls can be set to allow a mat to build up on the screening surface, allowing finer screening of the wastewater. Controlled by head loss, a rake arm

starts rotating within the screen basket, pushing the screenings off the rake and into a perforated screenings hopper located at the screen's central axis. A shafted auger along the screen axis conveys the screenings from the hopper through an inclined tube, which dewaters and compacts the screenings. The tube includes a perforated dewatering section. The discharged screenings are about 40-percent dry and can be discharged into a bin or directly into a bagging system.

Figure 5-1 illustrates the process. Manufacturers include Lakeside and Huber. The key benefit to this system is the integrated screenings washing system, minimizing additional screenings handling and odor potential. For this installation, the headworks will include one in-channel cylindrical screen, plus a bypass channel with manually cleaned bar rack.

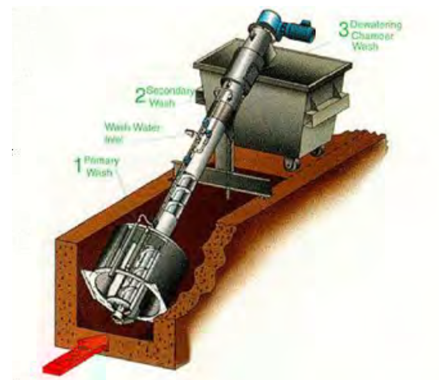


Figure 5-1. In-Channel Cylindrical Screen

5.1.4 Grit Removal

Grit is comprised of particles that are heavier than the organic biodegradable matter in wastewater. Grit particles can consist of sand, gravel, pebbles, silt, cinders, ground bone, eggshells, coffee grounds, and other materials. Grit in the wastewater collection and treatment system causes abrasive wear to mechanical equipment, piping, and appurtenances. Grit can also form deposits in pipelines, channels, and tanks, which reduces hydraulic capacity and can damage equipment. Removal of grit is very important to help prevent wear to downstream equipment, costly service interruptions and repair.

Grit removal systems usually are placed between screening and downstream treatment processes. At this point, the largest materials have been removed by the screens and will not interfere with grit handling equipment.

There are several types of grit removal methods, including induced vortex grit removal, aerated grit chambers, and lamella plate settlers. The type of grit removal chosen is mainly dependent on the size of the incoming grit particles and the desired capture rate. Removed grit must be washed, dewatered, and disposed.

5.1.4.1 Induced Vortex Grit Removal

Historically, vortex grit removal, or the circular grit chamber, has been the most widely used method for grit removal in the United States, Vortex grit removal relies on the principle that grit has a greater specific gravity than organic matter.

There are two configurations of vortex grit removal systems: a sloped bottom unit and a flat bottom unit. The sloped bottom unit relies on particle settling to remove grit. Flow enters the grit chamber tangentially to provide the longest flow path around the inside of the circular grit chamber. This longer flow path is designed to achieve a sufficient retention time to allow grit to settle. The sloped bottom funnels the settled grit into a hopper below the basin. A sloped bottom vortex grit unit cross section is shown in Figure 5-2.

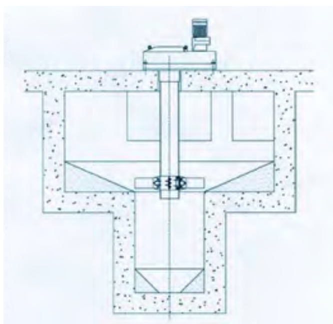


Figure 5-2. Sloped Bottom Vortex Grit Removal Cross Section

The flat bottom vortex system relies on hydraulic removal instead of specific gravity alone to remove grit from the wastewater stream. Flat bottom vortex systems use two paddles within the interior of the grit chamber that induce a toroidal flow pattern to move grit along the bottom towards the center. Once collected at the center of the grit chamber, a propeller forces excess grit down into the hopper. A flat bottom PISTA® Grit unit is shown in Figure 5-3.

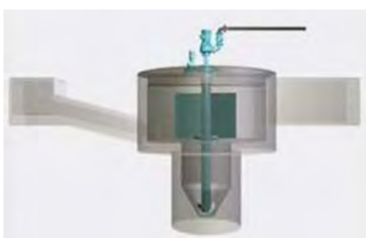


Figure 5-3. Flat Bottom PISTA® Grit Removal

5.1.4.2 Vortex Grit Removal Capture Rate

In BC's experience, it is necessary to de-rate vortex type grit removal units by a factor of 50 percent of the advertised capacity to achieve satisfactory performance, due to the short detention time in the chamber. At large flow rates, the small-chambered vortex type units tend to re-suspend smaller grit particles which become a problem for downstream processes. Table 5-1 lists some advantages and disadvantages of the vortex type grit removal.

Table 5-1. Induced Vortex–Advantages and Disadvantages

Advantages	Disadvantages
• Low maintenance • Low headloss • Small footprint	• Re-suspends/low capture rate of fines • Poor capture efficiency

5.1.4.3 Aerated Grit Removal

Aerated grit chambers are tanks that function specifically to remove inorganic solids from the wastewater stream. Aerated grit tanks are designed to induce sufficient vertical velocity in order to separate organic and inorganic solids. In theory, inorganic solids have a higher specific gravity than organic solids, and therefore require higher vertical velocities to keep them in suspension.

Air diffusers placed near one longitudinal tank wall induce a roll in the contents of the grit tank. This roll creates maximum velocities near the walls and lower velocities at the surface and bottom of the tank. The lower transverse horizontal velocities allow inorganic particles to settle out and be transported to the grit hopper by shear-induced currents.

Aerated grit chamber design is based on providing sufficient hydraulic detention time during peak wet weather flow (PWWF) conditions. In BC's experience it is necessary to provide at least 10 minutes of detention time to achieve satisfactory grit removal.

Aerated grit tanks can provide excellent grit removal with minimal headloss, but the chambers themselves require a larger footprint than induced vortex systems. Proper operation of aerated grit tanks can be difficult under varying hydraulic loads due to the need to make fine adjustments to the air diffusers. Figure 5-4 illustrates the particle settling action of an aerated grit chamber.

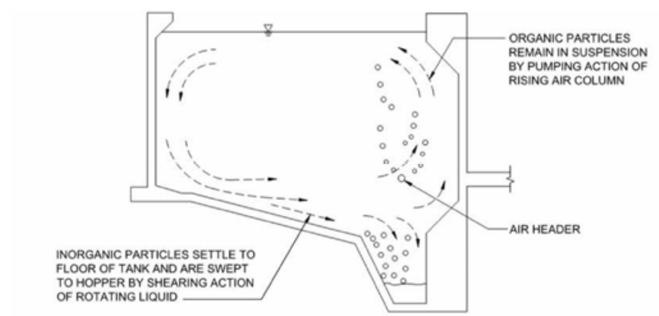


Figure 5-4. Aerated Grit Removal Schematic

Table 5-2 lists some advantages and disadvantages of aerated grit chambers.

Table 5-2. Aerated Grit Removal–Advantages and Disadvantages

Advantages	Disadvantages
• Low headloss • Once airflow is dialed in, the maintenance is low • Effective removal of fines • Provides additional aeration; "freshens" sewage prior to primary clarification. Reduces denitrification in primary clarifiers	• Large footprint • Requires fine tuning diffuser airflow for optimal performance • High capital cost • High O&M cost due to blowers

A variation of aerated grit removal technology that can be used in small WWTPs like Naalehu is an aerated grit trap. A small, aerated tank is provided to allow grit to settle. Aeration is provided to maintain organic solids in suspension and to "freshen" the influent. Accumulated grit is periodically removed using a Vactor truck.

5.1.4.4 Lamella Grit Removal

This proprietary technology from Eutek, called the HeadCell, consists of sloped trays stacked in deep tanks. Flow enters the tanks tangentially and establishes a vortex flow pattern. Solids settle onto each plate and fall toward an opening at the center of each plate. The grit collects at the cone shaped bottom of the tank where it is pumped to be washed and dewatered. Effluent flows out of the trays, over a weir, and into an effluent trough.

Grit capture is all done hydraulically and there are no moving parts. The headloss through each HeadCell is around one foot. HeadCells can be sized to provide up to 50 mgd of capacity within a single unit. With the stacked tray design, the HeadCells can achieve a 95 percent capture rate of grit 75 microns and larger. The multiple trays provide a large surface area for settling multiple size particles. The treatment capacity of the HeadCell is greater than other technologies with the same footprint. Figure 5-5 is an illustration of a section cut through the HeadCell process.

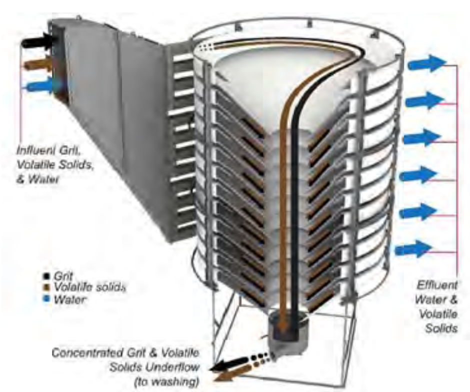


Figure 5-5. HeadCell Process Schematic

Image courtesy of Eutek

Table 5-3 lists advantages and disadvantages of the HeadCell.

Table 5-3. Lamella Plate Settling/HeadCell–Advantages and Disadvantages

Advantages	Disadvantages
• Effective removal of fines • Small footprint • No moving parts • Low operating cost	• High capital cost • Short history of installations

5.1.4.5 Grit Particle Size Considerations

Most grit technologies and literature assume that grit is a clean sand or silica particle with a specific gravity of 2.65. In reality, grit particles are often coated with fats, grease, and organic material that reduce the particle's specific gravity. Grit particles with lower specific gravity have lower settling velocities, behaving like lighter and smaller grit particles.

The sand equivalent size (SES) is the size of a clean sand sphere that exhibits the same settling velocity as the coated grit particles. For example, a grease coated grit particle with a physical size of 200 microns may settle and behave like a clean particle with an SES of 150 microns.

5.1.4.6 Efficiency comparison

Each of the alternatives claims a minimum particle size and capture rate. These claims are based on the ideal, clean grit particle. As previously discussed, in reality grit particles are coated with fats and grease and do not exhibit the behavior of ideal grit particles. The capture rates have to be derated to reflect the SES of the particles. Table 5-4 compares the claimed minimum particle size captured of the alternatives discussed.

Table 5-4. Grit Capture Size Comparison

Alternative	Targeted Particle Size
Induced Vortex	105 μm
Aerated Grit Removal	105 μm
HeadCell	75 μm

The HeadCell is able to remove the finest particles, with up to 95 percent removal of particles with a physical size down to 75 microns.

5.1.4.7 Grit Removal Recommendation

A simple aerated grit trap located downstream of the screening process is recommended for the Naalehu WWTP. Accumulated grit would be periodically removed using a Vactor truck, and dried onsite in a small drying bed. The dewatered grit would be disposed at the landfill.

An aerated grit trap provides adequate performance with a relatively uncomplicated process. Although a HeadCell grit removal system could potentially provide a slightly increased grit capture rate, that benefit is not likely to surpass its significantly higher costs and operational complexity. The capture rate of an aerated grit trap is sufficient to protect the downstream processes recommended in this report. High levels of grit removal are particularly important for anaerobic digestors, which are not anticipated for this facility.

5.1.5 Odor Control

A common location for foul odor is the headworks of a wastewater treatment plant. This odor is caused by hydrogen sulfide (H_2S), which is formed under anaerobic conditions of the wastewater collection system. Due to H_2S low solubility in wastewater, when there is an excessive concentration of H_2S in the wastewater or if there is turbulence, H_2S gas escapes into the atmosphere. This release produces the distinct rotten egg smell. In addition to H_2S, there are other foul odorous compounds that can be released from wastewater, such as ammonia, amines, diamines, mercaptans, skatole, and organic sulfides.

Treatment of foul odors can be approached in two ways: preventing odors through liquid treatment or controlling odors in the gas phase. While liquid treatment provides control of odors prior to their release, gas phase treatment involves the collection and treatment of gases once they have been released from wastewater. Treatment methods can be aimed at one type of odor or can treat a range of odors.

5.1.5.1 Biotrickling Filter

A biotrickling filter consists of a vessel containing plastic or foam media. Foul air is drawn through the media for treatment. A fixed film biomass is maintained on the media by circulating water over the media. Liquid fertilizer must be added to the circulating water to provide the nutrients (nitrogen and phosphorus) the biomass needs to grow. The biomass oxidizes odorous compounds from the foul air as it travels through the tower. A demister is provided to remove water droplets from the treated air stream.

Figure 5-6 shows a schematic diagram of a biotrickling filter. Biotrickling filters work best when H_2S concentrations are greater than 10 to 25 parts per million, which is greater than what is expected at Naalehu, due to the small size of the collection system.

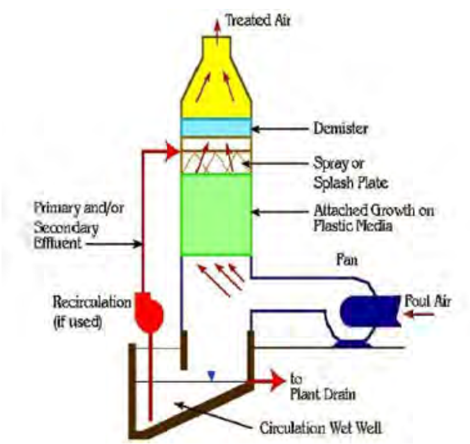


Figure 5-6. Biotrickling Filter

5.1.5.2 Granular Activated Carbon

A granular activated carbon (GAC) scrubber is recommended for the Naalehu WWTP headworks. A GAC scrubber passes odorous air through a bed of activated carbon, which adsorbs the odorous constituents within the pore spaces of the carbon.

Chemical oxidation or reduction of some compounds can also occur. As pore spaces become occupied, efficiency degrades, and the carbon must be replaced or regenerated. Carbon is most effective on higher molecular weight molecules such as the organic sulfur compounds, which makes it the technology of choice. Packaged GAC scrubbers are available for small headworks and vessels can be situated vertically, horizontally, or radially to optimize footprints and reduce structure elevation profiles. Figure 5-7 illustrates the process. The County currently operates GAC scrubbers at other facilities and purchases the GAC media in bulk to reduce costs.

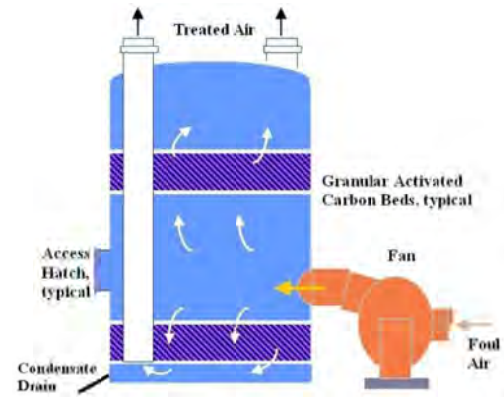


Figure 5-7. Activated Carbon Scrubber

5.1.6 Recommendation

The following are recommended for the Naalehu WWTP headworks:

- Parshall flume influent flow measurement
- Refrigerated automatic composite sampler
- In-channel cylindrical screen with integrated washer
- Aerated grit trap
- Covered channels with foul air collection and GAC scrubber

5.2 Secondary Treatment

Secondary treatment process provides 5-day biochemical oxygen demand (BOD_5), total suspended solids (TSS), and nutrient removal via biological treatment. This section provides descriptions of various secondary treatment options including advantages, disadvantages and applicability to the Naalehu WWTP. The treatment options are then screened to identify technologies for further evaluation.

5.2.1 Membrane Bioreactor

A membrane bioreactor (MBR) has the smallest footprint of the various biological treatment systems available and provides the highest quality effluent. An MBR basically combines an aeration basin with membrane filtration, eliminating the need for tertiary treatment if a very high-quality effluent is desired for water reuse purposes. Membranes provide an absolute barrier to large particles; TSS concentrations of the effluent (also known as “filtrate”) are typically less than 1 milligrams per Liter (mg/L). Effluent from an MBR process can meet stringent water recycling turbidity requirements without an additional filtration process.

The main difference between MBRs and other biological treatment technologies is the method of separating the bacteria from the clean water. MBRs have thin membranes with many thousands of micro-perforations. Depending on the manufacturer, these perforations are 0.04 to 0.2 microns in diameter, too small for the passage of most microorganisms or other particles present in the wastewater, but large enough to allow the passage of water molecules.

Figure 5-8 is an illustration of an MBR. Figure 5-9 shows submerged MBR membranes in clean water.

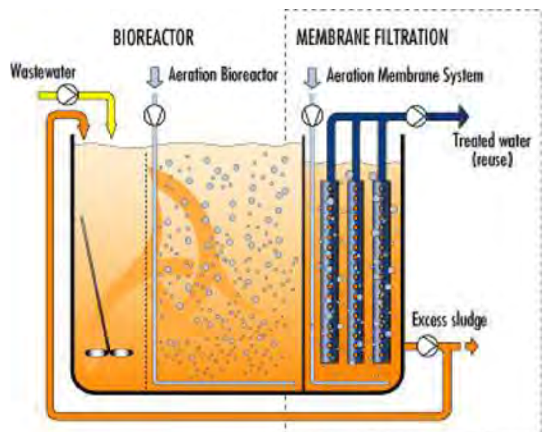


Figure 5-8. Membrane Bioreactor Illustration

Figure 5-9. Membrane Cassettes at Johns Creek Environmental Campus
Fulton County, Georgia

Important considerations of an MBR system include:

- Small capacity MBRs can be purchased as a packaged treatment system.
- MBRs can be designed and programmed to achieve nutrient reduction.
- The membrane cost is significant, and membranes must be replaced every 10 to 15 years.
- Membrane fouling can occur with wastewater with high fats, oils, and grease levels.
- MBRs require the use of membrane cleaning chemicals, typically NaOCl and citric acid.
- The process requires a computer control system and is difficult to operate efficiently if the computer malfunctions.
- The process incurs high electrical power costs, relatively high costs for cleaning chemicals, and high overall O&M costs. Highly skilled labor is required for some of the O&M tasks.

The MBR process would produce an effluent that is of high quality and has a small footprint, but has high overall capital, O&M, and life-cycle costs. MBR is retained for further evaluation.

5.2.2 Sequencing Batch Reactor

Sequencing batch reactors (SBRs) are fill-and-draw systems that combine the processes of activated sludge in a single reactor. The reactor is filled with wastewater, where aeration, settling, and decanting occurs. By combining these processes, the need for secondary settling is not required. Denitrification can be achieved by incorporating an anoxic fill step in the cycle or a separate anoxic zone. A minimum of two SBR reactors are typically used for the process.

SBRs are capable of producing high quality effluent and are potentially space saving in that separate secondary sedimentation is not needed. However, SBRs are operated by a proprietary computer control system, cannot be operated in manual mode, and may require influent and/or effluent equalization (and thus increasing the footprint requirements). Considering these challenges, SBRs will not be considered further.

5.2.3 Nereda (Granular Activated Sludge) Process

The Nereda technology is a granular activated sludge process that utilizes proprietary granules in an SBR. Features of the process include simultaneous fill and draw, fast settling, and approximately 1/5 the footprint of traditional activated sludge systems. The process was developed in Europe and most current full-scale applications are located in Europe. In the U.S., the process is marketed by Aqua Aerobic Systems, Inc, according to the supplier website, there are currently only two full-scale operating systems treating municipal wastewater in the United States. One is a demonstration facility, and the other is a 3.6 mgd facility in Alabama that began operation in early 2020.

Figure 5-10is a conceptual illustration of the Nereda process. Due to the challenges listed for an SBR and the lack of long-term operational experience in the United States, the Nereda process is considered not appropriate for the Naalehu WWTP application.

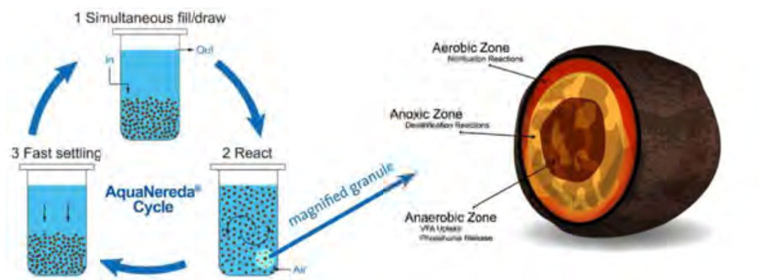


Figure 5-10. Nereda Process

Courtesy: Aqua Aerobic Systems

5.2.4 Oxidation Ditch

An oxidation ditch is a variation of the complete-mix extended aeration activated-sludge process. The process generally has a long solids residence time (SRT) and high mixed liquor suspended solids (MLSS) concentration, making it resilient to upset by peak organic loads. The typical SRT for oxidation ditches ranges from 15 to 30 days, and the MLSS is generally between 2,000 and 5,000 mg/L. Oxidation ditches are often oval in shape and have been called "racetrack" reactors. The depth of the ditch typically ranges from 4 to 12 feet. Mechanical aerators in the ditch provide aeration and mixing. Strategic placement of the aerators creates aerobic and anoxic zones within the oxidation ditch, for effective nitrification and denitrification. Biological phosphorus removal is also possible.

Oxidation ditches are usually preceded by preliminary treatment, such as screening and grit removal. Primary settling is typically not included upstream of oxidation ditch systems. Return activated sludge is pumped from the secondary clarifier back into the ditch.

Figure 5-11 presents a schematic of an oxidation ditch. Typically, rotating brush or disc mechanical aerators are used to move mixed liquor around the tank and to provide aeration. The aerators help mix scum into the water column for treatment. The rigorous mixing action of the mechanical aerators can generate off-spray. Oxidation ditches are not available as packaged treatment systems. Because of the large footprint requirements and non-availability of packaged treatment units, the oxidation ditch process is eliminated from further evaluation.

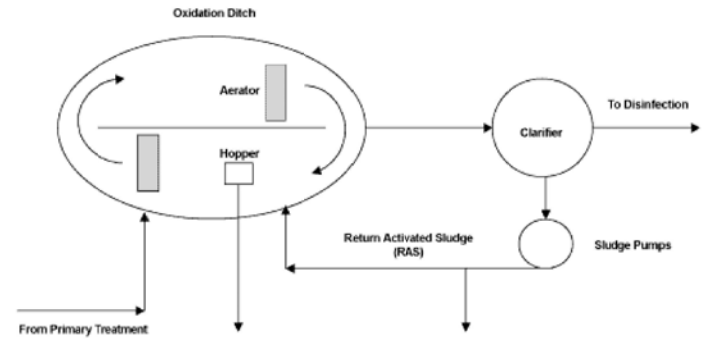


Figure 5-11. Typical Oxidation Ditch Schematic

5.2.5 Extended Aeration Activated Sludge Package Plant

Extended aeration is a less-complex system which can operate without primary treatment or anaerobic digestion. The treatment provides a completely mixed process operated at long hydraulic detention times and high sludge age. The process uses larger aeration tanks with extended solids retention times (SRTs) of over 20 days. Careful consideration needs to be given to the capacities of motors, pumps, and compressors in order to ensure the process can handle variations in flow. The basic extended aeration process schematic is shown in Figure 5-12.

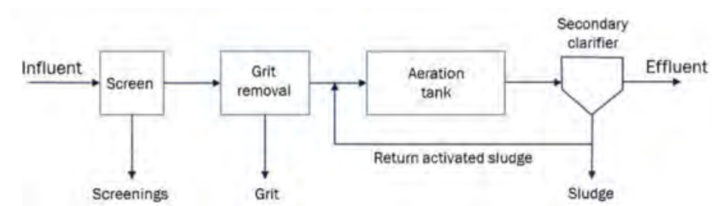


Figure 5-12. Extended Aeration Process Schematic

The process is generally limited to smaller WWTPs and is often used in prefabricated packaged plants. The range of typical SRTs on the mainland is 20 to 40 days, and the process generally operates with MLSSs between 2,000 and 5,000 mg/L. The long SRT and relatively high MLSS makes the process resistant to shock loading and stable but requires somewhat larger tanks and therefore incurs higher aeration costs for a given flow, compared to other forms of activated sludge. Sludge settling can be problematic in the tropics due to denitrification occurring in mixed liquor caused by the relatively high water temperatures. The process is similar to the oxidation ditch technology previously described but would use diffused aeration rather than mechanical aeration. The process is forgiving and resistant to shock loadings. Due to sludge settling challenges in the tropics this process will not be considered further.

5.2.6 Activated Sludge with Anoxic Selector

This process is similar to extended aeration but would employ a shorter SRT of less than 10 days and would operate at a MLSS concentration between 1,500 and 4,000 mg/L. Figure 5-13 shows a process schematic for this process. The Kihei WWRF and Wailuku-Kahului WWRFs on Maui operate with this process. The anoxic selector is typically sized to have a volume of approximately 10 to 30 percent of the total aeration basin volume. The process would not be as forgiving and resistant to shock loadings compared to the oxidation ditch and extended aeration processes due to the shorter SRT and lower MLSS concentration. But this option is available in a prefabricated package plants and would incur a smaller footprint than the oxidation ditch and extended aeration processes but would require operation and maintenance of blowers to provide air to the process. The fine bubble diffused aeration system would be more efficient than the mechanical aerators generally used in the oxidation ditch process. This process is retained for further evaluation.

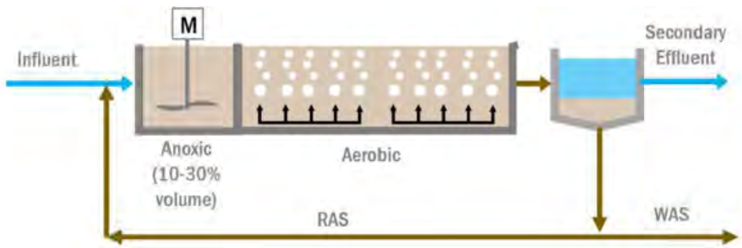


Figure 5-13. Activated Sludge with Anoxic Selector Process Schematic

5.2.7 Recirculating Gravel Filter

Recirculating gravel filter (RGF) technology is an effective technology to treat septic tank effluent wastewater. After collection and conveyance, the wastewater is treated, in this case using a recirculating pea gravel filter. RGFs are a relatively simple, but effective means to treat wastewater from small communities. RGFs have been used to treat flow rates up to 1.0 mgd. RGFs typically produce a nitrified effluent that contains less than 10 mg/L of BOD_5 and TSS (Crites and Tchobanoglous, 1998).

A schematic diagram of a RGF is shown in Figure 5-14. A septic tank is used to capture settleable and floatable solids. The septic tank effluent enters a recirculation tank. A dosing pump is used to apply wastewater in small doses to the top of the filter. The wastewater is treated as it percolates through the pea gravel media. A network of drainage piping collects the water at the bottom of the filter and returns it to the recirculation tank. A floating ball recirculation valve controls the return flow back to the recirculation tank or to the effluent disposal or reuse system. The dosing pump timer settings and recirculation tank volume are designed so that wastewater will typically flow through the filter for treatment an average of three to five times before being discharged. An example of a RGF system in use within a decentralized wastewater system can be found at the Stonehurst subdivision, located near Martinez, California (Crites, et. al. 1997).

For a community system with conventional sewers and Imhoff tank can be used in lieu of a septic tank. Imhoff tanks are designed to remove floatable and settleable solids, and also provides for some digestion of the removed materials.

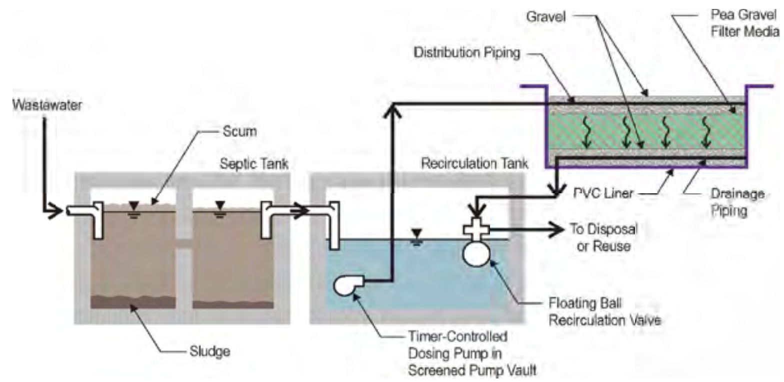


Figure 5-14. Recirculating Gravel Filter for Treatment of Septic Tank Effluent

5.2.8 Secondary Treatment Technology Screening

Table 5-5 provides a screening evaluation of the secondary treatment technologies described above. MBR, activated sludge with anoxic selector, and recirculating gravel filter are carried forward as project alternatives in Section 7.

Table 5-5. Screening of Secondary Treatment Options							
Criterion	MBR	SBR	Nereda	Oxidation Ditch	Extended Aeration	Activated Sludge with Anoxic Selector	Recirculating Gravel Filter
$BOD_5 \leq 30$ mg/L	X	X	X	X	X	X	X
TSS ≤ 30 mg/L	X	X	X	X	X	X	X
Nitrification	X	X	X	X	X	X	X
Total Nitrogen < 10 mg/L	X	X	X	X		X	
Anoxic selector	X	X	X	X		X	
Appropriate for remote island location	X			X	X	X	X
Appropriate for tropical climate	X	X	X	X		X	X
Aeration tank size	Small	Moderate	Small	Large	Large	Moderate	Not applicable, but largest overall footprint
Secondary clarifier size	None	None	None	Largest	Largest	Large	Not applicable, but largest overall footprint
Energy requirement	Highest	Moderate	Moderate	Moderate	Higher	Moderate	Low
Operational complexity	High	High	High	Moderate	Moderate	Moderate	Low
Available as packaged treatment system	X	X	X		X	X	
Fatal flaw		Proprietary control systems	Limited full scale installations in U.S.	Large footprint	Large footprint		
Carry forward in evaluations	X					X	X

5.3 Disinfection

Disinfection processes selectively kill pathogens or render them incapable of reproduction or harm to humans. Disinfection at WWTPs is employed for the purposes of protection of public health, reduction of organic matter, inorganics, nutrients, odor, aesthetics, and maintaining waste-assimilative capacity of receiving water bodies. The protection of public health through the control of disease-causing microorganisms is the primary reason for wastewater disinfection (WEF, 1996). As the last barrier of protection from pathogenic organisms, disinfection at WWTPs is an important process. To address disinfection, both sodium and calcium hypochlorite system and a UV system were evaluated.

5.3.1 Sodium Hypochlorite

Sodium hypochlorite (NaOCl) is the most commonly used form of liquid hypochlorite. It is an effective disinfectant at relatively low concentrations. Commonly known as “bleach,” NaOCl can be found in concentrations ranging from 1.5 to 15 percent. Household bleach usually has a NaOCl concentration of 3 to 6 percent. Swimming pool sanitizers usually have a NaOCl concentration of 11 to 15 percent. A concentration of 12.5 percent is commonly used for wastewater treatment and will degrade to 10 percent in 6 to 8 weeks. The product of degradation is chlorine gas. At low concentrations the product is relatively stable. The solution should be stored in a cool, dark area in a non-corrosive container. NaOCl is corrosive and toxic.

Scaling can occur in pipes and valves used to transport diluted NaOCl if hardness is present in the carrier water. The carrier water can be softened prior to mixing with the NaOCl or systems can be designed to transport undiluted (neat) NaOCl.

Once added to the wastewater, the NaOCl dissociates to form hypochlorous acid and hypochlorite. The combined amount of hypochlorous acid and hypochlorite is referred to as free chlorine. When reacted, the compounds formed with the free chlorine also have some disinfecting potential. These chlorine residuals are desired in some processes, but are toxic to aquatic life if the processed water is discharged to an open stream. Disinfection with hypochlorite can form DBPs similar to chlorine gas. For WWTPs, NaOCl can be delivered in bulk or generated on site.

5.3.1.1 Bulk Sodium Hypochlorite

Bulk NaOCl can be obtained in totes, drums, or smaller packages as desired. Currently, NaOCl is produced on Oahu and transported to neighbor islands in totes. NaOCl solutions are applied with a metering pump or suction injector. Table 5-6 lists advantages and disadvantages of bulk NaOCl.

Table 5-6. Bulk Sodium Hypochlorite–Advantages and Disadvantages	
Advantages	Disadvantages
• Able to oxidize at relatively low concentrations • Use is common at WWTPs • Readily available • Simple O&M–application with metering pumps • Stored and used as a liquid	• Corrosive and toxic • Degrades quickly at high concentrations and temperatures • Forms DBPs • Scaling in pipes and valves can occur • High transportation cost due to weight of liquid • 12.5% NaOCl is considered a hazardous chemical. A release of 100 lbs (approximately 12 gallons) or more is considered a reportable quantity. • Air binding of pumps is possible at high temperatures due to off-gassing, but can be mitigated through proper system design.

The chlorine demand at the Naalehu WWTP is anticipated to be relatively small due to the small WWTP size and method of effluent disposal. Bulk NaOCl is not recommended due to cost and the chemical degradation rate in storage.

5.3.1.2 On-Site Generation

On site generation comprises mixing softened water with salt to form brine and then passing an electric current through the brine to produce NaOCl. When generated on site, the resulting solution is a relatively weak solution, usually around 0.8 percent. Because the process includes passing an electrical current through the solution, the electrical power demand can be quite high. Figure 5-15 is a schematic illustration of NaOCl generation system.

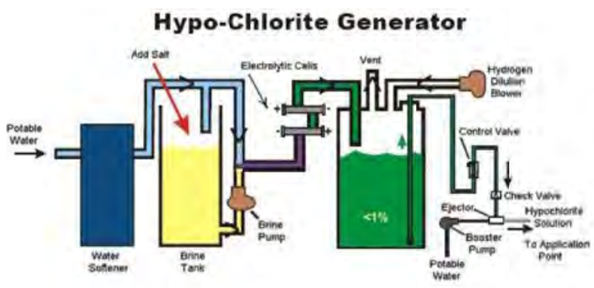


Figure 5-15. Schematic Diagram of an On-site NaOCl Generator

In addition to water hardness, the levels of silica present in the source water can cause build up problems in the on-site NaOCl generator. The level of pretreatment required is dependent on the water quality. A detailed water quality analysis would be necessary if this disinfection technology were chosen. Table 5-7 lists advantages and disadvantages of onsite NaOCl generation.

Table 5-7. Onsite Sodium Hypochlorite Generation–Advantages and Disadvantages

Advantages	Disadvantages
• Salt is readily available and inexpensive • Salt is transported as a solid • Relatively stable liquid product (low concentration) • 0.8% solution produced by on-site generation is not considered a hazardous chemical and is safer to handle than more concentrated solutions • Air binding in pumps due to off-gassing less likely to occur than with more concentrated solutions	• High electrical power demand • High maintenance requirements • Generation process generates flammable hydrogen gas • Disinfection by-products formed

Onsite NaOCl generation is not recommended at the Naalehu WWTP due to the high maintenance requirements.

5.3.2 Calcium Hypochlorite

Calcium hypochlorite is the most common solid form of hypochlorite used for disinfection. It can be found as a powder, granules, pellets, or as tablets in concentrations up to 70 percent. Calcium hypochlorite will degrade in strength at a rate of 3 to 5 percent per year. Once applied to the wastewater, the chemistry is similar to that for NaOCl (i.e., bleach). Calcium hypochlorite decomposes in an exothermic reaction if exposed to moisture.

The solid can be directly applied to wastewater at small WWTPs. Figure 5-16 shows a typical calcium hypochlorite feed system.

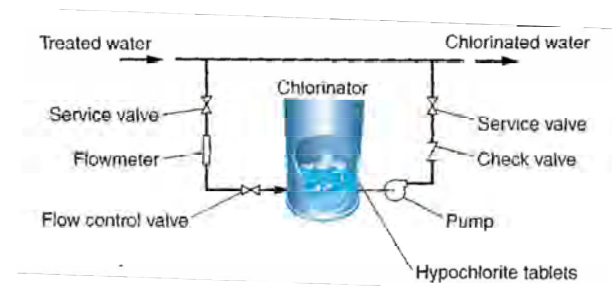


Figure 5-16. Typical Calcium Hypochlorite Feed System

The advantages of using calcium hypochlorite for disinfection at small, remote WWTPs is that it is available in concentrated form as powder, pellets, or tablets. This makes the transportation and storage of disinfectant optimal for small WWTPs. Table 5-8 summaries calcium hypochlorite characteristics.

Table 5-8. Calcium Hypochlorite Summary

Description	Characteristic
Transported form	Solid
Typical transported concentration	70%
Largest transported volume available	55 pound pails
Decay rate	Decays 3-5% per year
Hazards	Toxic if ingested (usually through dust or liquid form)
Storage constraints	Must be stored in a cool, dry, dark place
Special equipment	Tablet feeder
Particular issues	Heats and combusts if not stored properly, scaling in pipes, off gassing

5.3.2.1 Dose and Contact Time

The effectiveness of a chlorination system is highly dependent on the characteristics of the wastewater, the initial mixing and contact time, and the chlorine dose used. For nitrified effluent, the recommended dose is between 4 and 8 mg/L (Crites and Tchobanoglous, 1998).

Table 5-9 lists the chlorine demand for various flow conditions. Equipment will be sized to provide chemical feed at a rate of up to 100 lbs/day, which will ensure an adequate chlorine dose for peak wet weather discharge flows. The recommended minimum contact time for chlorination is 15 minutes (Ten States Standards Wastewater, Recommended Standards for Wastewater Facilities, 1997, Great Lakes–Upper Mississippi River Board of State and Provincial Public health and Environmental Managers).

Table 5-9. Chlorine Demand

Description	Flow (mgd)	Chlorine Demand (lbs/day)
Average dry weather flow	0.125	4-8
Peak day wet weather flow	0.322	11-22
Peak hour wet weather flow	0.457 (317 gpm)	15–31

5.3.3 Ultraviolet Light Disinfection

A common alternative to chlorine disinfection is ultraviolet light (UV). Ultraviolet systems destroy microorganisms by affecting their deoxyribonucleic acid (DNA) and ribonucleic acid (RNA) and impeding their ability to reproduce. A UV disinfection system is comprised of lamps, a reactor, and control panel. Wastewater can flow either parallel or perpendicular to the lamps in the reactor, while the control box provides a starting voltage and maintains the continuous current needed. Currently, most systems are equipped with an automated lamp cleaning system, to maintain lamp efficiency levels.

A UV system's effectiveness is dependent on the characteristics of the wastewater, the dose, and the exposure time. In the case of UV radiation, the most important factor is the transmittance of the water, which has a direct effect on the ability of UV light to penetrate through the liquid and reach microorganisms present at the required intensity. Ideally, the discharge undergoing treatment should not have a transmittance lower than 55 percent, with the intensity decreasing the farther the microorganisms are from the lamp. The optimum wavelength to effectively inactivate microorganisms is between 250 and 270 nanometers.

The main types of UV lamps used for wastewater disinfection are conventional low-pressure lamps, low pressure high output (LPHO) lamps and medium pressure lamps. Several UV systems include lamps with automated sleeve cleaning.

5.3.3.1 UV System Design Summary

A UV disinfection system requires about the same size footprint as chlorine at small WWTPs. Disinfection occurs as the organism is exposed to the UV radiation as the water flows past the UV lightbulbs. The Trojan UV3000+ system is used at numerous facilities across the U.S., including some treatment plants in Hawaii. The estimated cost included in this report are based on an assumed UV transmittance of 65 percent. The amalgam lamp used with the UV3000+ system has an end-of-lamp-life factor (ELLF) of 0.98 indicating little loss in UV light output over the life of the lamp. This ELLF has been tested and approved by the State of California and is also accepted by the State of Hawaii for reuse applications. The system would use LPHO lamps with automatic sleeve cleaning. LPHO lamps are energy efficient and the UV3000+ system is furnished with automatic sleeve cleaning devices to reduce labor requirements. Each UV lamp is enclosed in a quartz sleeve to separate it from the water medium. Each lamp draws 254 watts at full output and is driven by electronic ballast. The electronic ballast allows the lamps to be dimmed to conserve power based on

a control signal from a flow meter. The LPHO lamps will have a minimum life of 12,000 hours when operated in an automatic mode and limited to a maximum of 4 on/off cycles per 24 hours.
Table 5-10 summarizes the size and design criteria for the UV system required to treat the WWTP discharge.

Table 5-10. UV Disinfection Design Summary

Description	Value
Peak Hour Wet Weather Discharge	317 gpm
Minimum UV transmittance	65 percent
No. of UV channels	1
Design dose	35,000 μWs/cm2
Disinfection limit	30 MPN per 100 mL *(E.coli)*
Validation factors	0.98 end of lamp factor

MPN = most probable number

μWs/cm2 = microwatts per second per square centimeter

5.3.4 Cost Evaluation

A summary of capital and life-cycle estimated costs for both chlorination and UV disinfection is presented in Table 5-11 for comparison. Additional detail is included in Appendix A. The capital costs include the materials and equipment costs, construction costs, electrical, instrumentation and control, soft costs, and contingency. As shown in the table, the UV option incurs higher capital costs. The life-cycle costs look at the impact of the capital costs along with the annual operations and maintenance costs, including power, materials, chemicals, and labor costs over the next 30 years. The life-cycle costs for chlorination option appear to be about 55 percent of the UV option.

Table 5-11. Estimated Disinfection Costs

Description	Tablet Chlorination System	UV System
Capital Cost	$150,000	$1,100,000
Annual Operation and Maintenance	$25,000	$10,000
Life-cycle Cost (30-Year Net Present Value)	$740,000	$1,340,000

**Does not include annual labor.*

5.3.5 Disinfection Recommendation

A tablet chlorination feed system is the recommended disinfection option over the UV system for the Naalehu WWTP because it incurs lower capital and life-cycle costs. In addition, tablet chlorination will be more reliable than UV due to frequent “dirty power” conditions on the island. The County may elect to install a UV system at the Naalehu WWTP should they choose to pursue an R1 water recycling program in the future.

The proposed effluent management system (subsurface drip irrigation disposal) does not require a disinfection process to protect human health and the environment because the treated effluent is dispersed below the ground surface. However, periodic maintenance chlorination of the subsurface drip system will be required to reduce biofilm fouling within the drip lines.

Section 6

Solids Management

This section evaluates solids management options for the Naalehu WWTP.

6.1 Aerobic Digestion with Decant Thickening

Aerobic digestion consists of aerating sludge in a tank for an extended period of time. Volatile solids are oxidized in the process, stabilizing the sludge and reducing the total mass of solids that must be managed by recycling or disposal. Pathogen densities are also reduced. The process does not produce biogas. The aerobic digestion process requires substantial energy input in the form of aeration blowers, and therefore is not typically used at larger (i.e., greater than 10 million gallons per day [mgd]) wastewater reclamation facilities (WWRFs).

Many small (less than 5 mgd) wastewater treatment plants in the United States use aerobic digestion to stabilize solids, due to its relatively low capital costs, simplicity, and compatibility with the certain liquid treatment processes.

Aerobic digestion with decant thickening is a two-stage process that can be achieved in the same basin. The first stage includes a period of aerobic digestion as described above. In the second stage the blowers are turned off for a period of time to allow sludge to settle and thicken. Supernatant is then decanted off the top. The blowers are turned back on to continue the aerobic digestion process. This process is repeated a few times until the sludge reaches approximately three percent solids. It is then pumped to the next process.

Aerobic digestion with decant thickening is recommended for the proposed Naalehu WWTP due to its simplicity, low cost, and effectiveness for small WWRFs.

6.2 Anaerobic Digestion with Biogas Use

Anaerobic digesters are covered tanks equipped with mixing, heating, and biogas collection systems. Anaerobic bacteria in the digesters convert organic matter into methane, carbon dioxide, and water; pathogen densities are reduced; and a stabilized sludge is produced. Modern high-rate digesters are typically single-stage reactors. Mesophilic anaerobic digesters are typically operated at temperatures between 35 degrees Celsius (°C) and 38°C. Mesophilic digestion systems produce a Class B biosolids product if the solids retention time (SRT) is greater than 15 days.

Two-stage mesophilic anaerobic digestion, where digesters are operated in series, improves process performance. The second-stage anaerobic digester generally has less SRT than the first stage. The advantages of this process configuration are slightly improved volatile solids reduction, a product with reduced pathogen content, and less product odor potential.

The anaerobic digestion process generates biogas that can be used for digester heating and generation of electricity.

The mesophilic anaerobic digestion process requires primary sludge to operate effectively. Therefore, primary clarifiers are required for an anaerobic digestion process. WWRFs that do not have primary clarifiers must use other digestion technologies.

Anaerobic digestion is cost effective for facilities larger than 5 to 10 mgd. Anaerobic digestion is not considered to be an appropriate technology for a facility the size of the Naalehu WWTP.

6.3 Dewatering

A dewatering process is used to remove excess water from digested sludge to form a semi-solid “cake” product.

6.3.1 Centrifuge Dewatering

Centrifuges are a commonly used dewatering technology. Centrifuges provide the best dewatering performance of the dewatering technologies presented in this report but require the highest energy input to do so. High-solids centrifuge machines typically achieve anaerobically digested dewatered cake of approximately 23 to 28 percent total solids content. Aerobically digested sludge will typically have lower total solids content, on the order of 12 to 15 percent. The process is shown in Figure 6-1.

Centrifugal force of 500 to 3,000 times the force of gravity is applied to the biosolids within the centrifuge, separating liquid from the solids. The centrifuge has a solid bowl that spins at a high rate. Liquid sludge, conditioned with polymer, is introduced within the rotating bowl. The sludge spins with the bowl, separating into liquid and solid fractions. A screw conveyor mechanism spins within the rotating bowl at a slightly faster or slower speed than the bowl to facilitate moving the solids fraction towards one end of the bowl, where it is discharged. The centrate (removed liquid) is discharged through another port. The process operates continuously. Required ancillary equipment includes sludge feed pumps, polymer feed systems, and sludge cake conveyance systems.

Centrifuges are sized based on hydraulic and solids throughput. Machines are available to dewater sludge flow rates ranging from 25 gpm to 700 gpm. High-solids machines can produce a very well-dewatered material, if anaerobic digestion is used.

Centrifuges require a high level of operator due to the high rotational speed. For this reason, they are typically not used at small WWTPs like Naalehu.

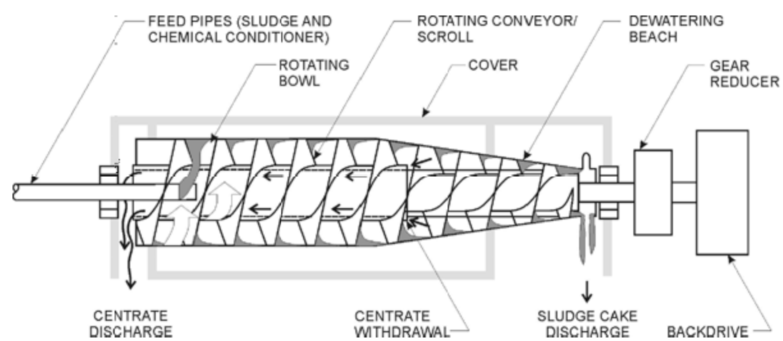


Figure 6-1. Centrifuge Dewatering

6.3.2 Screw Press Dewatering

The screw press represents a relatively new technology for dewatering municipal wastewater solids, although the technology has been used successfully in industrial, pulp and paper production, chemical, and food processing applications.

Figure 6-2 shows a diagram of a screw press. Thickened sludge, conditioned with polymer, is introduced to the machine in the head box at the inlet end. The mixture is conveyed from the inlet end to the outlet end of the press by the rotating screw. As the material is conveyed along the length of the press it is squeezed between the tapered screw shell and the screen drums. The dewatered solids exit the press at the discharge end and fall down the discharge box. The adjustable pressure cone provides back pressure within the machine, particularly when the machine is initially filled. For municipal wastewater solids applications, the pressure cone is typically not needed after the machine is filled; the dewatered sludge provides sufficient back pressure. The liquid that was forced out through the screens is returned to the liquid treatment process.

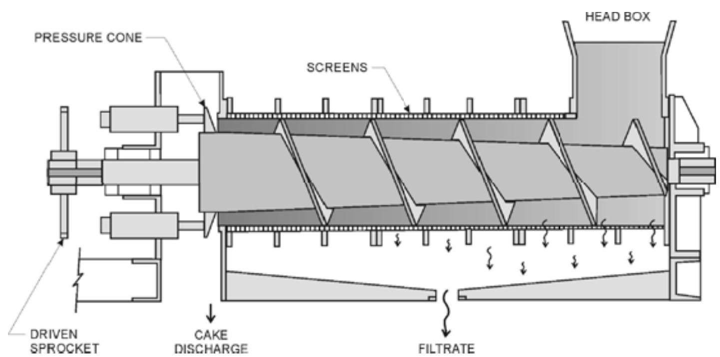


Figure 6-2. Screw Press Diagram

The screw press operates at a very slow rotational speed. The screw rotation is usually one-half of a revolution per minute or less for municipal wastewater solids. Water is slowly forced from the sludge by squeezing action–similar to a belt filter press–but for much longer periods of time. The solids retention time in a screw press can be on the order of 2 hours. The simplicity of screw presses makes them practical for small wastewater treatment plants, such as Naalehu.

6.4 Disposal

Dewatered solids, grit, and screenings would be trucked to the West Hawaii Landfill for disposal.

Section 7

Project Alternatives Evaluations

This section presents evaluations of the three project alternatives developed for the new wastewater treatment plant (WWTP).

7.1 Project Alternative Descriptions

Three project alternatives were developed as part of the tasks completed for this Preliminary Engineering Report. All three alternatives include a new C Brewer house lot collection system (i.e., Phase 1 + Phase 2), WWTP, and subsurface drip effluent disposal system.

7.1.1 Project Alternative 1: Activated Sludge with Anoxic Zone Package Plants

Project Alternative 1 is comprised of an activated sludge process with anoxic zone provided in the form of packaged treatment systems. A typical packaged treatment system of this type would include the following elements:

- Flow equalization
- Anoxic treatment zone
- Aerobic treatment zone
- Secondary clarifier
- Aerobic digester with decant thickening

Figure 7-1 presents a sketch of Project Alternative 1. Wastewater would receive preliminary treatment in the headworks before flowing into the packaged treatment system. Two package treatment units would be provided, each with 62,500 gallons per day (gpd) capacity. Effluent would flow into an irrigation equalization tank before being applied to the subsurface drip disposal system.

Digested solids would be dewatered using a screw press prior to disposal at the landfill.

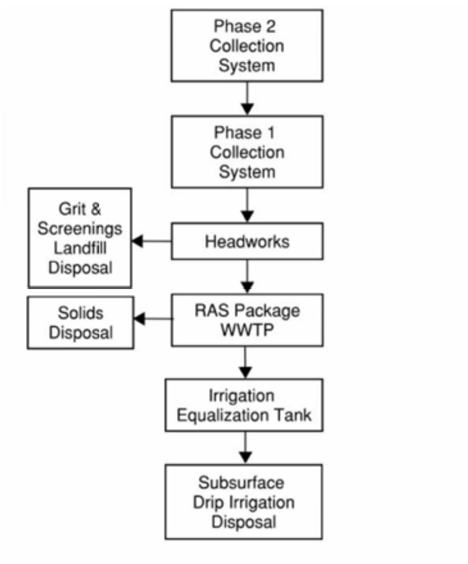


Figure 7-1. Project Alternative 1: Activated Sludge with Anoxic Zone Package Plants

7.1.2 Project Alternative 2: MBR Package Plants

Project Alternative 2 is similar to Project Alternative 1 but includes two MBR package plants to provide treatment. Figure 7-2 provides an outline of Project Alternative 2. The MBR technology would create effluent that could be recycled for irrigation and/or stock watering purposes, if desired in the future. However, recycled water distribution costs are not included in the evaluations below to allow all alternatives to be considered on an equal basis.

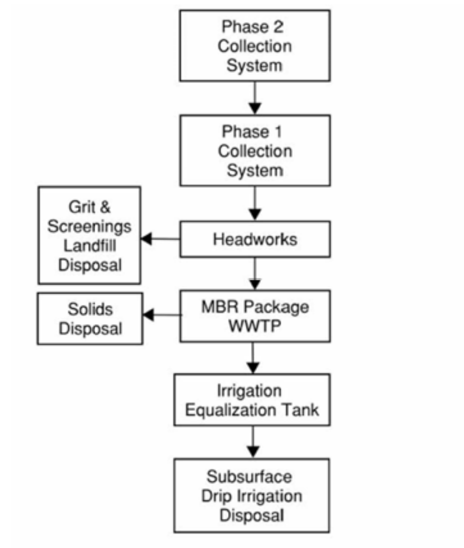


Figure 7-2. Project Alternative 2: MBR Package Plants

7.1.3 Project Alternative 3: Imhoff Tank/Recirculating Gravel Filter

Project Alternative 3 incorporates recirculating gravel filter treatment technology. Figure 7-3 provides a schematic of the project alternative. An Imhoff tank would be provided downstream of the headworks to remove grease and settleable solids prior to flowing into a recirculation tank. Recirculation pumps would distribute water from the recirculation tank over the surface of the pea gravel filter that provides secondary treatment. Water collected at the bottom of the filter would flow back to the recirculation tank. On average water would flow through the filter five times before disposal in the subsurface drip irrigation system as previously described.

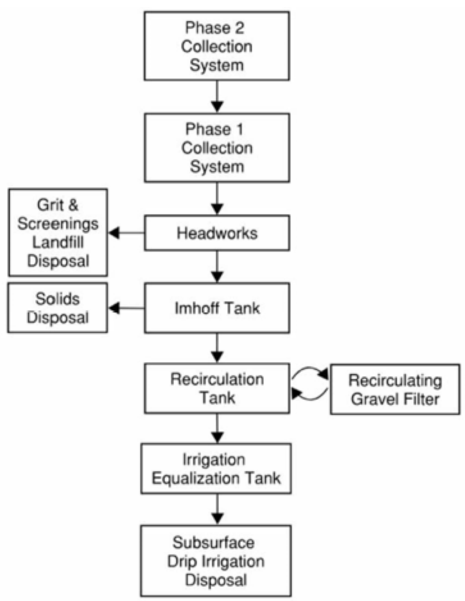


Figure 7-3. Project Alternative 3: Imhoff Tank/Recirculating Gravel Filter

7.2 Cost Evaluations

Capital, operations and maintenance (O&M), and life-cycle cost evaluations are presented in this section.

7.2.1 Capital Costs

Conceptual cost estimates were created for the three project alternatives. The cost estimates were developed using construction bids from similar projects, quantity take-offs, vendor quotes, and other sources. The costs were adjusted to account for economies of scale and construction inflation since the bid opening date. Where Hawaii costs were unavailable, U.S. mainland costs were used after adjustment to reflect Hawaii Island conditions.

In accordance with the Association for the Advancement of Cost Engineering International (AACE) criteria, these are Class 5 estimates. A Class 5 estimate is defined as a Conceptual Level or Project Viability Estimate. Typically, engineering is from 0 to 2 percent complete. Class 5 estimates are used to prepare planning level cost scopes or evaluation of alternative schemes, long range capital outlay planning.

Expected accuracy for Class 5 estimates typically ranges from -50 to +100 percent, depending on the technological complexity of the project, appropriate reference information and the inclusion of an appropriate contingency determination. In unusual circumstances, ranges could exceed those shown. Table 7-1 provides a summary of capital cost assumptions used.

Table 7-1. Capital Cost Estimating Assumptions

Description	Value
Estimate date	June 2023
Engineering News Record 20-Cities Average Construction Cost Index	13,345
Electrical and instrumentation markup	25 percent
Engineering, administration, and legal markup	25 percent
Estimating contingency for unknowns	20 percent

Table 7-2 provides a summary of the capital cost estimates, in current (June 2023) dollars. Detailed estimates can be found in Appendix A.

Table 7-2. Capital Cost Estimates Summary

Description	Alternative 1: Activated Sludge Package Plants	Alternative 2: MBR Package Plants	Alternative 3: Imhoff Tank/RGF
Collection system	$40.2 million	$40.2 million	$40.2 million
Drainage channel improvement	$19.9 million	$19.9 million	$19.9 million
Wastewater treatment	$20.7 million	$20.3 million	$29.6 million
Effluent disposal	$4.0 million	$4.0 million	$4.0 million
Totals	**$84.7 million**	**$84.3 million**	**$93.6 million**
AACE Class 5 estimate range	$42.4–$169.5 million	$42.2–$168.6 million	$46.8–$187.2 million

As shown in the table, all three project alternatives have similar capital costs, and can be considered equal at this level of analysis.

7.2.2 Operation and Maintenance Costs

O&M costs estimates were developed for the three alternatives. The O&M cost estimates include collection system maintenance, plus estimates of labor, electricity consumption, chemicals, maintenance materials and solids disposal for the WWTP. O&M assumptions are listed in Table 7-3. The O&M estimates are based on the WWTP average dry weather flow capacity.

Table 7-3. O&M Cost Assumptions

Description	Value
Average dry weather flow	125,000 gpd
Labor cost, loaded	$100,000/year/full time equivalent
Electricity cost	$0.45/kWh
Landfill tip fee	$116/wet ton
Maintenance materials	2 percent of equipment capital cost/year

The O&M estimates for the three project alternatives are summarized in Table 7-4. Details can be found in Appendix A. Per Table 7-4, Project Alternative 3: Imhoff Tank/Recirculating Gravel Filter incurs the lowest O&M cost, while Project Alternative 2: MBR Package Plants incurs the highest.

Table 7-4. O&M Cost Estimate Summary

Description	Annual Cost		
	Project Alternative 1: Activated Sludge Package Plants	Project Alternative 2: MBR Package Plants	Project Alternative 3: Imhoff Tank/RGF
Collection system	$74,000	$74,000	$74,000
Labor	$300,000	$300,000	$300,000
Electricity	$270,000	$300,000	$120,000
Chemicals	$27,000	$32,000	$27,000
Maintenance materials	$117,000	$113,000	$84,000
Solids disposal	$67,000	$67,000	$67,000
Totals	**$855,000**	**$886,000**	**$672,000**

7.2.3 Life-Cycle Costs

An economic evaluation was prepared to assess the potential life-cycle costs associated with each project alternative. The economic evaluation consists of a net present value (NPV) comparison. The NPV analysis includes capital, O&M, and equipment replacement costs. An appropriate inflationary factor and discount rate are applied to obtain the NPV over a 30-year planning period.

The NPV of an alternative represents the amount of money that would need to be set aside today (at a given interest rate) to pay the costs associated with the alternative over the entire planning period. The alternative with the lowest NPV is considered the most attractive from an economic perspective. The evaluation results are included in Appendix A.

Table 7-5 summarizes the life-cycle cost evaluation assumptions.

Table 7-5. Life-Cycle Economic Assumptions

Description	Value
Year of analysis	2023
Planning period, years	30
Inflation rate, percent	3.5
Discount rate, percent	5.0
Equipment replacement cycle, years	20
Membrane replacement cycle, years	15

Table 7-6 summarizes the results of the life-cycle cost analysis.

Table 7-6. Life-Cycle Cost Analysis Summary

Description	Alternative 1: Activated Sludge Package Plants	Alternative 2: MBR Package Plants	Alternative 3: Imhoff Tank/RGF
Capital cost	$84.8 million	$84.3 million	$93.6 million
Annual O&M cost	$855,000	$886,000	$672,000
Equipment replacement cost (excluding membranes)	$6.3 million	$6.0 million	$4.6 million
Membrane replacement cost	N/A	$60,000	N/A
Life-cycle cost	$109.6 million	$109.8 million	$112.9 million
Comparison to lowest cost alternative	0%	+0.2%	+3.0%

Figure 7-4 shows the results in graphical form. As shown in the table and graph, the three project alternatives have similar capital costs. Alternative 1: Activated Sludge Package Plants and Alternative 2: MBR Package Plants incur nearly equivalent life-cycle costs due to the similarities in design and package plant capital costs. Project Alternative 3: Imhoff Tank/Recirculating Gravel Filter incurs the greatest life-cycle costs, largely due to the high capital cost associated with the Imhoff tank and recirculating gravel filter beds. At this level of analysis all three project alternatives can be considered to have similar life-cycle costs.

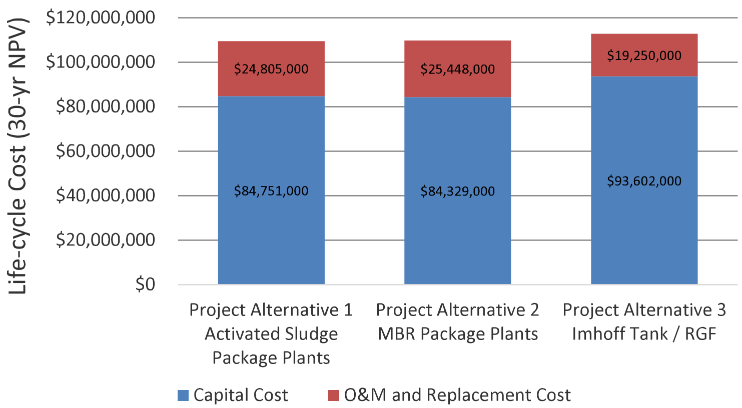


Figure 7-4. Life-Cycle Cost Evaluation Results

7.3 Non-Economic Evaluation

A non-economic evaluation was conducted to provide a qualitative comparison between the three alternatives.

7.3.1 Approach

Non-economic evaluations are generally subjective by necessity. Quantifiable measurements are used when available, but lack of information or difficulty and expense of obtaining information requires subjective assessments.

The project alternatives were scored in relation to one another and according to an evaluation matrix, described below. Each alternative was scored from 1 to 5 (5 = high/desirable, 1 = low/less desirable) for each evaluation criteria. The alternatives were not ranked in the scoring; alternatives could receive the same scores for any given criteria.

The evaluation criteria were weighted to reflect their overall significance for the project. The scores were multiplied by the criteria weights to develop a non-economic score for each alternative.

7.4 Non-Economic Evaluation Criteria

Table 7-7 shows the non-economic criteria chosen for comparing the three alternatives.

Table 7-7. Non-Economic Comparison Criteria

Category	Criteria	Description
Level of Service Measures	Effluent quality	The quality of the effluent produced with respect to BOD_5, TSS, nutrients, and turbidity.
	Potential for capacity expansion	Ability of the system to be expanded should additional capacity be required.
	Water recycling feasibility	The relative extent of modifications that would be needed to create R-1 recycled water to support a future water recycling program.
	Public perception/community concerns	The community's impression of the project and the perceived support.
Regulatory	Monitoring complexity	The relative difficulty of monitoring tasks required for the option chosen.
	Treatment adjustment potential	The ability to increase treatment to comply with future permit requirements and/or growth.
	Safety regulations complexity	The relative difficulty to comply with safety regulations including staff training, reporting, maintenance procedures.
	Environmental concerns	The extent of the project's potential environmental impacts should failures occur.
O&M Factors	Footprint	The physical space that the processes will occupy (affecting land acquisition, subdivision, and permitting).
	Safe work environment	The relative health and safety risk operation of given option will have on the employees; includes equipment access, chemical hazards, confined spaces, dust, etc.; the extent of measures required to ensure the health and safety of the employees.
	Maintenance complexity	The relative intensity of equipment maintenance requirements.
	Operations complexity	The relative intensity of the operations requirements.
Island Factors	Mainland delivery dependence	The relative dependence on regular deliveries of equipment, supplies, or spare parts from mainland sources.
	Mainland servicing dependence	The relative degree to which technology will require special servicing by mainland-based personnel.
	Power dependence	The relative degree to which the treatment processes depend on electrical power for operation.
	Chemical dependence	The relative dependence on chemical supplies, whether locally available or restricted by mainland delivery schedules and requirements.

The categories and criteria were developed using best engineering judgment and our understanding of the project, and the County of Hawaii Department of Environmental Management goals and concerns.

The weighting factors used for the non-economic comparison are listed in Table 7-8.

Table 7-8. Non-Economic Comparison Criteria Weighting Factors

Category	Criteria
Level of Service Measures (25%)	• Effluent quality (30%) • Potential for capacity expansion (20%) • Water recycling feasibility (30%) • Public perception/community concerns (20%) *Category Total (100%)*
Regulatory (25%)	• Monitoring complexity (25%) • Treatment adjustment potential (25%) • Safety regulations complexity (25%) • Environmental concerns (25%) *Category Total (100%)*
Owner Factors (25%)	• Footprint (30%) • Safe work environment (25%) • Maintenance complexity (25%) • Operations complexity (20%) *Category Total (100%)*
Island Factors (25%)	• Mainland delivery dependence (25%) • Mainland servicing dependence (25%) • Power dependence (25%) • Chemical dependence (25%) *Category Total (100%)*
Overall Total 100%	

7.5 Non-Economic Evaluation Results

A score of 1 through 5 was given for each criterion, with 5 being the most favorable, and 1 representing the least desired option. The complete non-economic evaluation is included as Appendix C. The non-economic evaluation results are summarized in Table 7-9.

Table 7-9. Non-Economic Weighted Scores

Alternative	Score	Rank
Project Alternative 1: Activated Sludge Package Plants	3.80	2
Project Alternative 2: MBR Package Plants	3.96	1
Project Alternative 3: Imhoff Tank/Recirculating Gravel Filter	3.53	3

As shown in Table 7-9, Project Alternative 2: MBR Package Plants, received the highest non-economic score. The higher score reflects the County's desire to standardize on MBR technology to provide the highest level of treatment at WWTP facilities and to facilitate future water recycling programs.

7.6 Conclusions and Recommendation

Figure 7-5 combines the economic and non-economic results into a single graph. As previously stated, the economic cost of the three project alternatives can be considered equivalent at this level of analysis. Project Alternative 2: MBR Package Plants, has the highest non-economic score and is recommended for implementation if the County proceeds with a centralized sewer system and WWTP for the community.

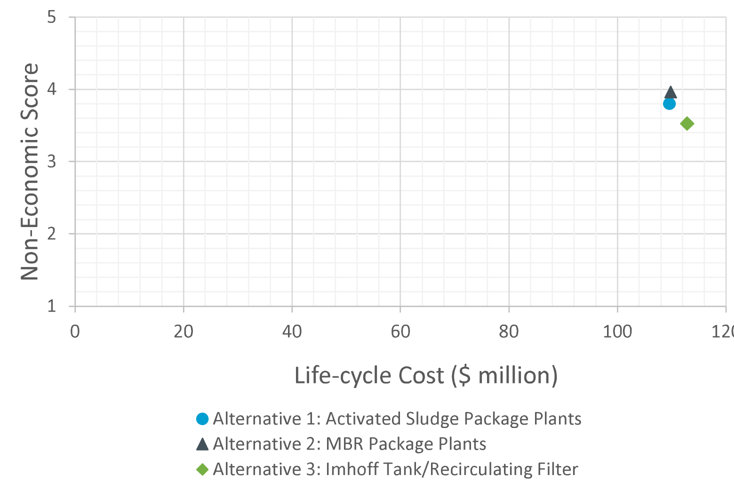


Figure 7-5. Combined Economic and Non-Economic Results

Section 8

Preliminary Design of Improvements

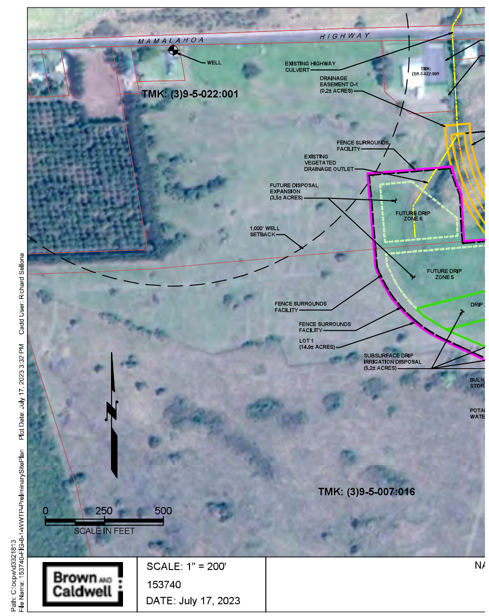
This section presents an overview of preliminary design improvements proposed for the new Naalehu wastewater treatment plant (WWTP) project.

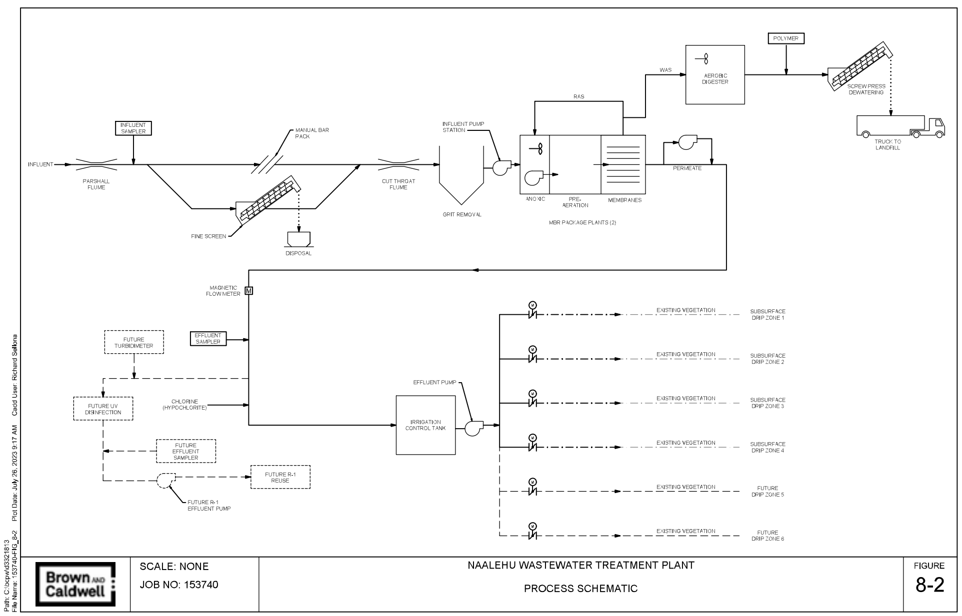
8.1 Site Plan

Figure 8-1 provides a preliminary site plan of the WWTP project.

8.2 Process Schematic

Figure 8-2 provides a preliminary process schematic of the WWTP.





8.3 Preliminary Design Criteria

Table 8-1 lists the preliminary design criteria for the proposed WWTP.

Table 8-1. Preliminary Design Criteria

Description	Value
Influent Flow	
Average dry weather, gallons per day (gpd)	125,000
Peak day wet weather, gpd	322,000
Peak hour wet weather, gpd (gallons per minute [gpm])	457,000 (317)
Influent Characteristics	
Biochemical oxygen demand (BOD_5), mg/L	300
Total suspended solids (TSS), mg/L	300
Total Nitrogen (TN), mg/L	40
Odor Control–Granular Activated Carbon	
Airflow rate, air changes per hour	6
H_2S inlet concentration, parts per million	1-10
H_2S removal efficiency, percent	99
Media, type	High-capacity carbon
Mechanical Screens	
Number of units, each	1
Type	In-channel cylindrical
Screen opening size, inches/(millimeters)	0.125 /(3)
Maximum flow rate capacity, gpm	Greater than 480
Screening washing	Integral
Screening compaction	Integral
Bypass Screen	
Type	Manually-cleaned bar rack
Bar spacing, inches	1
Rake	Fabricated to Interlock with bars
Screenings Receptacle	
Type	55-gallon drum or bags
Screenings volume per million gallons (Mgal) treated, ft^3/Mgal	5
Estimated screenings quantity, ft^3/day	0.63
Disposal frequency, per week	1
Influent Flow Metering	
Type	Parshall flume
Maximum flow capacity, gpm	Greater than 480
Minimum straight upstream channel section	20 times the throat width
Influent flow sampling	Refrigerated automatic composite sampler

Table 8-1. Preliminary Design Criteria

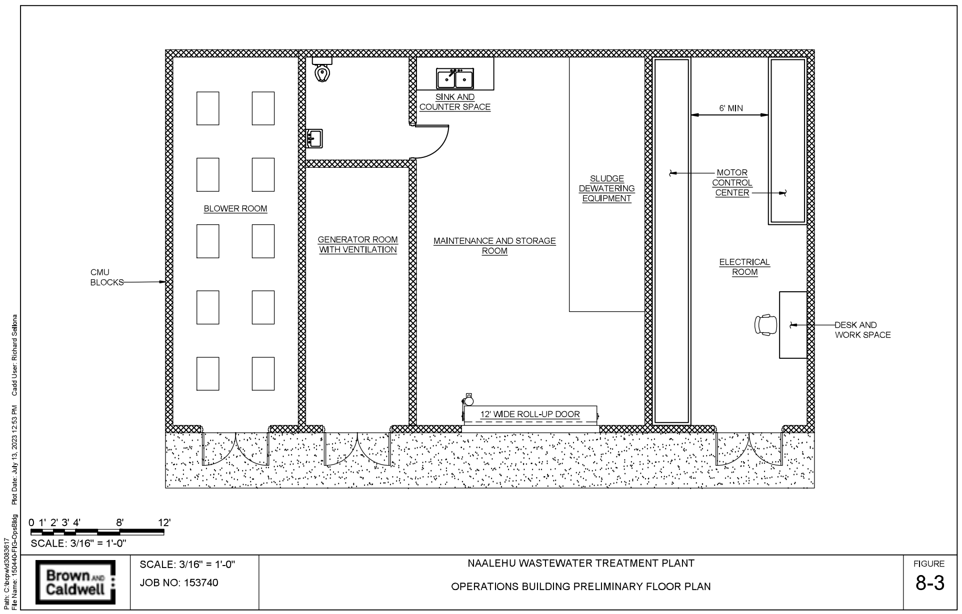
Description	Value
Grit Chamber	
Number of units, each	1
Type	Aerated grit trap
Volume, gallons	4,800
Detention time, minutes at Peak Hour Wet Weather Flow	10
Air supply, ft^3/minute	90
Removal	Vactor truck
Estimated average grit quantity, ft^3/day	1.4
MBR Package Plant	
Number of packaged biological treatment trains, each	2
Flow basis for biological design, gpd each	62,500
Anoxic tank working volume (excluding membranes), gallons each	2,000
Aerobic working volume, gallons each	10,000
Design SRT, days	7
Waste sludge removal, gpd each	1,500
Design mixed liquor suspended solids concentration in bioreactor, mg/L	≤ 8,000
Number of duty membrane blowers, per train	1
Number of duty process aeration blowers, per train	1
Aeration system, type	Coarse bubble diffused aeration
Mixed liquor recirculation rate, x Average Dry Weather Flow	4
Membrane cleaning dosing systems, types	Sodium hypochlorite, citric acid, and coagulant
Sludge Management System	
Number of units, each	1
Type	Incline screw press
Screw press capacity, gpm	45
Polymer dose, lbs/dry ton	20
Annual polymer use, lbs	621
Average amount of dewatered sludge, wet tons/day	0.71
Disposal frequency, per week	1
Maintenance Disinfection system	
Type	Chlorine
Form	Calcium hypochlorite tablets
Design chlorine dose, mg/L	8
Irrigation Equalization (Control) Tank	
Number of units, each	1
Type	Glass lined bolted steel
Volume, gallons	20,000
Drip flow, gpm	112
Effluent Flow Metering	
Type	Magnetic
Effluent flow sampler	Refrigerated automatic composite

Table 8-1. Preliminary Design Criteria

Description	Value
Effluent Quality	
BOD_5, mg/L	≤ 5
TSS, mg/L	≤ 5
TN, mg/L	≤ 10
Turbidity, nephelometric turbidity units	≤ 0.2
Effluent Management System	
Type	Subsurface drip irrigation disposal
Number of units. each	2 (1 active, 1 redundant)
Distribution system	Non-clog subsurface drip emitters
Design percolation rate, inches/day	2.50
Design application rate, % of percolation rate	4
Total land application area, acres	5.2
Number of irrigation zones	4
Area per zone, sq. ft.	56,630
Flow rate per zone, gallons per minute	112
Drip rate per emitter, gallons per hour	1
Total number of emitters, each	26,833
Total length of drip line, ft	53,667
Depth of drip line, inches	6–9
Drip line spacing, ft	4.2
Emitter spacing, ft	2
Vegetation	Existing vegetation
Irrigation system monitoring	Flow meter(s) and pressure indicators
Stormwater site management	10-year, 1-hour storm

8.4 Preliminary Floor Plan

Figure 8-3 provides a preliminary floor plan for the proposed Operations Building.



Section 9

Implementation Plan

This section describes the proposed implementation plan for the Naalehu wastewater treatment plant (WWTP).

9.1 Implementation Approach

The WWTP and collection system projects could be implemented using either a traditional design/bid/build (DBB) approach or a design/build (DB) approach, as discussed below.

9.1.1 Design Bid Build Approach

DBB is the traditional approach used by the County for implementing public works projects. The design is prepared by a consultant, and then bids are solicited from construction contractors. The County awards the contract to the lowest responsible bidder.

Advantages of the DBB approach are that the County retains maximum control over the design process, ensuring the project will meet its needs.

9.1.2 Design Build Approach

DB is an alternative delivery approach whereby the County would contract with an entity to both design and construct a facility that meets established project specifications. The combined WWTP and collection system projects are large enough monetarily for the County to consider a DB approach. The County would need to use a procurement process based on qualifications and cost to select the DB entity. The typical DB procurement process takes 9–12 months to complete. The DB bidders will need the County to complete the following prior to the DB procurement process:

- Complete geotechnical report
- Environmental assessment
- Land use entitlements
- WWTP land purchase

Advantages of DB implementation are:

- Possibility of reduced overall costs
- Design and construction can occur simultaneously, potentially reducing implementation time
- DB entity assumes the performance liability for the project, as defined in the project specifications

Disadvantages of the DB approach are that the County has limited experience with it, and the County would not have as much control over how the project is designed.

9.2 Implementation Schedules

Planning level implementation schedules were developed for both approaches.

9.2.1 Recent Change in State of Hawaii Land Use Commission Policy

The State of Hawaii Land Use Commission (LUC) recently changed its policy regarding the use of Special Permits for non-conforming uses. The proposed WWTP site is located in the Agricultural District as defined by the LUC. A WWTP is not an allowable land use in the Agricultural District. In the past the LUC has allowed Special Permits to be used for non-conforming uses. However, in response to litigation the LUC has recently changed its policy and now recommends that project proponents for permanent facilities (like a WWTP) pursue a District Boundary Amendment (DBA) from the LUC. The LUCs rationale is that permanent entitlement (i.e., a DBA) is more appropriate for a permanent facility like a WWTP, rather than a temporary entitlement like a Special Permit. Since the WWTP parcel is less than 15 acres the DBA can be processed by the County of Hawaii. However, the action will likely take longer to implement than a Special Permit.

9.2.2 Equipment Procurement Time to Impact Construction Schedule

The COVID-19 pandemic continues to impact the construction industry due to increased time to deliver equipment and other materials. Most significantly, the time for the MBR package plant supplier to manufacture their equipment was quoted at 55 weeks instead of a typical pre-pandemic time of approximately 26 weeks. Similar delays are being experienced on other construction projects in Hawaii, and it is reasonable to assume that other equipment suppliers will quote extended supply times. As a result, we now suggest that a construction schedule of 2 years is a reasonable expectation.

9.2.3 Implementation Schedules

Figure 9-1 presents implementation schedules for both approaches. At this time, both approaches may not enable the County to meet the Administrative Order on Consent (AOC) milestone schedule to close the LCCs. The DB approach offers greater potential to meet the milestone, because equipment procurement can possibly occur in parallel with design within a DB contract.

9.3 Recommendation

Given the Revised AOC deadline to close the LCCs, and the equipment procurement time impact to the construction schedule, a DB approach may offer a better opportunity to meet the deadline, because a DB entity could initiate equipment procurement while design activities progress. If the U.S. Environmental Protection Agency was able to grant a time extension, then either a DBB or DB approach can be taken. A traditional DBB approach would give the County greater control over the project outcome, and is the County's standard method for implementing projects.

Figure 9-1. Implementation Schedules

Section 10

References

Brown and Caldwell (November 2019). Feasibility Study: Naalehu WWTP R-1 Stock Water, Prepared for County of Hawaii Department of Environmental Management Wastewater Division.

Crites, Ron, Craig Lekven, Steve Wert, George Tchobanoglous (1997). *A Decentralized Wastewater System for a Small Residential Development in California*. The Small Flows Journal. National Small Flows Clearinghouse. Volume 3, Issue 1, Winter 1997.

Crites, R. W. and G. Tchobanoglous (1998) Small and Decentralized Wastewater Management Systems, McGraw-Hill, New York.

Department of Wastewater Management, City and County of Honolulu, State of Hawaii. Design Standards of the Department of Wastewater Management, Volume 1 and 2. July 2017.

Great Lakes–Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers. Recommended Standards for Wastewater Facilities. 1997.

Hawaii Administrative Rules, Title 11, Department of Health Administrative Rules.

Masa Fujioka & Associates. Letter Report, Probing for Large Cavities (Lava Tubes), Naalehu and Pahala Large Capacity Cesspool Sewerage System. January 9, 2007.

M&E Pacific, Inc. Kau Sewer System Evaluation, Kau, Island of Hawaii, Hawaii. December 2004.

SSFM International, Inc. Final Preliminary Engineering Report for Naalehu and Pahala Large Capacity Cesspool Conversion Projects, July 2007.

USEPA. "Process Design Manual, Land Treatment of Municipal Wastewater Effluents". EPA/625/R-06/016. September 2006.

Water Environment Federation. *Wastewater Disinfection, Manual of Practice FD-10*. Water Environment Federation, 1996.

Appendix A: Cost Estimates

Naalehu WWTP
Revised Preliminary Engineering Report
Alternative Solutions Cost Summary

Alternative #1 - RAS Package Plants / Subsurface Drip

Collection System TOTAL		**$40,165,000**
Drainage Channel TOTAL		**$19,865,000**
Wastewater Treatment TOTAL		**$20,705,000**
Effluent Disposal TOTAL		**$4,016,000**
ALTERNATIVE #1 CAPITAL COST TOTAL		***$84,751,000***
ANNUAL O&M COSTS		
Collection system	$74,000	
Labor	$300,000	
Electricity	$270,000	
Chemicals	$27,000	
Maintenance materials	$117,000	
Solids disposal	$67,000	
Total Annual Operating Costs	***$855,000***	
EQUIPMENT REPLACEMENT COST (20 YEAR)	***$6,238,000***	

Alternative #2 - MBR Package Plants / Reuse / Subsurface Drip

Collection System TOTAL		**$40,165,000**
Drainage Channel TOTAL		**$19,865,000**
Wastewater Treatment TOTAL		**$20,283,000**
Effluent Disposal TOTAL		**$4,016,000**
ALTERNATIVE #2 CAPITAL COST TOTAL		***$84,329,000***
ANNUAL O&M COSTS		
Collection system	$74,000	
Labor	$300,000	
Electricity	$300,000	
Chemicals	$32,000	
Maintenance materials	$113,000	
Solids disposal	$67,000	
Total Annual Operating Costs	***$886,000***	
MEMBRANE REPLACEMENT COST (15 YEAR)	***$60,000***	
EQUIPMENT REPLACEMENT COST (20 YEAR)	***$6,005,000***	

Alternative #3 - Imhoff Tank / RGF / Subsurface Drip

Collection System TOTAL		**$40,165,000**
Drainage Channel TOTAL		**$19,865,000**
Wastewater Treatment TOTAL		**$29,556,000**
Effluent Disposal TOTAL		**$4,016,000**
ALTERNATIVE #3 CAPITAL COST TOTAL		***$93,602,000***
ANNUAL O&M COSTS		
Collection system	$74,000	
Labor	$300,000	
Electricity	$120,000	
Chemicals	$27,000	
Maintenance materials	$84,000	
Solids disposal	$67,000	
Total Annual Operating Costs	***$672,000***	
EQUIPMENT REPLACEMENT COST (20 YEAR)	***$4,574,000***	

Naalehu WWTP
Revised Preliminary Engineering Report
Unit Cost Estimates

Electrical & Instrumentation	25.0%	
Engineering, Admin, & Legal	25.0%	
Contingency	20.0%	
ENR CCI	13,345.00	June, 2023

Naalehu WWTP Capital Unit Costs	Units	Unit Cost
Environmental protection, BMPs	ac	$11,000
Site clearing	ac	$20,000
Site roads, guard rails, pavement	ac	$92,000
Perimeter fence	LF	$150
WWTP site grading	ac	$30,000
WWTP site drainage improvements	ac	$18,000
Drainage channel improvements	LS	$13,700,000
Plant water catchment/collection system	LS	$75,000
Process yard piping	LS	$250,000
Headworks (includes site/civil, structures, equipment & piping)	LS	$1,024,000
Influent pump station	LS	$1,670,000
Chlorine disinfection	LS	$150,000
RAS package plants	LS	$3,812,000
MBR package plants	LS	$3,579,000
Irrigation equalization tank	gal	$10
Effluent pump station	LS	$1,250,000
Subsurface drip irrigation line	LF	$10
Irrigation piping & valves	LF	$250
Imhoff tank	LS	$1,184,000
Recirculation tank	LS	$1,320,000
Recirculating gravel filter	LS	$6,591,000
Plant drainage system	ac	$40,000
Main generator (including process piping)	LS	$500,000
Maintenance/operations/electrical building	SF	$1,000
Phase 1 existing gravity collection system w/ new WWPS & force main	LS	$17,650,000
Reuse existing Brewer area gravity collection system	LS	$3,700,000
Phase 2 new gravity collection system w/ new WWPS & force main	LS	$27,700,000
Sludge dewatering system	LS	$860,000

Naalehu WWTP
Revised Preliminary Engineering Report
Unit Cost Estimates

Naalehu WWTP Operation, Maintenance, & Replacement Unit Costs	Unit Cost	Units
Equipment replacement cost	25%	of process capital cost
Package plant replacement cost	100%	of package plant captial cost
Maintenance materials	2%	of equipment capital cost
Gravity mainline collection system maintenance cost	$16,000.00	per mi
Force main collection system maintenance cost	$10,000.00	per mi
Membrane replacement cost	$1,950.00	per module + S&H & install
Solids disposal dumpster rental fee	$500.00	per week
Sanitary landfill tipping fee	$116.00	per wet ton
Hypochlorite tablet cost	$8.00	per lb
Dewatering polymer cost	$3.00	per lb
Diesel price	$6.06	per gallon

Naalehu WWTP
Revised Preliminary Engineering Report
Lump Sum Cost Estimates

Imhoff Tank	*Units*	*Unit Cost*	*Number of Units*	*Cost*
Excavation	CY	$300	450	$135,000
Bedding & backfill	CY	$100	35	$3,500
Concrete	CY	$1,500	160	$240,000
Piping & valves	LS	$50,000	1	$50,000
Cover plates	SF	$200	75	$15,000
Odor control	LS	$500,000	1	$500,000
Epoxy Coating	SF	$80	3,000	$240,000
			TOTAL	**$1,184,000**

Recirculating Gravel Filter	*Units*	*Unit Cost*	*Number of Units*	*Cost*
RGF bed excavation	CY	$300	11,800	$3,540,000
Bed liner	SF	$8	75,100	$600,800
20-inch PVC manifold pipe	LF	$200	400	$80,000
3-inch PVC lateral pipe	LF	$30	13,900	$417,000
6-inch PVC drainage pipe	LF	$60	3,700	$222,000
8-inch PVC recirculation pipe	LF	$80	200	$16,000
Gravel media	CY	$150	10,500	$1,575,000
6 in sand media under liner	CY	$100	1,400	$140,000
			TOTAL	**$6,591,000**

Recirculation Tank	*Units*	*Unit Cost*	*Number of Units*	*Cost*
Recirculation tank excavation	CY	$300	1,480	$444,000
Bedding & backfill	CY	$100	200	$20,000
Concrete	CY	$1,500	290	$435,000
Handrail	LF	$100	210	$21,000
Pumps & valves	ea	$100,000	4	$400,000
			TOTAL	**$1,320,000**

Naalehu WWTP
Revised Preliminary Engineering Report
Lump Sum Cost Estimates

Sludge Dewatering System	***Units***	***Unit Cost***	***Number of Units***	***Cost***
300 HP diesel dump truck	LS	$300,000	1	$300,000
Dewatering screw press	LS	$300,000	1	$300,000
Incline screw conveyor	LS	$80,000	1	$80,000
Polymer system	LS	$80,000	1	$80,000
Sludge feed pump & piping	LS	$100,000	1	$100,000
			TOTAL	**$860,000**

Reuse Existing Gravity Collection System	***Units***	***Unit Cost***	***Number of Units***	***Cost***
Inspection & cleaning	LS	$1,500,000	1	$1,500,000
Repair defects	LS	$2,000,000	1	$2,000,000
Archaeological monitoring	LS	$50,000	1	$50,000
BMPs	LS	$50,000	1	$50,000
Traffic control measures	LS	$50,000	1	$50,000
Pre- & post-construction inspections & documentation	LS	$50,000	1	$50,000
			TOTAL	**$3,700,000**

New Drainage Channel	***Units***	***Unit Cost***	***Number of Units***	***Cost***
Earthwork	CY	$250	49500	$12,375,000
Concrete culverts	LS	$1,250,000	1	$1,250,000
Archaeological monitoring	LS	$25,000	1	$25,000
Clear and grub	LS	$25,000	1	$25,000
BMPs	LS	$25,000	1	$25,000
			TOTAL	**$13,700,000**

Naalehu WWTP
Revised Preliminary Engineering Report
Cost Estimate

Alternative #1 - RAS Package Plants / Subsurface Drip

Capital Cost Estimate

Naalehu WWTP Capital Cost Item Description	**Units**	**General Unit Cost**	**Number of Units**	**COST**
Collection System				
Phase 2 new gravity collection system w/ new WWPS & force main	LS	$27,700,000	1	$27,700,000
			Subtotal	$27,700,000
			Contingency @ 20%	$5,540,000
			Engineering, Admin, & Legal @ 25%	$6,925,000
			Collection System Total	**$40,165,000**
Drainage Channel				
Drainage channel improvements	LS	$13,700,000	1	$13,700,000
			Subtotal	$13,700,000
			Contingency @ 20%	$2,740,000
			Engineering, Admin, & Legal @ 25%	$3,425,000
			Drainage Channel Total	**$19,865,000**
Wastewater Treatment				
Environmental protection, BMPs	ac	$11,000	1.5	$16,500
Site clearing	ac	$20,000	1.5	$30,000
Site roads, guard rails, pavement	ac	$92,000	1.5	$138,000
Perimeter fence	LF	$150	4,100	$615,000
WWTP site grading	ac	$30,000	1.5	$45,000
WWTP site drainage improvements	ac	$18,000	1.5	$27,000
Plant water catchment/collection system	LS	$75,000	1	$75,000
Process yard piping	LS	$250,000	1	$250,000
Headworks (includes site/civil, structures, equipment & piping)	LS	$1,024,000	1	$1,024,000
Influent pump station	LS	$1,670,000	1	$1,670,000
Chlorine disinfection	LS	$150,000	1	$150,000
RAS package plants	LS	$3,812,000	1	$3,812,000
Plant drainage system	ac	$40,000	1.5	$60,000
Main generator (including process piping)	LS	$500,000	1	$500,000
Maintenance/operations/electrical building	SF	$1,000	2,150	$2,150,000
Sludge dewatering system	LS	$860,000	1	$860,000
			Subtotal	$11,422,500
			Electrical & Instrumentation @ 25%	$2,856,000
			Subtotal	$14,279,000
			Contingency @ 20%	$2,856,000
			Engineering, Admin, & Legal @ 25%	$3,570,000
			Wastewater Treatment Total	**$20,705,000**
Effluent Disposal				
Irrigation equalization tank	gal	$10	20,000	$200,000
Effluent pump station	LS	$1,250,000	1	$1,250,000
Subsurface drip irrigation line	LF	$10	54,000	$540,000
Irrigation piping & valves	LF	$250	900	$225,000
			Subtotal	$2,215,000
			Electrical & Instrumentation @ 25%	$554,000
			Subtotal	$2,769,000
			Contingency @ 20%	$554,000
			Engineering, Admin, & Legal @ 25%	$693,000
			Effluent Disposal Total	**$4,016,000**
			Alternative #1 TOTAL	**$84,751,000**

Alternative #2 - MBR Package Plants / Reuse / Subsurface Drip

Capital Cost Estimate

Naalehu WWTP Capital Cost Item Description	Units	General Unit Cost	Number of Units	COST
Collection System				
Phase 2 new gravity collection system w/ new WWPS & force main	LS	$27,700,000	1	$27,700,000
			Subtotal	$27,700,000
			Contingency @ 20%	$5,540,000
			Engineering, Admin, & Legal @ 25%	$6,925,000
			Collection System Total	**$40,165,000**
Drainage Channel				
Drainage channel improvements	LS	$13,700,000	1	$13,700,000
			Subtotal	$13,700,000
			Contingency @ 20%	$2,740,000
			Engineering, Admin, & Legal @ 25%	$3,425,000
			Drainage Channel Total	**$19,865,000**
Wastewater Treatment				
Environmental protection, BMPs	ac	$11,000	1.5	$16,500
Site clearing	ac	$20,000	1.5	$30,000
Site roads, guard rails, pavement	ac	$92,000	1.5	$138,000
Perimeter fence	LF	$150	4,100	$615,000
WWTP site grading	ac	$30,000	1.5	$45,000
WWTP site drainage improvements	ac	$18,000	1.5	$27,000
Plant water catchment/collection system	LS	$75,000	1	$75,000
Process yard piping	LS	$250,000	1	$250,000
Headworks (includes site/civil, structures, equipment & piping)	LS	$1,024,000	1	$1,024,000
Influent pump station	LS	$1,670,000	1	$1,670,000
Chlorine disinfection	LS	$150,000	1	$150,000
MBR package plants	LS	$3,579,000	1	$3,579,000
Plant drainage system	ac	$40,000	1.5	$60,000
Main generator (including process piping)	LS	$500,000	1	$500,000
Maintenance/operations/electrical building	SF	$1,000	2,150	$2,150,000
Sludge dewatering system	LS	$860,000	1	$860,000
			Subtotal	$11,189,500
			Electrical & Instrumentation @ 25%	$2,798,000
			Subtotal	$13,988,000
			Contingency @ 20%	$2,798,000
			Engineering, Admin, & Legal @ 25%	$3,497,000
			Wastewater Treatment Total	**$20,283,000**
Effluent Disposal				
Irrigation equalization tank	gal	$10	20,000	$200,000
Effluent pump station	LS	$1,250,000	1	$1,250,000
Subsurface drip irrigation line	LF	$10	54,000	$540,000
Irrigation piping & valves	LF	$250	900	$225,000
			Subtotal	$2,215,000
			Electrical & Instrumentation @ 25%	$554,000
			Subtotal	$2,769,000
			Contingency @ 20%	$554,000
			Engineering, Admin, & Legal @ 25%	$693,000
			Effluent Disposal Total	**$4,016,000**
			Alternative #2 TOTAL	**$84,329,000**

Naalehu WWTP
Revised Preliminary Engineering Report
Cost Estimate

Alternative #3 - Imhoff Tank / RGF / Subsurface Drip

Capital Cost Estimate

Naalehu WWTP Capital Cost Item Description	Units	General Unit Cost	Number of Units	COST
Collection System				
Phase 2 new gravity collection system w/ new WWPS & force main	LS	$27,700,000	1	$27,700,000
			Subtotal	$27,700,000
			Contingency @ 20%	$5,540,000
			Engineering, Admin, & Legal @ 25%	$6,925,000
			Collection System Total	**$40,165,000**
Drainage Channel				
Drainage channel improvements	LS	$13,700,000	1	$13,700,000
			Subtotal	$13,700,000
			Contingency @ 20%	$2,740,000
			Engineering, Admin, & Legal @ 25%	$3,425,000
			Drainage Channel Total	**$19,865,000**
Wastewater Treatment				
Environmental protection, BMPs	ac	$11,000	2	$22,000
Site clearing	ac	$20,000	2	$40,000
Site roads, guard rails, pavement	ac	$92,000	2	$184,000
Perimeter fence	LF	$150	4,100	$615,000
WWTP site grading	ac	$30,000	2	$60,000
WWTP site drainage improvements	ac	$18,000	2	$36,000
Plant water catchment/collection system	LS	$75,000	1	$75,000
Process yard piping	LS	$250,000	1	$250,000
Headworks (includes site/civil, structures, equipment & piping)	LS	$1,024,000	1	$1,024,000
Influent pump station	LS	$1,670,000	1	$1,670,000
Imhoff tank	LS	$1,184,000	1	$1,184,000
Recirculation tank	LS	$1,320,000	1	$1,320,000
Recirculating gravel filter	LS	$6,591,000	1	$6,591,000
Chlorine disinfection	LS	$150,000	1	$150,000
Plant drainage system	ac	$40,000	2	$80,000
Main generator (including process piping)	LS	$500,000	1	$500,000
Maintenance/operations/electrical building	SF	$1,000	1,645	$1,645,000
Sludge dewatering system	LS	$860,000	1	$860,000
			Subtotal	$16,306,000
			Electrical & Instrumentation @ 25%	$4,077,000
			Subtotal	$20,383,000
			Contingency @ 20%	$4,077,000
			Engineering, Admin, & Legal @ 25%	$5,096,000
			Wastewater Treatment Total	**$29,556,000**
Effluent Disposal				
Irrigation equalization tank	gal	$10	20,000	$200,000
Effluent pump station	LS	$1,250,000	1	$1,250,000
Subsurface drip irrigation line	LF	$10	54,000	$540,000
Irrigation piping & valves	LF	$250	900	$225,000
			Subtotal	$2,215,000
			Electrical & Instrumentation @ 25%	$554,000
			Subtotal	$2,769,000
			Contingency @ 20%	$554,000
			Engineering, Admin, & Legal @ 25%	$693,000
			Effluent Disposal Total	**$4,016,000**
			Alternative #3 TOTAL	**$93,602,000**

Naalehu WWTP
Revised Preliminary Engineering Report
O&M Cost Estimates

Electricity cost	$0.45	/kWh	
Flow			
ADWF:	0.125	mgd	
	0.193404	cfs	
Labor (common across all alternatives)			
COH WWTP operator annual salary	$100,000		*including fringe benefits*
Number of employees/operators	3		*2 shifts: Wed - Sat / Mon - Fri + 1 supervisor*
Annual labor cost:	$300,000		

Electricity

Load	Duty Unit Count	Motor Size (hp)	Use Factor	Equivalent Continuous Load (hp)	Annual Power (kWh)	Alt 1 RAS PP (kWh)	Alt 2 MBR PP (kWh)	Alt 3 RGF (kWh)
Headworks								
Screens	1	2	20%	0.4	2,613	2,613	2,613	2,613
Grit blower	2	5	100%	10	65,323	65,323	65,323	65,323
Process tanks								
Anoxic zone mixers	2	5	100%	10	65,323	65,323	65,323	N/A
Aeration blower (main)	1	27	100%	27	176,373	176,373	176,373	N/A
Aeration blower (flow equalization)	1	13	100%	13	84,920	84,920	84,920	N/A
Imhoff tank odor control	1	2	100%	2	13,065	N/A	N/A	13,065
Recirculation tank pump	1	5	100%	5	32,662	N/A	N/A	32,662
Influent pump	1	10	30%	3	19,597	19,597	19,597	19,597
Effluent pump	1	15	40%	6	39,194	39,194	39,194	39,194
Secondary clarifier								
Clarifier mechanisms	2	1	100%	2	13,065	13,065	N/A	N/A
Membranes								
Membrane blower	2	5	30%	3	19,597	N/A	19,597	N/A
Permeate pumps	2	5	100%	10	65,323	N/A	65,323	N/A
Aerobic digestion								
Digester blowers	2	5	90%	9	58,791	58,791	58,791	58,791
Sludge dewatering								
Screw press feed pump	1	5	30%	1.5	9,798	9,798	9,798	9,798
Screw press	1	2	30%	0.6	3,919	3,919	3,919	3,919
Cake conveyor	1	2	30%	0.6	3,919	3,919	3,919	3,919
Miscellaneous								
Drainage return pumps	1	5	10%	0.5	3,266	3,266	3,266	3,266
Plant water pumps	1	5	100%	5	32,662	32,662	32,662	N/A
Fans	2	1	100%	2	13,065	13,065	13,065	13,065
Annual electricity consumption kWh:						591,829	663,685	265,213
Annual electricity cost:						$270,000	$300,000	$120,000

Chemicals

Hypochlorite Tablets			
Daily chlorine demand @ ADWF	8.3	lbs/d	*assuming 8 mg/L dose, 15 min contact time @ PHWWF*
Annual hypochlorite demand @ ADWF	3,030	lbs/yr	
Hypochlorite tablet unit cost	$8	per lb	
Total annual hypochlorite tablet cost:	$24,300		*common across all alternatives*
Dewatering polymer			
Daily dewatering polymer use	1.7	lbs/d	*assuming 20 lbs/dry ton dose*
Annual dewatering polymer use	621.0	lbs/yr	
Dewatering polymer unit cost	$3	per lb	
Total annual dewatering polymer cost:	$1,900		*common across all alternatives*

MBR cleaning chemicals			
Sodium hypochlorite & citric acid cost:	$5,000	per yr	*Alternative #2 only*
Membrane replacement (Alt #2)			
Membrane cost per module	$1,950		*material costs only*
Estimated additional costs per module	$550		*shipping & handling + installation costs*
Number of membrane modules	24		*modules (12 per unit)*
Membrance replacement cost (15 year):	$60,000		

WWTP maintenance materials

	Alt 1 RAS PP	Alt 2 MBR PP	Alt 3 RGF	
Package plant capital cost	$3,812,000	$3,579,000	N/A	
Process equipment capital cost	$8,104,000	$8,104,000	$16,694,000	*not including package plant*
Equipment replacement cost factor	25.0%	25.0%	25.0%	*replace after 20 years*
process equipment replacement cost	$2,026,000	$2,026,000	$4,173,500	*not including package plants*
Total WWTP equipment replacement cost:	$5,838,000	$5,605,000	$4,174,000	*includes 100% package plant replacement*
Maintenance materials cost factor	2.0%	2.0%	2.0%	
Total WWTP annual maintenance materials cost:	$117,000	$113,000	$84,000	

Sludge disposal			
Daily dewatering flow:	680	gpd	
Daily dewatered sludge mass	0.71	wet tons/d	
West HI sanitary landfill tipping fee	$116.00	per wet ton	
Onsite disposal roll off dumpster size	10	cu yds	
Dumpster rental fee	$500.00	per week	
Annual dumpster rental fee	$26,000.00		
Disposal frequency	7	days	*Requires weekly disposal (once every 7 days)*
Diesel price (dollar per gallon)	$6.06	per gallon	
Employee labor cost per hour	$48.08	per hour	*based on 100K annual salary*
Distance Naalehu to Landfill (roundtrip)	165	mi	
Dump truck fuel economy	5.0	mpg	
Annual sludge disposal cost (truck to landfill)			
Annual fuel cost	$10,400		
Annual landfill tipping fee	$30,000		
Annual Dumpster rental fee	$26,000		
Total annual sludge disposal cost:	$67,000		

Collection system

Phase 1: Reuse Brewer gravity collection system (Close LCCs) maintenance			
Existing Brewer gravity sewer mainline	20,788	ft	*2004 Kau Sewer System Evaluation Report*
	3.94	mi	
Existing gravity mainline multiplier	3		
Gravity mainline maintenance cost	$48,000		
Annual mainline maintenance cost:	$188,990		
New gravity sewer mainline (FM to WWTP)	2,500	ft	
New gravity sewer mainline (LCCs to SPS)	1,950	ft	
New gravity sewer mainline TOTAL	4,450	ft	
	0.84	mi	
Gravity mainline maintenance cost	$16,000	per mi	
Annual gravity mainline maintenance cost:	$13,490		
Force main length	2,800	ft	*Fukunaga estimate*
	0.53	mi	
Force main maintenance cost	$10,000	per mi	
Annual force main maintenance cost:	$5,310		
WWPS process equipment capital cost	$1,670,000		*Assume equal to influent pump station*
WWPS process equipment replacement cost:	$400,000		*20 year replacement*
Total annual maintenance materials cost:	$10,000		
Total annual WWPS electricity cost	$20,000		
Total annual maintenance cost:	$238,000		

Phase 2: New Brewer gravity collection system maintenance

New Brewer gravity sewer mainline	10,140	ft	
New gravity sewer mainline (FM to WWTP)	2,500	ft	
New gravity sewer mainline TOTAL	12,640	ft	
	2.39	mi	
Gravity mainline maintenance cost	$16,000	per mi	
Annual gravity mainline maintenance cost:	$38,310		
Force main length	2,800	ft	*Fukunaga estimate*
	0.53	mi	
Force main maintenance cost	$10,000	per mi	
Annual force main maintenance cost:	$5,310		
WWPS process equipment capital cost	$1,670,000		*Assume equal to influent pump station*
WWPS process equipment replacement cost:	$400,000		*20 year replacement*
Total annual maintenance materials cost:	$10,000		
Total annual WWPS electricity cost	$20,000		
Total annual maintenance cost:	$74,000		

County of Hawaii
Naalehu WWTP Revised PER
Alternatives Net Present Value Analysis

Agency: County of Hawaii

Project/Problem: Naalehu Collection System

		Risk Premium	Sensitivity Adjustments (%) Benefits	Capital Costs	Other Costs	Results Capital Cost	30-year NPV
Alternative 1	Phase 1 - Reuse C Brewer Collection System					$30,032,500	($35,930,046)
Alternative 2	Phase 2 - New C Brewer Collection System					$40,165,000	($42,197,986)
Alternative 3							
Alternative 4							
Alternative 5							

Year of analysis: 2023
Escalation rate: 3.50%
Discount rate: 5.00%

Select one
- (●) All entries in dollars
- ( ) All entries in thousands of dollars

Note: "Status quo" refers to Alternative 1

Make entries in yellow cells only

County of Hawaii
Naalehu WWTP Revised PER
Alternatives Net Present Value Analysis

			Sensitivity Adjustments (%)			Results	
Agency:	County of Hawaii						
Project/Problem:	Naalehu Disinfection System	Risk Premium	Benefits	Capital Costs	Other Costs	Capital Cost	30-year NPV
Alternative 1	Tablet Chlorination Feed System					$150,000	($738,500)
Alternative 2	Ultraviolet Light (UV) System					$1,100,000	($1,335,400)
Alternative 3							
Alternative 4							
Alternative 5							

Year of analysis:	2023
Escalation rate:	3.50%
Discount rate:	5.00%

Select one
- (●) All entries in dollars
- ( ) All entries in thousands of dollars

Note: "Status quo" refers to Alternative 1

Make entries in yellow cells only

County of Hawaii
Naalehu WWTP Revised PER
Alternatives Net Present Value Analysis

			Sensitivity Adjustments (%)			Results	
Agency:	County of Hawaii						
Project/Problem:	Naalehu WWTP Revised PER	Risk Premium	Benefits	Capital Costs	Other Costs	Capital Cost	30-year NPV
Alternative 1	RAS Package Plants / Subsurface Drip					$84,751,000	($109,555,755)
Alternative 2	MBR Package Plants / Subsurface Drip					$84,329,000	($109,776,643)
Alternative 3	Imhoff Tank / RGF / Subsurface Drip					$93,602,000	($112,851,053)
Alternative 4							
Alternative 5							

Year of analysis:	2023
Escalation rate:	3.50%
Discount rate:	5.00%

Select one
- (●) All entries in dollars
- ( ) All entries in thousands of dollars

Note: "Status quo" refers to Alternative 1

Make entries in yellow cells only

County of Hawaii DEM
Naalehu Revised AOC PER
Alternatives Net Present Value Analysis

			Sensitivity Adjustments (%)			Results	
Agency:	County of Hawaii DEM						
Project/Problem:	Naalehu Revised AOC PER	Risk Premium	Benefits	Capital Costs	Other Costs	Capital Cost	30-year NPV
Alternative 1	i. Package plant and new collection system					$84,329,000	($109,776,643)
Alternative 2	ii. Package plant connected to existing collection system					$74,197,000	($103,505,201)
Alternative 3	IWS management model 2A					$29,100,000	($38,859,287)
Alternative 4	iii. A maintenance contract model IWS program					$29,100,000	($39,321,375)
Alternative 5	IWS management model 3A					$29,100,000	($39,093,038)
Alternative 6	iv. An operating permit model IWS program					$29,100,000	($41,422,061)
Alternative 7							
Alternative 8							
Alternative 9							
Alternative 10							
Alternative 11							
Alternative 12							

Year of analysis:	2023
Escalation rate:	3.50%
Discount rate:	5.00%

Select one
- ● All entries in dollars
- ○ All entries in thousands of dollars

Note: "Status quo" refers to Alternative 1

Make entries in yellow cells only

Appendix B: Letter to Support Department of Hawaii Flow Variance Application

Brown AND Caldwell

2261 Aupuni Street, Suite 201
Wailuku, Maui, HI 96793

T: 808.244.7005

July 18, 2023

Mr. Mark Grant
County of Hawaii Wastewater Division
108 Railroad Ave
Hilo, HI 96729-4252

Subject: Naalehu Wastewater Treatment Plant – Capacity Phasing

Dear Mr. Grant,

The County of Hawaii (County) is investigating options to reduce the size and impact of the Naalehu Wastewater Treatment Plant (WWTP). While previous planning and design efforts focused on an aerated lagoon secondary WWTP, the County is now evaluating a mechanical secondary treatment process to strive to meet the EPA Administrative Order on Consent (AOC) deadlines.

This letter provides information regarding a phased capacity innovative approach to the project scope that will further the County's goals. A phased WWTP capacity approach will require Department of Health (DOH) acceptance as it potentially falls outside of normally accepted practices and regulatory guidance.

Phased WWTP capacity implementation is proposed to reduce initial WWTP size while protecting human health and the environment. The phasing approach that the County is proposing requires an explanation of deviations from Hawaii Administrative Rules (HAR) 11-62, including utilization of potable water use data to estimate wastewater flows, peak flow prediction, and phasing implementation.

1.1 Background

HAR 11-62 requires WWTPs to be designed in accordance with County standards, or the City and County of Honolulu (CCH) standards if no applicable County standards exist. The County does not have its own WWTP standards, and therefore relies on the CCH standards.

Project planning and design to date has followed the CCH flow standards that were updated in 2017. Table 1 provides a summary of the flows to the Naalehu WWTP based on the 2017 CCH standards.

Table 1. Naalehu WWTP Flows Based on 2017 CCH Standards

Description	Peaking Factor	Value
Average dry weather flow	1.0	225,000 gpd
Peak day dry weather flow	2.0	446,000 gpd
Peak day wet weather flow [a]	2.5	563,000 gpd
Peak hour wet weather flow	3.1	480 gpm (691,000 gpd)

Notes: gpd = gallons per day, gpm = gallons per minute

[a] Peak day wet weather flow is not part of the CCH standards but is an important WWTP design parameter. Peak day wet weather flow estimate was developed using an appropriate peaking factor.

The 2017 CCH flow standards include three elements:

1. Wastewater flow generation estimates based on equivalent population estimates (70 gallons per capita per day (gpcd)). This reflects the amount of wastewater that is expected to enter the sewer from residences and businesses and provide the main source of organic material mass to be removed by the WWTP process.
2. Dry weather infiltration and inflow (I/I) estimates based on equivalent population estimates (35 gpcd).
3. Wet weather I/I estimates based on service area acreage (3,000 gallons per acre per day (gpad)).

1.2 County Experience with the CCH Flow Standards

The CCH standards were established for a major metropolitan area that includes vast areas of residential, commercial, and industrial development, with significant proportions of service areas near sea level elevations. Wastewater generation rates are generally lower in rural areas than in urban areas. Typical flow rates in the United States range between 50 gpcd in rural areas and 120 gpcd in typical urban areas (Tchobanoglous, George, F. L. Burton, and H.D. Stensel, Wastewater Engineering: Treatment and Reuse / Metcalf & Eddy, Inc., 4th edition, 2003). The County's experience with the CCH flow standards on other projects (e.g., Honokaa WWTP) has illustrated that the standards are very conservative for small rural communities located at higher elevations on Hawaii Island. The observed monthly average dry weather flows at Honokaa are consistently less than 50 percent of the average dry weather flow design capacity of the WWTP. Peak day wet weather flow events have been near the WWTP facility capacity as designed per the 1993 CCH standards that were in effect at the time (1,250 gpad for sewers above the water table). Therefore, the current wastewater standards based on urban Honolulu are likely overly conservative for rural communities like Naalehu, as substantiated by flows observed at Honokaa WWTP and discussed in Section 1.5.

1.3 Service Area

Fukunaga & Associates, Inc (FAI) prepared a preliminary engineering report for the Naalehu wastewater collection system improvements in May 2020. The results of FAI's investigation established an updated service area for the proposed Naalehu WWTP that incorporates both the town's and County's needs. Figure 1 shows the updated WWTP service area, which includes properties that are currently connected to the three large capacity cesspools (LCC 3, 4, and 5), and properties that will be "newly accessible" to the collection system after the replacement collection system is constructed. LCC 1 and 2 are located in the neighboring town of Pahala.

Figure 1. Naalehu WWTP Service Area Established by Fukunaga & Associates, Inc

Table 2 provides a summary of the WWTP service area.

Table 2. Naalehu WWTP Service Area Summary

Property Type	Number of Parcels		
	Existing C Brewer Lots	Newly Accessible Lots	New Collection Total
Residential	159	25	184
Commercial	2	7	9
Church	1	1	2
Industrial	-	2	2
Agricultural	1	2	3
Residential/Commercial	1	1	2
Residential/Agricultural	-	1	1
Park	-	1	1
Total	164	40	204

1.4 Potable Water Use

The amount of wastewater generated within a residence will not exceed the amount of potable water used by the occupants. Therefore, potable water use records can be used to estimate wastewater generation rates within existing communities where no combined sewers are present. The County of Hawaii Department of Water Supply (DWS) provided potable water use records for the parcels located within the service area from November 2017 through October 2022. Figure 2 provides an analysis of the potable water use records, with adjustments for properties for which no water use data was available. As shown figure 2, the maximum monthly average water use during the period of record was approximately 78,000 gpd in May and June 2018.

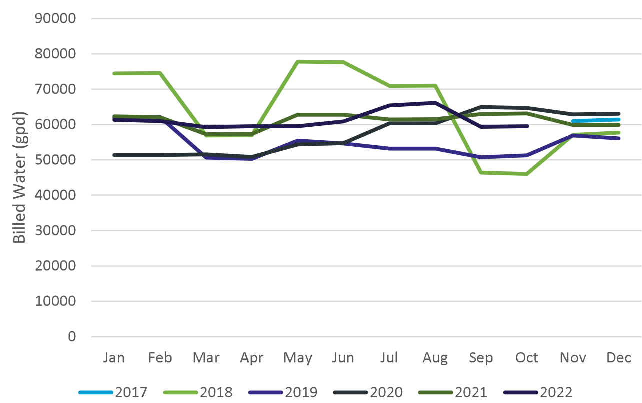


Figure 2. Average Potable Water Use in Naalehu WWTP Service Area, Nov 2017 – Oct 2022

Potable water is used both indoors and outdoors in residential areas, but only indoor uses enter the sewer system. Figure 3 shows the results of an irrigation demand analysis for Naalehu. Peak irrigation demands occur during the months of May through August, but inspection of potable water demands in Figure 2 shows little to no increase in potable water use during the driest months of the year. Therefore, it is reasonable to conclude that Naalehu residents do not use significant volumes of potable water for outdoor irrigation purposes, and most of the potable water that is supplied to the community by DWS ends up in the sewer.

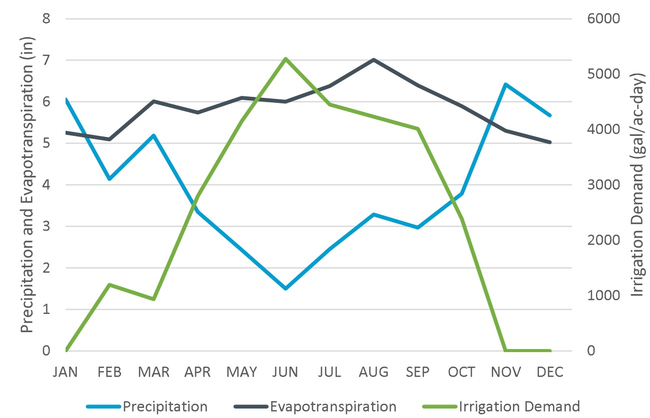


Figure 3. Naalehu Irrigation Analysis

Based on the above analyses, we believe assuming an 80,000 gpd monthly average wastewater generation rate in the capacity calculations reflect the current needs of the service area.

Daily wastewater flows can vary substantially from the monthly average flow. The CCH standards use a 2.5 peaking factor to estimate the maximum wastewater flow into the collection system. The 2.5 peaking factor is appropriate for Naalehu, resulting in a maximum wastewater flow of 200,000 gpd.

1.5 Dry Weather I/I Allowance

Groundwater can infiltrate into wastewater collection systems during dry weather, increasing the flow to the WWTP. The 2017 CCH standards specify a dry weather I/I allowance of 35 gpcd. The previous CCH standards (dated 1993) specified a dry weather I/I allowance of 5 gpcd for properties located above the groundwater table. The significant increase in the dry weather I/I allowance in the latest CCH standard will help the CCH to plan for increased dry weather I/I due to sea level rise effects in Honolulu. The Honokaa WWTP was designed for an average dry weather flow (ADWF) capacity of 200,000 gpd, which includes a dry weather I/I allowance based on the 1993 CCH standards. The County's experience at Honokaa has been that the 1993 dry weather I/I allowance is adequate for a rural collection system located in Hawaii Island's well-drained geology, at elevations hundreds of feet above sea level, and a significant distance from the shoreline. Figure 4 summarizes annual average effluent flows at the Honokaa WWTP, which include dry weather I/I. The high flows in July 2016 and August 2018 were due to Hurricanes Darby and Lane, respectively. We conclude that continued use of the 1993 standard for dry weather I/I is appropriate for Naalehu and using the 2017 standard would be overly-conservative.

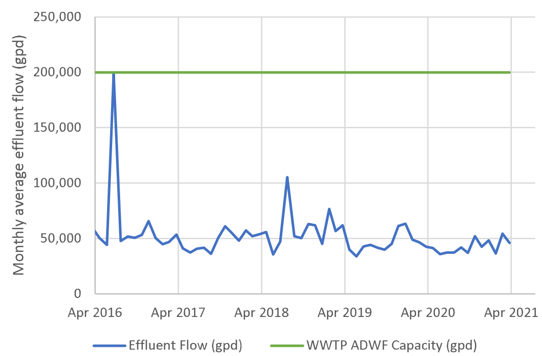


Figure 4. Honokaa WWTP Monthly Average Effluent Flows, Apr 2016 – Apr 2021

1.6 Wet Weather I/I Allowance

The 2017 CCH standards, which specify a wet weather I/I allowance of 3,000 gpad, are used for all wet weather I/I calculations.

1.7 Phased Capacity Implementation Recommendations

A phased approach towards implementing WWTP capacity is recommended to provide a flexible and appropriately sized wastewater treatment and disposal facility for the Naalehu community:

- **Phase 1:** Provide sufficient capacity for the existing parcels within the service area, including newly accessible parcels, reflecting current development. This will allow the County to close the LCCs. Provide sufficient area within the WWTP site for future expansion.
- **Phase 2:** When needed, expand the WWTP capacity to reflect the full CCH flow standards requirements for the existing service area. HAR 11-62 requires development of a facility plan when flows reach 75 percent of capacity and implementation of capacity-increasing measures at 90 percent.
- **Phase 3:** When needed, expand the WWTP capacity to reflect the recommendations included in the Kau Community Development Plan to sewer the entire community. This is not anticipated to occur within the near future and is not part of the current project's environmental assessment.

Table 3 provides a summary of the calculated capacities for the three-phase approach.

Table 3. Calculated Capacity Phasing

Description	Phase 1	Phase 2	Phase 3
Base sanitary flow	80,000 gpd	147,000 gpd	211,000 gpd
Peak base sanitary flow [a]	200,000 gpd	368,000 gpd	528,000 gpd
Dry weather I/I [b]	12,000 gpd	78,000 gpd	119,000 gpd
Wet weather I/I [c]	245,000 gpd	245,000 gpd	931,000 gpd
Average dry weather flow [d]	92,000 gpd	225,000 gpd	330,000 gpd
Peak day dry weather flow [e]	212,000 gpd	446,000 gpd	647,000 gpd
Peak day wet weather flow [f]	322,000 gpd PF=3.5	563,000 gpd PF=2.5	825,000 gpd PF=2.5
Peak hour wet weather flow [h]	317 gpm (457,000 gpd)	480 gpm (691,000 gpd)	1096 gpm (1,578,000 gpd)

[a] *Base sanitary flow x 2.5 peaking factor.*
[b] *5 gpcd for Phase 1, 35 gpcd for Phase 2 and Phase 3.*
[c] *3,000 gpad*
[d] *Base sanitary flow + dry weather I/I.*
[e] *Peak base sanitary flow + dry weather I/I.*
[f] *Average dry weather flow x peaking factor (PF) shown. Peak day wet weather flow estimate was developed using an appropriate peaking factor.*
[h] *Peak base sanitary flow + dry weather I/I + wet weather I/I.*

HAR 11-62-23.1(i) requires the initiation of a facility planning process when the actual wastewater flows reach 75 percent of the design capacity of the WWTP, and implementation of the facility plan must be initiated when actual wastewater flows reach 90 percent of the design capacity. **We recommend the Phase 1 WWTP be rated to treat an average dry weather flow of 125,000 gpd** to avoid the potential of having to initiate a facility plan shortly after the project is constructed. The peak day and peak hour flow capacities can remain as shown in Table 3. Note that the biological processes in the mechanical WWTP will need to be sized to treat the peak day dry weather flow of 212,000 gpd, not the average dry weather flow.

Per capita wastewater generation rate estimates were considered to check the validity of the proposed Phase 1 average dry weather flow capacity. The non-residential properties in the service area are expected to contribute approximately 50 percent of the total flows. Therefore, 50 percent of the average dry weather flow capacity can be allocated to the residential properties in the service area (92,000 gpd x 50% = 46,000 gpd). If we consider only the 184 residential properties in the service area, and assume four residents per residential lot, we have a total residential population of 736 persons (184 lots x 4 persons/lot = 736 persons). Dividing the residential flow capacity by the population yields a wastewater flow capacity of approximately 63 gpcd (46,000 gpd / 736 capita = 63 gpcd), which is within the typical values presented in Section 1.2 above.

The proposed Phase 1 capacity is based on actual water use data to establish wastewater generation rates, and rational assumptions to establish dry weather I/I allowances, and we believe it is appropriate for the Phase 1 existing conditions, while providing limited capacity for growth. Table 4 presents the recommended Phase 1 capacity.

Table 4. Recommended Phase 1 Capacity

Description	Value	Peaking Factor
Average dry weather flow	125,000 gpd	1.0
Peak day dry weather flow	212,000 gpd	1.7
Peak day wet weather flow	322,000 gpd	2.6
Peak hour wet weather flow	457,000 gpd (317 gpm)	3.7

If the County pursues a WWTP approach (using the Phase 1 capacity recommendation above) to close the LCCs then a DOH variance from HAR 11-62 requirements will be needed. The variance will need to be renewed every five years. The WWTP capacity needs should be re-evaluated upon application for the variance renewal.

Please call me at (808) 442-3301 if you have any questions.

Very truly yours,

Brown and Caldwell

Craig Lekven, P.E.
Project Manager

Appendix C: Non-Economic Evaluation

Naalehu WWTP Alternative Solutions
Non-Economic Evaluation July 2023

Category	Category Weight	Criteria	Criteria Weight	Raw Scores Alt #1 RAS	Raw Scores Alt #2 MBR	Raw Scores Alt #3 RGF	Weighted Scores Alt #1 RAS	Weighted Scores Alt #2 MBR	Weighted Scores Alt #3 RGF
Level of Service	25%	Effluent quality	30%	3	5	3	0.90	1.50	0.90
		Potential for capacity expansion	20%	5	5	2	1.00	1.00	0.40
		Water recycling feasibility	30%	3	5	2	0.90	1.50	0.60
		Public perception / community concerns	20%	3	5	3	0.60	1.00	0.60
Regulatory	25%	Monitoring complexity	25%	4	3	5	1.00	0.75	1.25
		Treatment adjustment potential	25%	5	5	3	1.25	1.25	0.75
		Safety regulations complexity	25%	4	4	4	1.00	1.00	1.00
		Environmental concerns	25%	4	5	3	1.00	1.25	0.75
O&M Factors	25%	Footprint	30%	5	5	2	1.50	1.50	0.60
		Safe work environment	25%	4	3	4	1.00	0.75	1.00
		Maintenance complexity	25%	4	3	4	1.00	0.75	1.00
		Operations complexity	20%	4	3	5	0.80	0.60	1.00
Island Factors	25%	Mainland delivery dependence	25%	3	3	4	0.75	0.75	1.00
		Mainland servicing dependence	25%	3	3	4	0.75	0.75	1.00
		Power dependence	25%	3	3	5	0.75	0.75	1.25
		Chemical dependence	25%	4	3	4	1.00	0.75	1.00
						Overall Score:	**3.80**	**3.96**	**3.53**

****Note*: 5 = high/desirable, 1 = low/not-desirable*

Appendix D: Naalehu Wastewater Collection System Improvements Technical Memorandum

Fukunaga & Associates, Inc., May 2020

Brown AND Caldwell

FUKUNAGA & ASSOCIATES, INC.
CONSULTING ENGINEERS

MEMORANDUM

TO: Michelle Sorensen, Brown and Caldwell
Craig Lekven, Brown and Caldwell

FROM: Andrew Amuro

DATE: May 1, 2020

SUBJECT: Naalehu Wastewater Collection System Improvements
Final Preliminary Engineering

1. GENERAL PROJECT DESCRIPTION

The County of Hawaii (COH) is scheduled to close three large capacity cesspools (LCCs) in the town of Naalehu on the southeast side of the Big Island. The Naalehu town area is shown on **Figure 1**. To accomplish the closure, the COH has tasked Brown and Caldwell (B&C) with the planning and preliminary engineering for a wastewater treatment plant (WWTP) to serve the properties impacted by the LCC closure. Fukunaga and Associates, Inc. (FAI) has been tasked with investigating options for the collection system to convey the wastewater from the impacted properties to the proposed WWTP. The focus of the project is to close the LCCs as expediently and economically as possible; however, the Consent Order also requires 30 connections to the WWTP in addition to the Brewer properties currently served by the LCCs.

Three properties requested connection to the County sewer system and are presented in **Figure 1**. These properties are:

- Iglesia ni Cristo Church (TMK 9-5-009:079)
- Punalu'u Bakery (TMK 9-5-025:037; owned by La'i LLC)
- Hana Hou Restaurant (TMK 9-5-021:005; owned by Fujimoto, Drake S.)

These properties are not connected to the former Brewer sewer system. The church property is located on the Hilo side of the former Brewer house lots and can be connected to the collection system by adding a sewer within the State right-of-way (ROW) (see Section 2) or by adding a sewer within an easement behind the propert if the County chooses to extend the sewer to this property. The Punalu'u Bakery and Hana Hou Restaurant are located on the Kona side of the former Brewer house lots. This side of Naalehu town, to the west of the concrete-lined drainage canal, is considered the "commercial" side of town. The collection system can be designed to accommodate connection of these two commercial properties and will serve to define the western extent of the collection system.

1357 Kapiolani Blvd., Ste. 1530 Honolulu, Hawaii 96814 | Ph: 808.944.1821 Fax: 808.946.9339 | fukunagaengineers.com office@fukunagaengineers.com

2. GENERAL CRITERIA

The COH will be the owner of the collection system; therefore, the sewer system will meet COH standards and be accessible for maintenance. Preference is to construct sewers within the County ROW as much as possible unless other factors make placing the pipes within easements on private property or in the State ROW much more practical from economic and engineering standpoints. The COH prefers sewers not be within easements due to future access challenges when maintenance and repairs are needed. It is also recommended that the collection system not be located in a State ROW if possible due to the lengthy review and approval time needed for the Use and Occupancy Agreement (UOA). This was emphasized by the State Department of Transportation Highways Division (DOT-H) in their Environmental Assessment (EA) pre-consultation comment to stay out of the State ROW unless there is no other feasible means of routing the sewer. The collection system will require a crossing of the State ROW to convey the sewage from the community Mauka of the highway to the WWTP site that is Makai of the highway; however, DOT-H tends to take less time when reviewing ROW crossings, especially if they are done using trenchless installation techniques.

3. TOPOGRAPHY

The topography of the Naalehu area is presented in **Figure 2**. The proposed location of the wastewater treatment plant is upgradient of the lowest of the former Brewer properties. The ground elevation of the WWTP site is approximately 690 ft MSL while the ground elevation of the lowest Brewer house lot is about 645 ft MSL, an elevation difference of 45 feet. A gravity sewer at this depth is technologically possible using micro tunneling techniques for construction; however, a wastewater pump station will be more feasible to convey the wastewater to the WWTP due to the cost of micro tunneling a relatively short distance. The micro tunneling option can be investigated in the event that an acceptable wastewater pump station location cannot be found.

4. POTENTIAL WASTEWATER PUMP STATION LOCATIONS

As noted in the previous section, the former Brewer properties in Naalehu would most likely be served by a pump station due to the topography. When investigating potential sites for a wastewater pump station (WWPS), priority was placed on sites that are on County or State lands to minimize land acquisition issues, or large private parcels where a portion can be purchased by the County in hopes of minimizing impact to the landowner. The potential WWPS sites are listed in Table 1, and shown on **Figure 3**.

Table 1: Potential WWPS Sites

TMK	Owner	Current Use	Class	Size (sq ft)	Notes
9-5-008:012	Chinese Society Church	Church	Agricultural	186,001	Requires land from the owner and/or easement for WWPS site, utilities and road. Requires sewer and force main in State ROW. WWPS can be set back away from houses. Located at lowest point of the collection system. Within 550 feet of school property line. Longest distance for transmission to proposed WWTP location.
9-5-008:048	Kuahiwi Contractors Inc.	Storage/ Baseyard	Agricultural	534,307	Requires land from the owner and/or easement for WWPS site, utilities and road. WWPS can be set back away from most residents. Within 300 feet of school property line. Located near lowest point of the collection system requiring approx. 15 foot wet well.
9-5-009:006	State of Hawaii	Naalehu School	Residential	534,481	Site is frequented by the public. Residents have indicated sensitivity to wastewater facility at a school. Located at lowest point of the collection system.
9-5-021:023	County of Hawaii	Naalehu Park	Residential	279,176	Site is frequented by the public. Residents may be sensitive to wastewater facility at a park. Requires sewer in State ROW. Located upgradient of some of the former Brewer properties.
9-5-021:035	Thy Word Ministries – Waikoloa Faith Ctr	Vacant	Residential	134,949	Requires land acquisition from the owner and access easement or dedicated County road. Routing would most likely have sewer within State ROW. WWPS can be set back away from most houses.
9-5-024:007	‘O Ka’u Kakou Inc.	Senior Center	Residential/ Commercial	84,680	Facility currently in construction, timing to coordinate location could be difficult. Residents may be sensitive to wastewater facility within senior center campus.
9-5-024:011	County of Hawaii	LCC Location	Residential	10,347	Site is surrounded by houses. Facilities will be relatively close to property line. Residents may be sensitive to wastewater facility in residential area. Located up-gradient of the lowest Brewer properties requiring 30+ foot deep wet well.

Two of the potential sites appear to be more favorable than the others, the County site located within the former Brewer house lots (TMK 9-5-024:011) and the Kuahiwi Contractors site (TMK 9-5-008:048). The remaining parcels were eliminated from consideration at this time but can be re-visited in the future if needed. The Naalehu School and Naalehu Park sites would likely face the most public opposition due to proximity to areas frequented by the general population for recreation and education. The Chinese Society Church and Thy Word Ministries sites would require land acquisition after negotiation with the landowner and a UOA within the State ROW. Both processes would be time consuming and the land acquisition depends on the landowner’s willingness to cede some of their land to the County. The new senior center parcel is currently in construction, making the timing to negotiate the WWPS site difficult and may possibly incur construction delays that would also factor into the land negotiations.

A. Pump Station on County Parcel TMK 9-5-024:011

The County site would be the most favorable from a timing standpoint. It does not require land acquisition and would minimize work in the State ROW by limiting construction to a single crossing of Mamalahoa Highway. However, since this site is up-gradient from the collection system low point, this site will require deeper sewers and a very deep pump station wet well. Construction on this site would be more challenging due to the narrow site and the existing sewers and LCC that would have to remain in operation until the collection system and WWTP are completed. These utilities, especially the existing sewer pipes, would have to be protected during construction as heavy vehicles and machinery enter and leave the site. The condition of the existing pipes may require additional protection such as supplemental concrete cover and/or partial replacement depending on condition. A proposed layout of a pump station on the County parcel is shown in **Figure 4**.

The need to trench for the deep influent sewer and the deep wet well may result in flow from the LCC being diverted to these trenches due to the lower resistance to flow through the ground to those excavated areas. Using mud walls for groundwater control would hinder the flow of sewage from the LCC into the ground and probably reduce the capacity of the LCC. Therefore, septage pumping for the duration of the pump station construction would most likely be required until the collection system and WWTP are complete. This would be a significant cost to the construction. In addition, should there be unforeseen delays in completion of the collection system and/or WWTP, the additional septage handling due to the delay could result in a significant construction change order for the additional pumping.

The on-site stormwater may be more difficult to contain due to the small area. Pervious pavement, if geotechnical investigation shows this type of pavement is permissible, would be used to minimize hard surfaces on the site. The only hard pavement area required would be the area designated for refueling of the generator. The grade of the site would be adjusted to minimize flow of off-site stormwater. Grade adjustment walls are anticipated along the property lines on the south and west sides of the parcel to raise the ground elevation.

This site is surrounded by residences directly adjacent to the property line on the east, south and west. The north side is bordered by Opukea Street. Due to the narrow site, the house structures are only about 60 feet from the proposed pump station location. The ambient noise from odor control ventilation fans and electrical switches could be a nuisance to the residents if not mitigated. The standby generator would also produce noise during testing and operation. This would require additional sound insulation for the generator and other equipment on the site.

A passive odor control system can be used to eliminate the need for a mechanical fan; however, passive systems rely on the collection system to be at a higher pressure than atmosphere to force the foul air through the odor control system. When the collection system becomes pressurized, odors can begin to leak out of the wet well hatches and nearby manholes so they must also be gasketed or sealed. A forced-air odor control system using a mechanical fan to draw air out of the pump station would keep the wet well and collection system at negative pressure, thus minimizing the chance that odors escape from nearby manholes and hatches.

Electrical and water utilities are located just off-site on Opukea Road. The HELCo transformer for the site can be located within an easement just off the County road. Water for fire protection could be from existing hydrants (pending analysis by a fire protection engineer). Water service is anticipated to be similar to a residential unit to provide wash down and general housekeeping hose bibbs.

This site poses several risks during construction that could add significantly to the cost and time to construct the pump station. The site is also narrow and cannot be configured optimally to mitigate noise, which could be significant to the homeowners directly adjacent to the site.

B. Pump Station on Portion of Kuahiwi Contractors, Inc. Parcel TMK 9-5-008:048

The Kuahiwi Contractors site is private property and would require time to negotiate the subdivision or easement for the WWPS site and access roadway; however, similar to the County site, work in the State ROW can be limited to a single crossing of the highway. The anticipated size of the site is about 8000 to 9000 square feet. A proposed pump station layout and site are presented in **Figure 5**. A larger area may be needed if soil conditions require a larger area to mitigate on-site stormwater flows. This is smaller than the County parcel above but the dimensions can be optimized to provide the area needed for the facility. This site is located at the low point of the collection system, which would keep the sewers and pump station wet well at more typical depths. Locating the WWPS on a portion of the Kuahiwi Contractors site would allow sewering of the Iglesia ni Cristo Church that requested connection but will place it at the farthest point from the WWTP, thus increasing the force main and sewer lengths required. An access road or driveway would also be needed to the site. A gravel drive would minimize the impervious surface area but can be susceptible to erosion during heavy rains.

The pump station would be placed close to the south property line, the low side of the parcel. The far south east or Hilo corner of the parcel is the lowest point where stormwater from this parcel and possibly some adjacent parcels collect before entering a drainage culvert under Mamalahoa

Highway. Anecdotal reports from residents indicate the highway floods at the storm drain during heavy or sustained rains. There is also a swale that appears to divert stormwater from cattle and horse pens on the site toward the far south east corner. It is recommended that the County not encroach into the far south east corner to maintain the current storm drainage pattern from the site. An aerial view of the area is shown in **Figure 6**. On-site stormwater can be contained by making the site large enough for impoundments and by using pervious pavement where possible depending on geotechnical investigation data. The only road area requiring hard surfacing is the area designated for re-fueling the generator. Grade adjustment walls are anticipated along the perimeter of the pump station site to raise the grade on the south side and lower the grade on the north side to even out the elevation of the site and minimize inflow of off-site storm water.

The site would be bordered on the south by residences unless the pump station is moved further interior of the parcel. If the pump station site is located against the south property line, the pump station could be as close as 80 feet from the house structures. Similar to the County parcel, the ambient noise from equipment could be a nuisance to the residents if not mitigated. This parcel would allow the County to obtain a more optimally configured site that would allow an additional motor control center (MCC) room that would not only mitigate noise issues from electrical switches, but also allow the valuable electrical equipment to be secured in a locked room. The MCC room can be integrated into the generator building. Noise from the odor control system could also be an issue, especially from the fan that would operate continuously. However, the site can be optimally sized to allow sound attenuating enclosures around the fan or around the entire odor control system. Therefore, a passive odor control system as discussed above for the County parcel site is probably not needed at this site.

Running electrical utility and communication lines would be more costly for this site since the closest pole would be on Ohai Road. HELCo would charge the County to run utility lines to their transformer near the pump station site. As an alternative, the HELCo transformer and meter can be placed within an easement near Ohai Road and the County would own the power lines going into the site. This option is mentioned in case HELCo prefers not to own the power lines going into the site or requires road improvements that would not be favorable to the County. This would require discussion with and approval by HELCo and would have to be analyzed further by an electrical engineer.

A potable water line would be required at the site for wash down and general housekeeping. In addition, a hydrant for fire protection would be needed. The potable water pipe in Naalehu appear to be 6-inch diameter. The new potable water line to the site would maintain the 6-inch size to maximize the water flow in case of fire or other emergency requiring water.

This site is preferred from an engineering standpoint because it is at the low side of the collection system and does not entail unknowns during construction such as breakage of existing utilities or need for septage pumping for unknown duration. It can also be optimally configured to mitigate noise and odors.

5 COLLECTION SYSTEM DESIGN

The town of Naalehu is divided by a concrete flood control canal into an east side (Hilo side) where the majority of the properties are residences, and a west side (Kona side) where the majority of the properties are commercial. The town is also divided in the Mauka (mountain) and Makai (ocean) directions by the Mamalahoa Highway. The collection system will convey the wastewater to the proposed WWTP that is located on the Makai-Kona side of Naalehu. The Naalehu collection system will be analyzed as two distinct systems, one serving the former Brewer house lots located on the Mauka-Hilo side to allow closure of the LCCs, and the gravity sewer located on the Kona side to transport the sewage to the proposed WWTP. An added benefit would be provision of sewer service to the two restaurants requesting connection. The church on the Hilo side that requested service falls outside of this area. The County has expressed a desire to accommodate their request; however, depending on the location of the WWPS, connection of the church may have to be deferred.

C. Former Brewer House Lots

The former Brewer house lots are located on the Mauka-Hilo side as shown in **Figure 7**. The houses are on a hillside with a slope of 8% to 9%, ranging in elevation from about 780 ft MSL to 645 ft MSL. The steep hillside results in houses located on the downhill side of the street being below the elevation of the street. Sewage from houses on the uphill side can flow easily by gravity to a sewer in the street. On the downhill side; however, the lateral serving the home is lower than a typical depth sewer (typically designed with 4 feet to 5 feet cover). Four options were investigated to address the low-lying properties; use of easements on private property, vacuum sewers, individual grinder pump stations at low-lying properties, and deep sewers to allow gravity flow from the low-lying properties.

i. Easements

The use of easements was eliminated as a viable option at this time. An initial investigation of the house lots along the backyard property lines where an easement would be most beneficial revealed extensive homeowner improvements. As part of sewer construction and easement terms, the improvements can be removed and the homeowners can be ordered to keep improvements off of the easements. However, over time it is likely that the homeowners' memory of the easement locations would fade and various improvements may be placed over the easement, hindering access by the County for repairs and maintenance.

ii. Vacuum Sewers

The use of vacuum sewers was also eliminated at this time. Vacuum sewers use a sealed sewer system that produces suction to move the wastewater from low or flat areas. Research into these types of systems revealed that it is not cost effective to sewer the uphill houses by gravity and the downhill houses by vacuum because of the need for a sealed piping system

for vacuum service. Serving some house by conventional gravity and some by vacuum would require two sewer collection systems in the County ROW.

The vacuum interface valve that would be located on each property requires frequent maintenance checks to ensure proper operation. These checks should be done by trained maintenance personnel but since these valves would be on private property, the responsibility would fall on the homeowner to hire trained personnel or obtain training on the system. Another drawback is that the vacuum interface valves typically fail open to minimize the chance of spills. A failed valve will therefore result in the County-owned vacuum pumping system to run constantly (normal operation would be intermittent to save energy). County maintenance personnel would not be able to readily find the faulty valve since they would not have right-of-entry onto the individual properties. Also, since there is no spill or "problem" with the sewer at the individual property with the faulty valve, there is no incentive to correct the problem in a timely manner. Remote telemetry can be added to the vacuum interface valves to monitor the valves via SCADA but these would also require periodic maintenance on private property and would add to the cost of the system for monitoring at every property.

iii. Individual Grinder Pump Stations

The original concept developed for Brewer before the company dissolved was to have individual grinder pump stations at the low-lying properties. This type of system consists of a small pump station at each downhill home. As the pump station fills with sewage, the high wastewater level starts a pump that evacuates the station and discharges into the gravity sewer system on the street. Houses on the uphill side of the street would discharge sewage by gravity into the collection system. The advantage of individual grinder pump stations is the ability to keep the collection system as shallow as possible.

Disadvantages of this system are the need to maintain the pumps and valves on private property and the energy used to pump the wastewater. Another disadvantage is the potential for spills when there are mechanical failures such as, power outages, pump breakdowns, level switch malfunctions, and clogs within the pump. Similar to the vacuum sewer system, the mechanically intensive nature of individual grinder pump stations requires trained maintenance personnel to perform regular checks on the system. However, since the system belongs to the homeowner, it is their responsibility to either hire a maintenance service or obtain the necessary training. Unlike the vacuum system, the pump stations are not "fail safe" and will result in sewage backup in the home or a spill on the homeowner's property that would prompt them to seek corrective action. A rough life-cycle cost analysis of an individual grinder pump unit resulted in an annual cost burden of $850 per house on the homeowners.

The subsurface conditions of the area at the depths required for the sewers is yet to be investigated. If the deep gravity sewers (see below) are not feasible due to unfavorable conditions; such as, lava tubes, then the sewers may have to be kept as shallow as possible. This option is feasible and will be kept in consideration in the event that subsurface conditions require it, but is not the preferred option due to the disadvantages, especially the cost burden on the homeowners.

iv. Deep Gravity Sewers

The majority of the collection system sewer mains can be kept within the County or State ROW and fed by gravity if the pipes are deep below the low point of the low-lying parcels. Sewers constructed in the County of Hawaii must adhere to the *Wastewater System Design Standards of the City and County of Honolulu*, which requires review and approval for sewers deeper than 15 feet due to higher soil loading and potential difficulty when repairs are needed. A preliminary layout of a gravity sewer system, as shown in **Figure 7**, resulted in sewer depths of about 20 to 25 feet at the deepest point on the upper portions of Ohai Road and Nahele Street, and 15 to 18 feet at the deepest point on Lokelani Street and Kilika Street. These depths are based on running a lateral from the lowest point on a house lot up to the street. This was used as the basis because there are houses with sinks and outhouses at the back of the lot that are assumed to be connected to the existing collection system. The soil depth to rock in the area as reported by USGS and verified by past geotechnical investigations is 40 to 60 inches; therefore, excavation for the deep gravity sewers would be mainly in rock.

A sewer along the highway or easements would be needed to service the houses on the State highway between Kukui Road and Ohai Road. The depth, length and direction of flow for this sewer would depend on the location of a pump station. The depth of the sewer on Opukea Street depends on the location of a sewage pump station (see Section 4). As a worse case, the manhole fronting the County-owned parcel (TMK 9-5-024:011) on Opukea Street would have an invert about 30 feet deep if a pump station is constructed on that site due to the elevation of the house at the corner of Ohai Road and Mamalahoa Hwy (TMK 9-5-024:001), the lowest point of the former Brewer community. Although 30 feet is rather deep, it is not unheard of at the entrance to pump stations in Honolulu which are often 3 stories deep. At the Kuahiwi Contractors site (TMK 9-5-008:048) the ground elevation is about the same as the house at Ohai Road and Mamalahoa Hwy resulting in sewers that are at a more reasonable depth of about 15 feet.

This option is feasible and will be considered further. Despite the depth of the sewers in the County ROW, the advantage of not burdening the homeowners with the cost of maintaining the pumping system in Section 5-A-iii, above, makes this option preferred over the individual grinder pump option.

D. Gravity Sewer from Force Main to WWTP

The primary purpose of the sewer on the Kona side of Naalehu is to convey the wastewater from the Brewer house lots to the WWTP. A gravity sewer on Kaalaiki Road can be used to collect the wastewater discharged from a pump station servicing the housing area on the Hilo side of the

drainage canal at either the County parcel on Opukea Street or the Kuahiwi Contractors site. The force main can be run entirely Mauka of the highway, cross the drainage canal, and discharge into a manhole when it reaches Kaalaiki Road. An easement would be required from the drainage canal to the County road. There is an existing access and utility easement located on a parcel owned by La'i LLC (TMK 9-5-025:039) that goes from Kaalaiki Road to the canal. This would be the recommended method of conveying the sewage to the WWTP to keep construction in the State ROW to a minimum. The force main route is discussed further in the next section.

Two commercial properties requested connection to the new collection system. These were the Punaluu Bake Shop (TMK 9-5-025:037) and Hana Hou Restaurant (TMK 9-5-021:005). These properties can be connected to the collection system via the gravity sewer running down Kaalaiki Road, across the highway, and down Naalehu Spur Road to the WWTP site. There are potentially an additional eight properties that would be newly accessible along this sewer route depending on the disposition of Naalehu Spur Road, which is privately owned by Kuahiwi Contractors, Inc. If the road is dedicated to the County or an easement in favor of the County spans the entire road width, then both sides of Naalehu Spur Road would be newly accessible. If the sewer easement is only on one side of the road, assumed to be the Hilo side to allow connection of Hana Hou Restaurant (TMK 9-5-021:005), then only the Hilo-side properties would be newly accessible. The proposed Kona-side collection system is presented in **Figure 8**.

E. Force Main from Brewer House Lots to Gravity Sewer on Kona Side

A force main will be needed to convey the wastewater from the WWPS that serves the former Brewer house lots to the gravity sewer going to the WWTP on the Kona side. The force main can be kept out of the State ROW by running the pipe along easements and County roads. **Figure 8** shows the possible force main routes from the County parcel and the Kuahiwi Contractors sites. The approximate force main lengths from the County parcel and Kuahiwi Contractors parcel are 1300 LF and 2800 LF, respectively.

Both WWPS options will require crossing the concrete drainage canal that divides the Kona side of Naalehu from the Hilo side. The force main can go either above the canal on a support structure, or under the canal. There is an existing pedestrian bridge crossing the canal that can be reconstructed and used to support the new force main; however, the County DEM is not in favor of this option due to the possibility of the structure impeding flow through the canal and ownership of the bridge structure being a burden on DEM personnel who are not set up for bridge inspection and maintenance duties. Routing the force main under the canal can be done by either cutting the concrete canal structure and laying the pipe in an open trench or tunneling under the canal. Cutting the structure poses some risk should a rain storm occur while the trench is open or repaired concrete is curing. Tunneling would be costly due to the depth and equipment needed to micro-tunnel or the shoring required to excavate under the structure. Further discussions with a geotechnical engineer will be needed to determine the best method to cross the canal while limiting risk during construction. For planning purposes, it will be assumed that the canal crossing will be approximately 100 LF using micro-tunneling as a worse case.

6 COLLECTION SYSTEM COSTS AND RECOMMENDATIONS

Planning level capital costs were developed for the collection system options developed above. The costs are presented in Table 2. Basis for the costs are presented in Table 3. Cost basis numbers are from recent past project construction and bid costs inflated to the current year.

Table 2: Collection System Costs

Deep Gravity Sewer at House Lots	$12 million
Individual Grinder Pumps at House Lots	$9 million
WWPS at County Parcel	$7.1 million + $1.3 million FM = $8.4 million
WWPS at Kuahiwi Contractors	$4.9 million + $2.8 million FM = $7.7 million
Canal Crossing (Tunneled)	$0.7 million
Gravity Sewer from FM to Proposed WWTP	$3.3 million

Table 3: Cost Basis

	Unit Cost
Deep WWPS at County Parcel	$7.1 million
Typical WWPS at Kuahiwi Contractors Parcel	$4.9 million
Gravity Sewers	$1100/LF
Deep Gravity Sewers in Rock	$1600/LF
Deep Sewers (Tunneled)	$7000/LF
Sewer Force Mains (not including tunneled section under canal)	$1000/LF

Note: Cost of individual grinder pump system based on design cost estimate of $5.6 million prepared in 2012 inflated to 2020 at 6% average inflation ($5.6m x 1.06^(2020-2012) = $9 million)

The overall recommendation for the collection system is to use deep gravity sewers for the former Brewer housing area. Two backyard easements would be used to connect four properties to the collection system. These easements have already been surveyed and are located on the south side of TMK 9-5-024:009 and TMK 9-5-024:010. These easements would expedite implementation by avoiding the need for a sewer in the State ROW to serve three of the properties. Two commercial properties requested connection to the new collection system. These were the Punaluu Bake Shop (TMK 9-5-025:037) and Hana Hou Restaurant (TMK 9-5-021:005). These properties can be connected to the collection system via a gravity sewer running down Kaalaiki Road, across the highway, and down Naalehu Spur Road. There are up to an additional fifteen properties that would be newly accessible along this sewer route. The newly accessible house lots along with the newly accessible properties along the sewer to serve the commercial lots brings the total newly accessible properties to 39, exceeding the number identified in the Consent Order. If the WWPS is located on the County parcel, the overall estimated cost of the system would be $24.4 million. If the the WWPS

is located on the Kuahiwi Contractors site, overall estimated cost would be $23.7 million. The recommended collection system options are presented in **Figure 9 and 10**.

If using deep sewers in the former Brewer house lots is not feasible due to subsurface conditions, the estimated cost of the collection system would be $21.4 million if the WWPS is on the County parcel, and $20.7 million if the WWPS is on the Kuahiwi Contractors site. However, there would be added cost for the homeowners with parcels below the road of approximately $850 per year per house to maintain the pumps. A summary of the overall costs is presented in Table 4.

Table 4: Overall Planning Level Cost Estimates

	Deep Gravity Sewers	Individual Pumps
County WWPS at County Parcel	$24.4 million	$21.4 million
County WWPS at Kuahiwi Contractors Site	$23.7 million	$20.7 million

7 COLLECTION SYSTEM PHASING

The collection system can be constructed in phases to expedite the closure of the LCCs. As a minimum, the collection system would have to intercept the existing sewers entering the LCCs and convey the sewage to a pump station. To minimize the need for temporary facilities that would be removed when the collection system is completed in a second phase, it would be beneficial to construct the permanent WWPS as part of Phase 1. Phase 1 would therefore consist of the following:

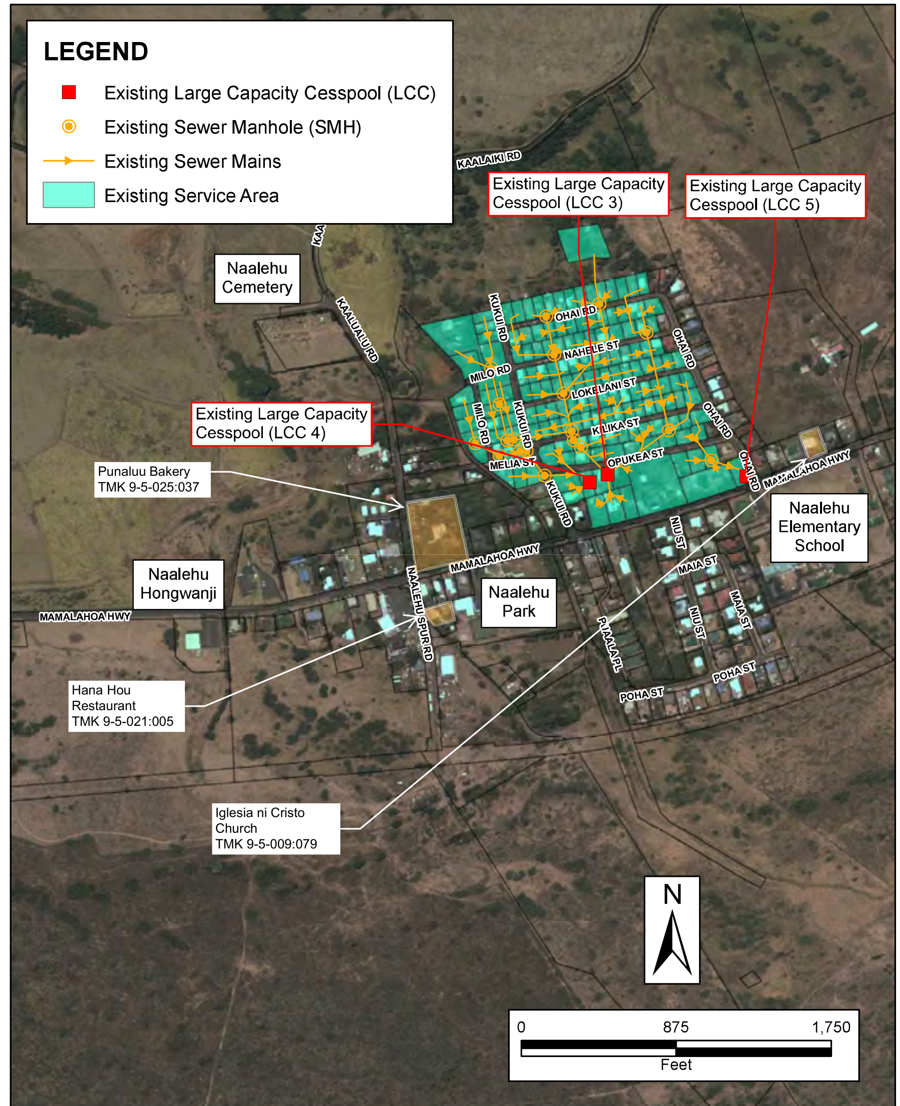
a. Construct Gravity Sewer on Kaalaiki Road and Naalehu Spur Road to the WWTP
b. Construct the WWPS and force main
c. Construct the gravity sewer on Opukea Street and Ohai Road to intercept existing sewers and connect to the WWPS

The sewer system for the proposed Phase 1 is presented in **Figures 11 and 12**. Sub-phases “a” and “b” can be done concurrently; however, intercepting the existing sewer system should be done at the end of Phase 1. This is so that the if there are issues encountered when constructing the sewers, the main WWPS and means of conveying the flow to the WWTP will be in place so that bypass pumping to the WWPS can be used if needed. If the main WWPS and conveyance sewers to the WWTP were not in place, the contractor would have a more difficult time with bypass pumping to the WWTP or would have to truck sewage if a problem occurs. The new WWPS would be close enough to allow temporary piping to be routed from the problem area into the wet well.

The cost to implement Phase 1 would be about $15.3 million with the WWPS on the County parcel, and about $15.1 million with the WWPS on the Kuahiwi Contractors site (not including land acquisition costs). A phased cost summary is presented in Table 5.

Table 5: Phased Cost Summary

	Deep Gravity Sewers		Individual Pumps	
	County Parcel	Kuahiwi Parcel	County Parcel	Kuahiwi Parcel
Phase 1	$15.3 million	$15.1 million	$12.3 million	$12.1 million
Phase 2	$9.1 million	$8.6 million	$6.1 million	$5.6 million
Total	$24.4 million	$23.7 million	$18.4 million	$17.7 million



From:

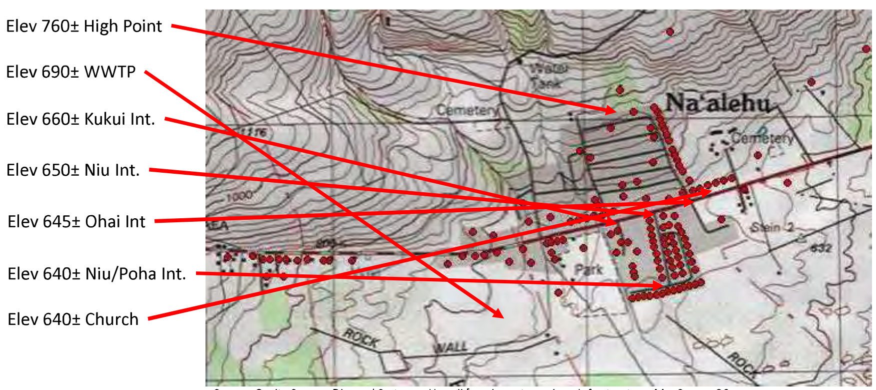
Brown AND Caldwell

SCALE AS SHOWN
JOB NO.: 151494

NAALEHU WASTEWATER TREATMENT PLANT
Existing Naalehu Wastewater System

FIGURE
1

Figure 2: Naalehu Topography



Source: Onsite Sewage Disposal Systems - Hawaii [arcgis_rest_services_Infrastructure_MapServer_26

Figure 3: Possible

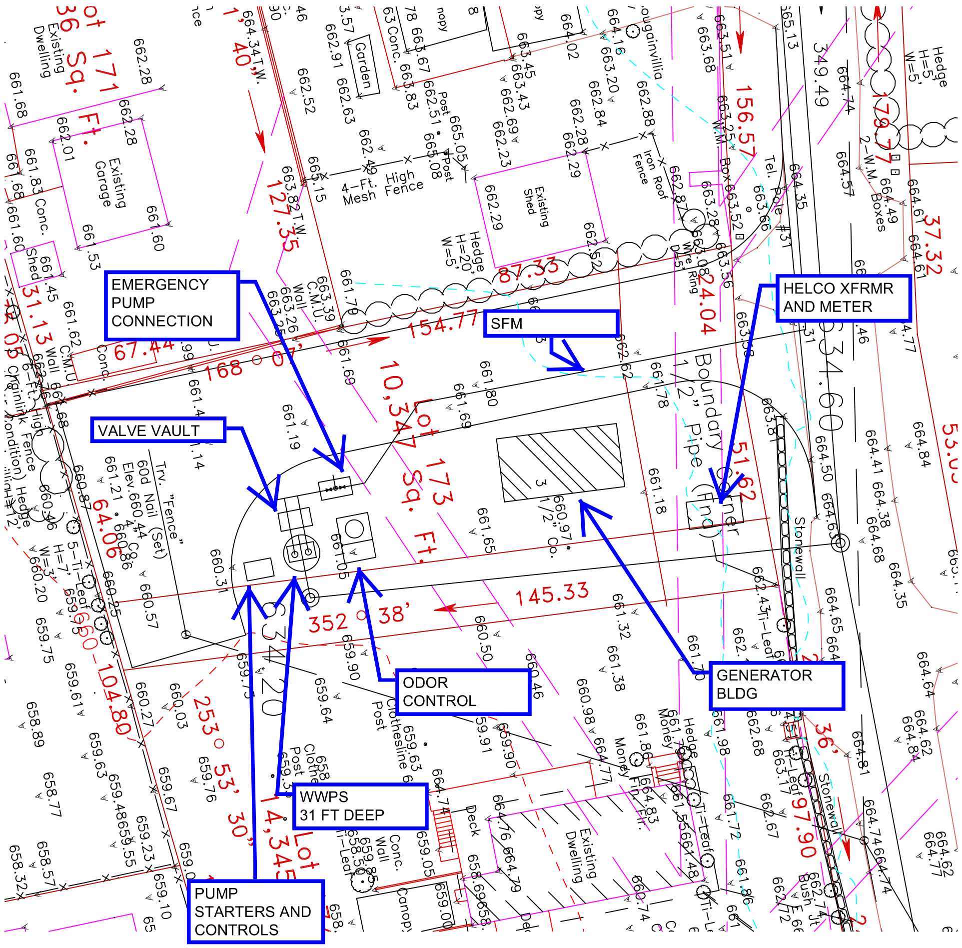


Figure 4
Naalehu Wastewater Collection System
Pump Station Layout on County Parcel

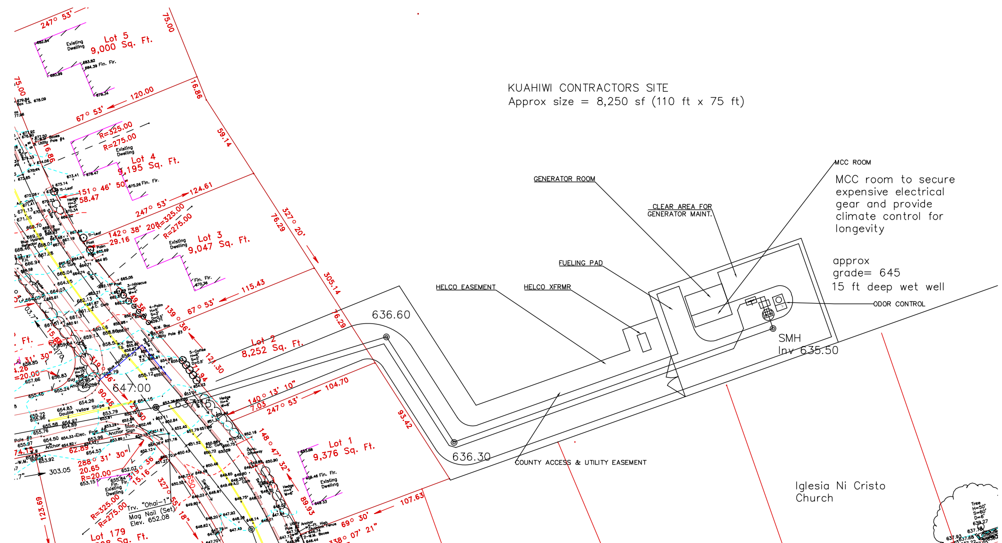


Figure 5
Pump Station on Portion of Kuahiwi Contractors Parcel

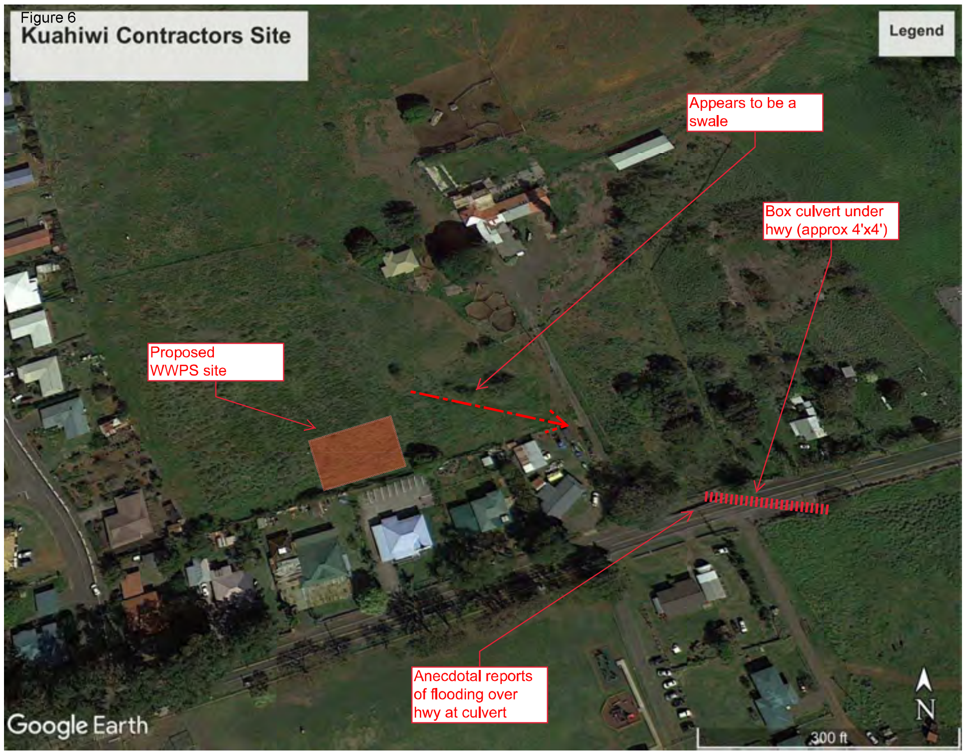


Figure 6
Kuahiwi Contractors Site
Legend
Appears to be a swale
Box culvert under hwy (approx 4'x4')
Proposed WWPS site
Anecdotal reports of flooding over hwy at culvert
Google Earth
300 ft
N

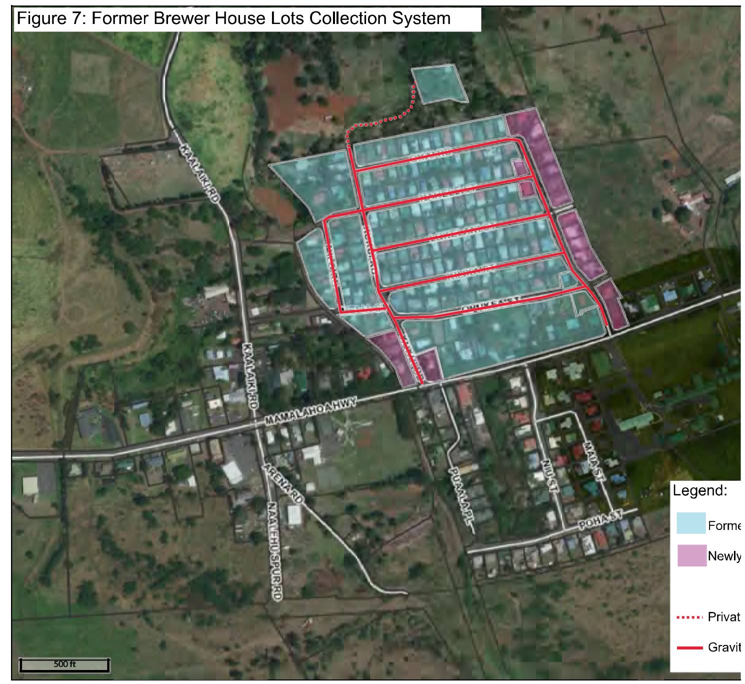


Figure 7: Former Brewer House Lots Collection System
KAALAIKI RD
MAMALAHOA HWY
APENA RD
NAALEHU SPUR RD
PUAALA PL
NIU ST
MAIA ST
POHA ST
Legend:
Forme
Newly
Privat
Gravit
500 ft

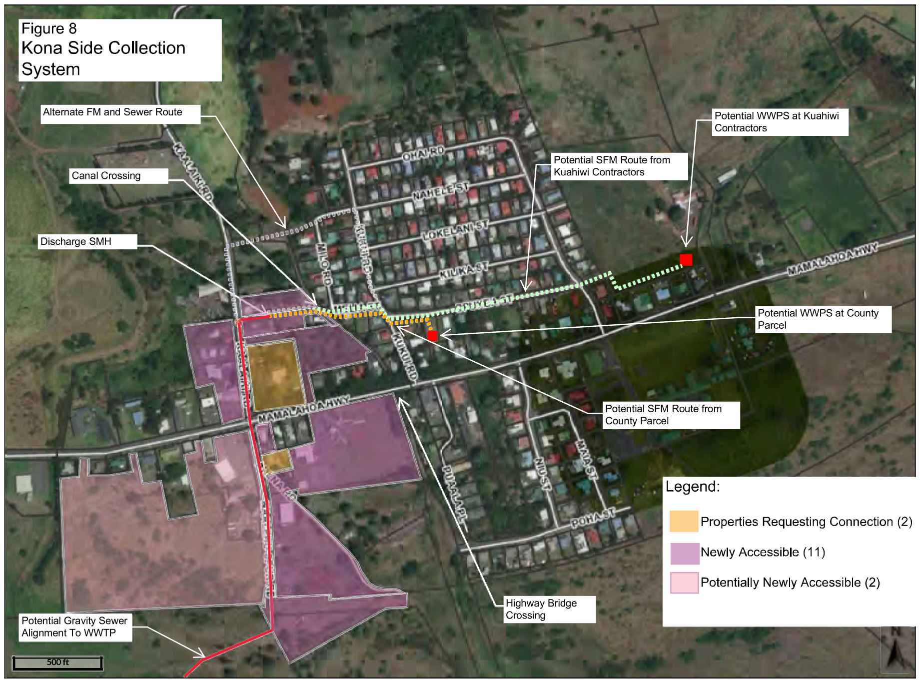


Figure 8
Kona Side Collection System
Alternate FM and Sewer Route
Canal Crossing
Discharge SMH
Potential SFM Route from Kuahiwi Contractors
Potential WWPS at Kuahiwi Contractors
Potential WWPS at County Parcel
Potential SFM Route from County Parcel
Highway Bridge Crossing
Potential Gravity Sewer Alignment To WWTP
MAMALAHOA HWY
OHA RD
NANELE ST
LOKELANI ST
NILIKA ST
MAIA ST
POHA ST
PUAALA PL
Legend:
Properties Requesting Connection (2)
Newly Accessible (11)
Potentially Newly Accessible (2)
500 ft

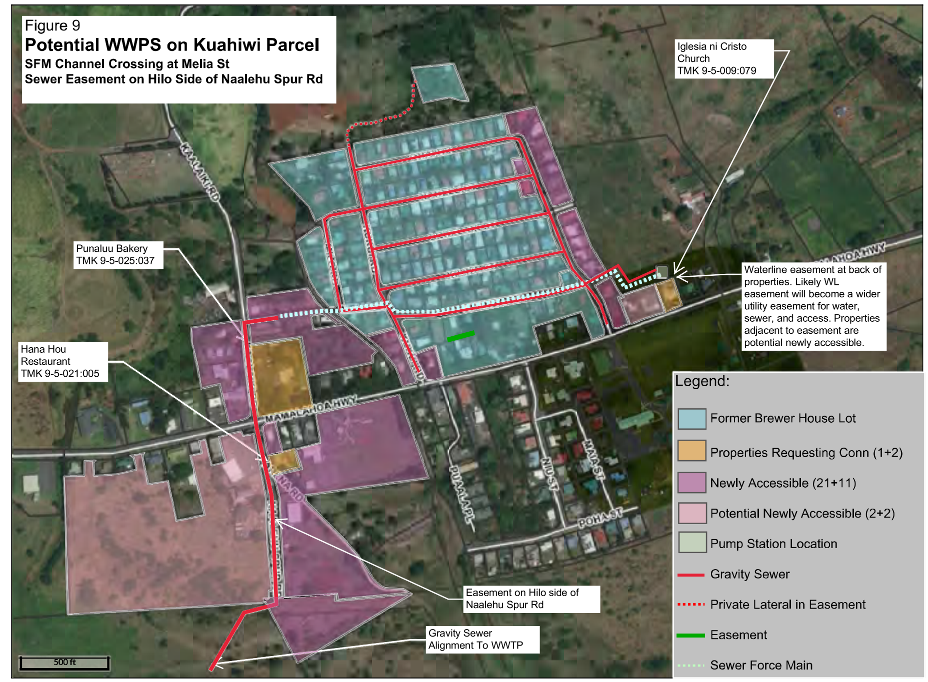
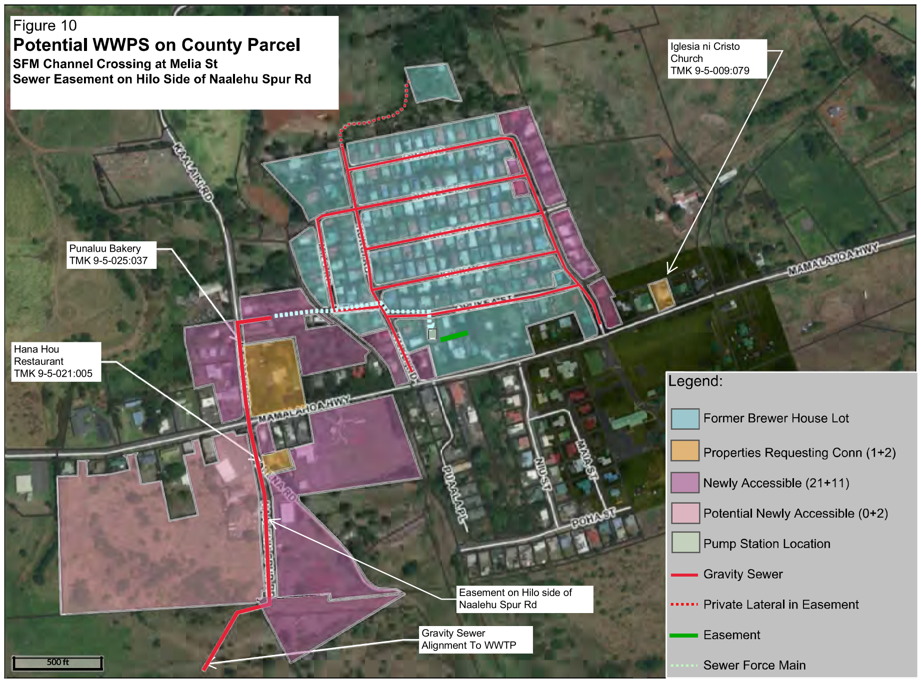
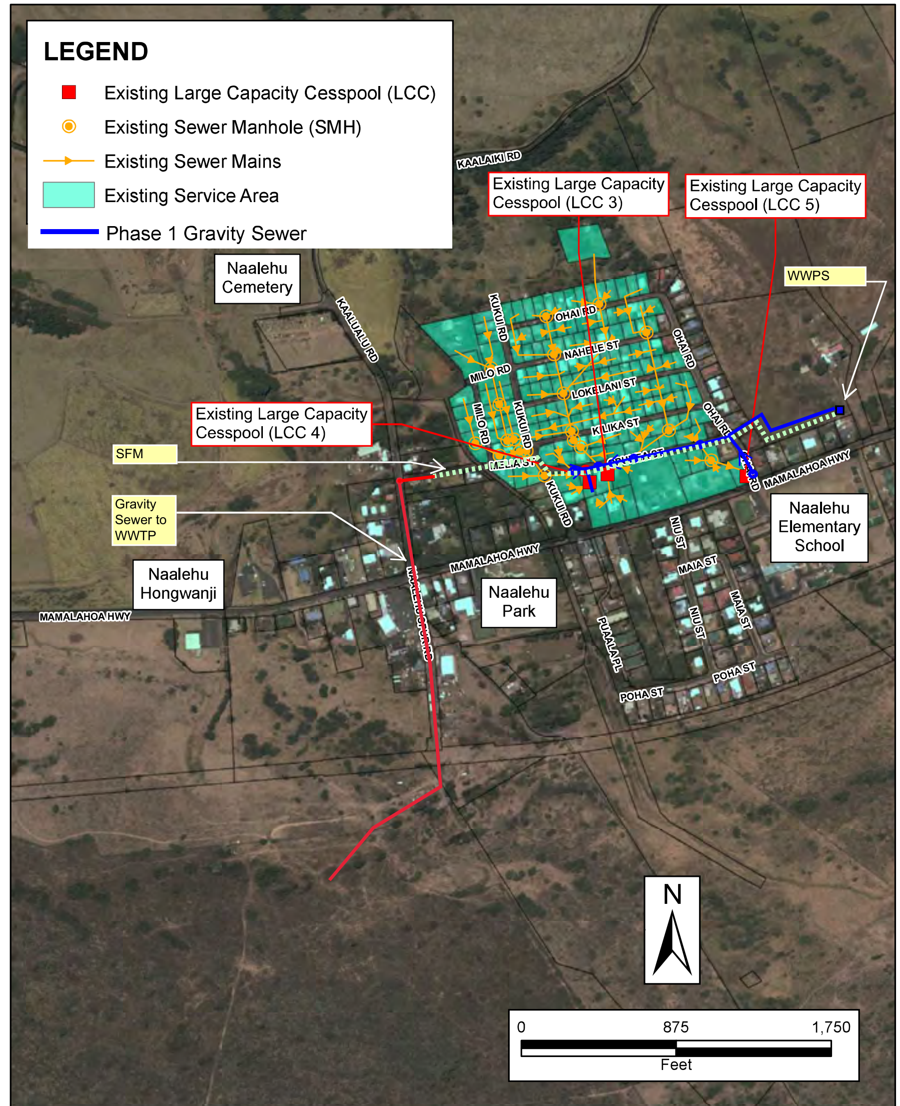
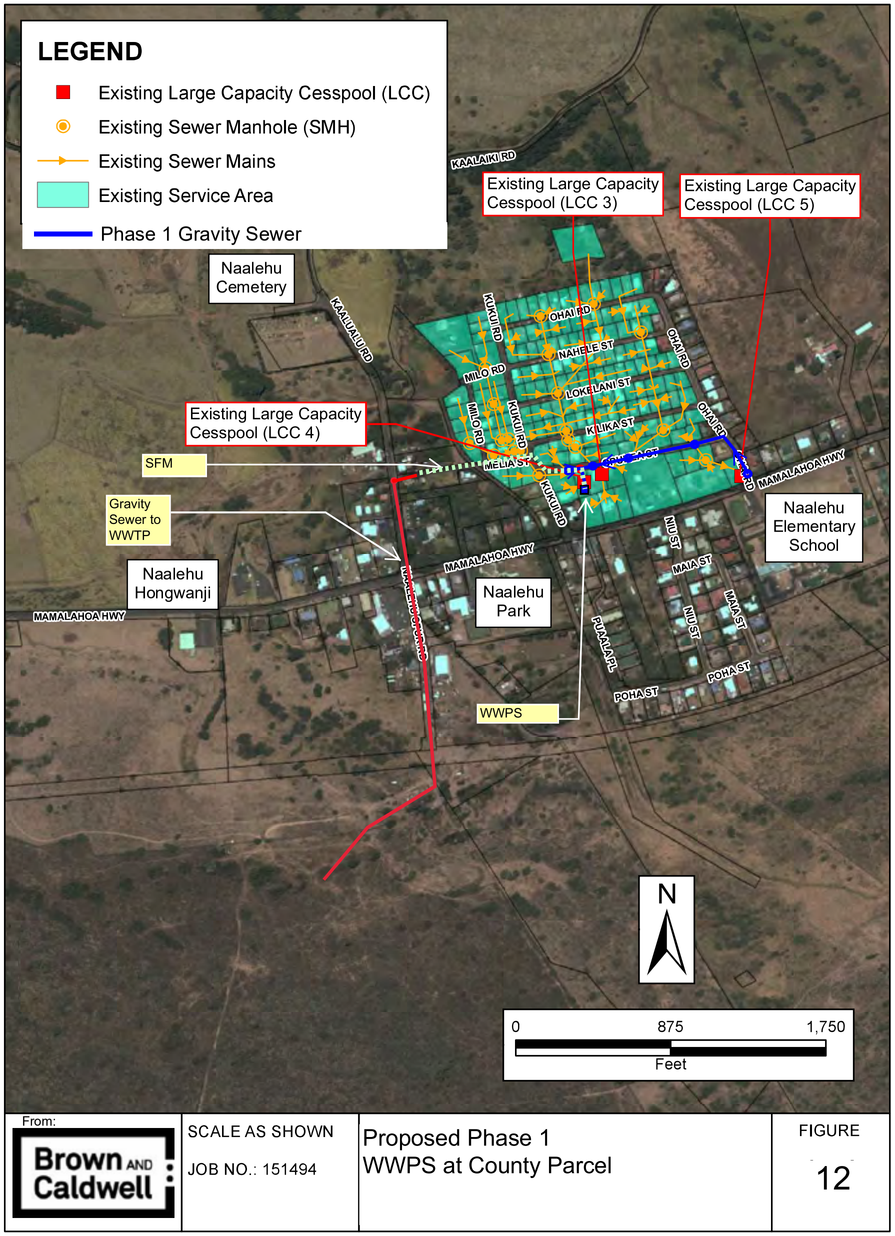


Figure 9
Potential WWPS on Kuahiwi Parcel
SFM Channel Crossing at Melia St
Sewer Easement on Hilo Side of Naalehu Spur Rd
Iglesia ni Cristo Church TMK 9-5-009:079
Waterline easement at back of properties. Likely WL easement will become a wider utility easement for water, sewer, and access. Properties adjacent to easement are potential newly accessible.
Punaluu Bakery TMK 9-5-025:037
Hana Hou Restaurant TMK 9-5-021:005
Easement on Hilo side of Naalehu Spur Rd
Gravity Sewer Alignment To WWTP
MAMALAHOA HWY
MAIA ST
POHA ST
PUAALA PL
Legend:
Former Brewer House Lot
Properties Requesting Conn (1+2)
Newly Accessible (21+11)
Potential Newly Accessible (2+2)
Pump Station Location
Gravity Sewer
Private Lateral in Easement
Easement
Sewer Force Main
500 ft





From:			FIGURE
Brown AND Caldwell	SCALE AS SHOWN JOB NO.: 151494	Proposed Phase 1 WWPS at Kuahiwi Contractors Site	11


LEGEND
Existing Large Capacity Cesspool (LCC)
Existing Sewer Manhole (SMH)
Existing Sewer Mains
Existing Service Area
Phase 1 Gravity Sewer
Naalehu Cemetery
KAALAIKI RD
KAALUALU RD
Existing Large Capacity Cesspool (LCC 3)
Existing Large Capacity Cesspool (LCC 5)
Existing Large Capacity Cesspool (LCC 4)
SFM
Gravity Sewer to WWTP
Naalehu Hongwanji
MAMALAHOA HWY
Naalehu Park
Naalehu Elementary School
WWPS
OHAI RD
NAHELE ST
LOKELANI ST
KILIKA ST
KUKUI RD
MILO RD
MELIA ST
NIU ST
MAIA ST
POHA ST
PUAALA PL
N
0
875
1,750
Feet
From:
Brown AND Caldwell
SCALE AS SHOWN
JOB NO.: 151494
Proposed Phase 1
WWPS at County Parcel
FIGURE
12

Pump Station Option Summary Table

County Parcel Vertical Shaft Machine	$ 7,700,000	*
County Parcel Dig and Shore	$ 7,100,000	
Kuahiwi Site Minimum VSM	$ 6,100,000	* #
Kuahiwi Site Minimum Dig and Shore	$ 4,900,000	#
Kuahiwi Site Large, Dig and Shore	$ 5,600,000	#

Notes:

* Includes full cost of mobilizing VSM to Hawaii. If VSM is used for any other purposes (e.g., trenchless pipe installation, deep SMHs etc.) then mobilization cost will get distributed,

\# Does not include cost of stormwater control that may be required due to flooding issues at SE corner of site

County Parcel
Vertical Shaft Machine (Herrenknecht VSM 8000 at 4.5 m diameter)

DESCRIPTION	QTY	UM	MATERIAL	LABOR	EQUIPMENT	UNIT COST	TOTAL
Mobilization	1	LS				$ 800,000.00	$ 800,000
Clearing and grubbing	10,000	sf		$ 8.00	$ 3.00	$ 11.00	$ 110,000
Machine setup	1	LS				$ 60,000.00	$ 60,000
Wet well shaft	35	ft	$ 15,000.00	$ 12,000.00	$ 3,000.00	$ 30,000.00	$ 1,050,000
Haul Spoils	230	cy		$ 13.00	$ 8.00	$ 21.00	$ 4,830
Septage pumping (keep LCC low)	2	mo	$ 6,000.00	$ 4,800.00	$ 1,500.00	$ 12,300.00	$ 24,600
Septage hauling	2	mo		$ 14,400.00	$ 3,000.00	$ 17,400.00	$ 34,800
Concrete mat foundation	20	cy	$ 750.00	$ 225.00	$ 12.00	$ 987.00	$ 19,740
Wet well structure; 8' dia, 9" wall	31	ft	$ 500.00	$ 100.00	$ 250.00	$ 850.00	$ 26,350
Wet well base	1	ea	$ 1,750.00	$ 800.00	$ 300.00	$ 2,850.00	$ 2,850
Wet well top slab, 12'x12'x10"thk	4	cy	$ 950.00	$ 450.00	$ 85.00	$ 1,485.00	$ 5,940
Wet well hatch, ss and aluminum	1	ea	$ 2,300.00	$ 500.00	$ 90.00	$ 2,890.00	$ 2,890
Wet well interior coating	1000	sf	$ 85.00	$ 20.00	$ 10.00	$ 115.00	$ 115,000
Wet well exterior moisture prot	1045	sf	$ 12.00	$ 10.00	$ 2.00	$ 24.00	$ 25,080
Engineered backfill	140	cy	$ 47.00	$ 42.00	$ 20.00	$ 109.00	$ 15,260
Subm Pumps, 400 gpm, 80 ft TDH	2	ea	$ 3,000.00	$ 1,800.00	$ 180.00	$ 4,980.00	$ 9,960
Disch elbows and guides	2	ea	$ 1,500.00	$ 1,200.00	$ 180.00	$ 2,880.00	$ 5,760
Valve vault structure	1	ea	$ 925.00	$ 250.00	$ 180.00	$ 1,355.00	$ 1,355
Emergency pump conn vault	1	ea	$ 925.00	$ 250.00	$ 180.00	$ 1,355.00	$ 1,355
Gate Valve, 6"	5	ea	$ 910.00	$ 175.00	$ 85.00	$ 1,170.00	$ 5,850
Check valve, 6"	2	ea	$ 1,050.00	$ 175.00	$ 85.00	$ 1,310.00	$ 2,620
Quick connect hose coupling	1	ea	$ 400.00	$ 100.00	$ 85.00	$ 585.00	$ 585
90 bend, FExFE, 6"	3	ea	$ 1,005.00	$ 150.00	$ 85.00	$ 1,240.00	$ 3,720
Tee, FExFE, 6"	1	ea	$ 1,250.00	$ 225.00	$ 85.00	$ 1,560.00	$ 1,560
45 bend, MJ, 6"	4	ea	$ 935.00	$ 150.00	$ 85.00	$ 1,170.00	$ 4,680
Wye, MJ, 6"	2	ea	$ 1,270.00	$ 225.00	$ 85.00	$ 1,580.00	$ 3,160
Plug, MJ, 6"	1	ea	$ 685.00	$ 75.00	$ 85.00	$ 845.00	$ 845
DI pipe, FE, 6"	80	LF	$ 185.00	$ 25.00	$ 15.00	$ 225.00	$ 18,000

DI pipe, MJ, 6"	150	LF	$ 180.00	$ 25.00	$ 15.00	$ 220.00	$ 33,000
Sewer trench excavation, soft	270	cy		$ 25.00	$ 7.00	$ 32.00	$ 8,640
Sewer trench excavation, rock	110	cy		$ 175.00	$ 35.00	$ 210.00	$ 23,100
Haul Spoils	380	cy		$ 13.00	$ 8.00	$ 21.00	$ 7,980
Trench Shoring, 0-10 ft	2200	sf	$ 2.00	$ 5.00	$ 3.00	$ 10.00	$ 22,000
Trench Shoring 10-20 ft	2200	sf	$ 2.50	$ 7.00	$ 3.00	$ 12.50	$ 27,500
Trench Shoring 20-27 ft, rock	1540	sf	$ 3.50	$ 9.00	$ 5.00	$ 17.50	$ 26,950
Septage pumping (keep LCC low)	1.5	mo	$ 6,000.00	$ 4,800.00	$ 1,500.00	$ 12,300.00	$ 18,450
Septage hauling	1.5	mo		$ 14,400.00	$ 3,000.00	$ 17,400.00	$ 26,100
Influent sewer, 14" DI, lined	110	LF	$ 260.00	$ 45.00	$ 25.00	$ 330.00	$ 36,300
Reinf conc jkt	6.3	cy	$ 950.00	$ 350.00	$ 55.00	$ 1,355.00	$ 8,537
CLSM Backfill	285	cy	$ 300.00	$ 5.00	$ 10.00	$ 315.00	$ 89,775
Backfill	41	cy	$ 20.00	$ 42.00	$ 10.00	$ 72.00	$ 2,952
Deep manhole (27 ft)	1	ea	$ 7,500.00	$ 3,300.00	$ 1,500.00	$ 12,300.00	$ 12,300
Manhole interior coating	355	sf	$ 85.00	$ 20.00	$ 10.00	$ 115.00	$ 40,825
SMH exterior moisture protection	410	sf	$ 12.00	$ 10.00	$ 2.00	$ 24.00	$ 9,840
Odor control unit	1	ea	$ 7,150.00	$ 6,000.00	$ 400.00	$ 13,550.00	$ 13,550
Generator Bldg	320	sf	$ 250.00	$ 265.00	$ 10.00	$ 525.00	$ 168,000
Roofing membrane	5.8	sq	$ 3,000.00	$ 2,000.00	$ 170.00	$ 5,170.00	$ 29,986
Block sealant and paint	700	sf	$ 11.00	$ 10.00	$ 4.00	$ 25.00	$ 17,500
Acoustic insulation	700	sf	$ 90.00	$ 20.00	$ 5.00	$ 115.00	$ 80,500
Acoustic louvers	144	sf	$ 245.00	$ 50.00	$ 60.00	$ 355.00	$ 51,120
Generator w/base mounted tank	1	ea	$ 127,000.00	$ 35,000.00	$ 800.00	$ 162,800.00	$ 162,800
Conc inertia pad for generator	6	cy	$ 950.00	$ 450.00	$ 85.00	$ 1,485.00	$ 8,910
Conc fueling pad	3.5	cy	$ 750.00	$ 225.00	$ 12.00	$ 987.00	$ 3,455
Pervious pavement road	5000	sf	$ 50.00	$ 30.00	$ 9.00	$ 89.00	$ 445,000
3' Grade adjustment wall	360	LF	$ 625.00	$ 475.00	$ 5.00	$ 1,105.00	$ 397,800
Fence	426	LF	$ 45.00	$ 35.00	$ 5.00	$ 85.00	$ 36,210
Gate	1	ea	$ 950.00	$ 500.00	$ 30.00	$ 1,480.00	$ 1,480
2" water service	120	LF	$ 75.00	$ 9.00	$ 2.00	$ 86.00	$ 10,320
2" water meter box	1	ea	$ 250.00	$ 200.00	$ 15.00	$ 465.00	$ 465
Water meter	1	LS				$ 1,500.00	$ 1,500

General civil site work	10000	sf				$ 20.00	$ 200,000
HELCO xfrmr and fees	1	LS				$ 125,000.00	$ 125,000
SCADA and security system	1	LS				$ 95,000.00	$ 95,000
Electrical, incl instrumentation	1	LS				$ 377,310.60	$ 377,311
Adder for deeper sewers	2000	lf	$ 105.00	$ 235.00	$ 125.00	$ 465.00	$ 930,000
						SUBTOTAL	$ 5,906,945
						CONTINGENCY (30%)	$ 1,772,083
						TOTAL	$ 7,679,028

County Parcel
Conventional Dig and Shore

DESCRIPTION	QTY	UM	MATERIAL	LABOR	EQUIPMENT	UNIT COST	TOTAL
Mobilization	1	LS				$ -	$ -
Clearing and grubbing	10,000	sf		$ 8.00	$ 3.00	$ 11.00	$ 110,000
Mud walls for water control	75	cy	$ 600.00	$ 200.00	$ 200.00	$ 1,000.00	$ 75,000
Excavation soft material	296	cy		$ 164.71	$ 85.00	$ 249.71	$ 73,914
Excavation rock	80	cy		$ 500.00	$ 175.00	$ 675.00	$ 54,000
Haul Spoils	376	cy		$ 13.00	$ 8.00	$ 21.00	$ 7,896
Septage pumping (keep LCC low)	4	mo	$ 6,000.00	$ 4,800.00	$ 1,500.00	$ 12,300.00	$ 49,200
Septage hauling	4	mo		$ 14,400.00	$ 3,000.00	$ 17,400.00	$ 69,600
Shoring, 0-10 ft	800	sf	$ 45.00	$ 200.00	$ 120.00	$ 365.00	$ 292,000
Shoring 10-20 ft	640	sf	$ 65.00	$ 320.00	$ 200.00	$ 585.00	$ 374,400
Shoring 20-35 ft, rock	720	sf	$ 160.00	$ 320.00	$ 225.00	$ 705.00	$ 507,600
Concrete mat foundation	20	cy	$ 750.00	$ 225.00	$ 12.00	$ 987.00	$ 19,740
Wet well structure; 8' dia, 9" wall	31	ft	$ 500.00	$ 100.00	$ 250.00	$ 850.00	$ 26,350
Wet well base	1	ea	$ 1,750.00	$ 800.00	$ 300.00	$ 2,850.00	$ 2,850
Wet well top slab, 12'x12'x10"thk	4	cy	$ 950.00	$ 450.00	$ 85.00	$ 1,485.00	$ 5,940
Wet well hatch, ss and aluminum	1	ea	$ 2,300.00	$ 500.00	$ 90.00	$ 2,890.00	$ 2,890
Wet well interior coating	1000	sf	$ 85.00	$ 20.00	$ 10.00	$ 115.00	$ 115,000
Wet well exterior moisture prot	1045	sf	$ 12.00	$ 10.00	$ 2.00	$ 24.00	$ 25,080
Engineered backfill	295	cy	$ 47.00	$ 42.00	$ 20.00	$ 109.00	$ 32,155
Subm Pumps, 400 gpm, 80 ft TDH	2	ea	$ 3,000.00	$ 1,800.00	$ 180.00	$ 4,980.00	$ 9,960
Disch elbows and guides	2	ea	$ 1,500.00	$ 1,200.00	$ 180.00	$ 2,880.00	$ 5,760
Valve vault structure	1	ea	$ 925.00	$ 250.00	$ 180.00	$ 1,355.00	$ 1,355
Emergency pump conn vault	1	ea	$ 925.00	$ 250.00	$ 180.00	$ 1,355.00	$ 1,355
Gate Valve, 6"	5	ea	$ 910.00	$ 175.00	$ 85.00	$ 1,170.00	$ 5,850
Check valve, 6"	2	ea	$ 1,050.00	$ 175.00	$ 85.00	$ 1,310.00	$ 2,620
Quick connect hose coupling	1	ea	$ 400.00	$ 100.00	$ 85.00	$ 585.00	$ 585
90 bend, FExFE, 6"	3	ea	$ 1,005.00	$ 150.00	$ 85.00	$ 1,240.00	$ 3,720
Tee, FExFE, 6"	1	ea	$ 1,250.00	$ 225.00	$ 85.00	$ 1,560.00	$ 1,560
45 bend, MJ, 6"	4	ea	$ 935.00	$ 150.00	$ 85.00	$ 1,170.00	$ 4,680
Wye, MJ, 6"	2	ea	$ 1,270.00	$ 225.00	$ 85.00	$ 1,580.00	$ 3,160
Plug, MJ, 6"	1	ea	$ 685.00	$ 75.00	$ 85.00	$ 845.00	$ 845
DI pipe, FE, 6"	80	LF	$ 185.00	$ 25.00	$ 15.00	$ 225.00	$ 18,000
DI pipe, MJ, 6"	150	LF	$ 180.00	$ 25.00	$ 15.00	$ 220.00	$ 33,000
Sewer trench excavation, soft	270	cy		$ 25.00	$ 7.00	$ 32.00	$ 8,640
Sewer trench excavation, rock	110	cy		$ 175.00	$ 35.00	$ 210.00	$ 23,100
Haul Spoils	380	cy		$ 13.00	$ 8.00	$ 21.00	$ 7,980
Trench Shoring, 0-10 ft	2200	sf	$ 2.00	$ 5.00	$ 3.00	$ 10.00	$ 22,000
Trench Shoring 10-20 ft	2200	sf	$ 2.50	$ 7.00	$ 3.00	$ 12.50	$ 27,500
Trench Shoring 20-27 ft, rock	1540	sf	$ 3.50	$ 9.00	$ 5.00	$ 17.50	$ 26,950
Septage pumping (keep LCC low)	1.5	mo	$ 6,000.00	$ 4,800.00	$ 1,500.00	$ 12,300.00	$ 18,450
Septage hauling	1.5	mo		$ 14,400.00	$ 3,000.00	$ 17,400.00	$ 26,100
Influent sewer, 14" DI, lined	110	LF	$ 260.00	$ 45.00	$ 25.00	$ 330.00	$ 36,300
Reinf conc jkt	6.3	cy	$ 950.00	$ 350.00	$ 55.00	$ 1,355.00	$ 8,537
CLSM Backfill	285	cy	$ 300.00	$ 5.00	$ 10.00	$ 315.00	$ 89,775
Backfill	41	cy	$ 20.00	$ 42.00	$ 10.00	$ 72.00	$ 2,952
Deep manhole (27 ft)	1	ea	$ 7,500.00	$ 3,300.00	$ 1,500.00	$ 12,300.00	$ 12,300
Manhole interior coating	355	sf	$ 85.00	$ 20.00	$ 10.00	$ 115.00	$ 40,825
SMH exterior moisture protection	410	sf	$ 12.00	$ 10.00	$ 2.00	$ 24.00	$ 9,840
Odor control unit	1	ea	$ 7,150.00	$ 6,000.00	$ 400.00	$ 13,550.00	$ 13,550
Generator Bldg	320	sf	$ 250.00	$ 265.00	$ 10.00	$ 525.00	$ 168,000
Roofing membrane	5.8	sq	$ 3,000.00	$ 2,000.00	$ 170.00	$ 5,170.00	$ 29,986
Block sealant and paint	700	sf	$ 11.00	$ 10.00	$ 4.00	$ 25.00	$ 17,500
Acoustic insulation	700	sf	$ 90.00	$ 20.00	$ 5.00	$ 115.00	$ 80,500
Acoustic louvers	144	sf	$ 245.00	$ 50.00	$ 60.00	$ 355.00	$ 51,120
Generator w/base mounted tank	1	ea	$ 127,000.00	$ 35,000.00	$ 800.00	$ 162,800.00	$ 162,800
Conc inertia pad for generator	6	cy	$ 950.00	$ 450.00	$ 85.00	$ 1,485.00	$ 8,910
Conc fueling pad	3.5	cy	$ 750.00	$ 225.00	$ 12.00	$ 987.00	$ 3,455
Pervious pavement road	5000	sf	$ 50.00	$ 30.00	$ 9.00	$ 89.00	$ 445,000
3' Grade adjustment wall	360	LF	$ 625.00	$ 475.00	$ 5.00	$ 1,105.00	$ 397,800
Fence	426	LF	$ 45.00	$ 35.00	$ 5.00	$ 85.00	$ 36,210

Gate	1	ea	$ 950.00	$ 500.00	$ 30.00	$ 1,480.00	$ 1,480
2" water service	120	LF	$ 75.00	$ 9.00	$ 2.00	$ 86.00	$ 10,320
2" water meter box	1	ea	$ 250.00	$ 200.00	$ 15.00	$ 465.00	$ 465
Water meter	1	LS				$ 1,500.00	$ 1,500
General civil site work	10000	sf				$ 20.00	$ 200,000
HELCO xfrmr and fees	1	LS				$ 125,000.00	$ 125,000
SCADA and security system	1	LS				$ 95,000.00	$ 95,000
Electrical, incl instrumentation	1	LS				$ 379,844.85	$ 379,845
Adder for deeper sewers	2000	lf	$ 105.00	$ 235.00	$ 125.00	$ 465.00	$ 930,000
						SUBTOTAL	$ 5,455,754
						CONTINGENCY (30%)	$ 1,636,726
						TOTAL	$ 7,092,480

Kuahiwi Contractors Site, Minimum
Vertical Shaft Machine (Herrenknecht VSM 8000 at 4.5 m diameter)

DESCRIPTION	QTY	UM	MATERIAL	LABOR	EQUIPMENT	UNIT COST	TOTAL
Mobilization	1	LS				$800,000.00	$800,000
Clearing and grubbing	8,000	sf		$8.00	$3.00	$11.00	$88,000
Machine setup	1	LS				$60,000.00	$60,000
Wet well shaft	18	ft	$15,000.00	$12,000.00	$3,000.00	$30,000.00	$540,000
Haul Spoils	103	cy		$13.00	$8.00	$21.00	$2,163
Concrete mat foundation	20	cy	$750.00	$225.00	$12.00	$987.00	$19,740
Wet well structure; 8' dia, 9" wall	15	ft	$500.00	$100.00	$250.00	$850.00	$12,750
Wet well base	1	ea	$1,750.00	$800.00	$300.00	$2,850.00	$2,850
Wet well top slab, 12'x12'x10"thk	4	cy	$950.00	$450.00	$85.00	$1,485.00	$5,940
Wet well hatch, ss and aluminum	1	ea	$2,300.00	$500.00	$90.00	$2,890.00	$2,890
Wet well interior coating	500	sf	$85.00	$20.00	$10.00	$115.00	$57,500
Wet well exterior moisture prot	440	sf	$12.00	$10.00	$2.00	$24.00	$10,560
Engineered backfill	64	cy	$47.00	$42.00	$20.00	$109.00	$6,976
Subm Pumps, 400 gpm, 80 ft TDH	2	ea	$3,000.00	$1,800.00	$180.00	$4,980.00	$9,960
Disch elbows and guides	2	ea	$1,500.00	$1,200.00	$180.00	$2,880.00	$5,760
Valve vault structure	1	ea	$925.00	$250.00	$180.00	$1,355.00	$1,355
Emergency pump conn vault	1	ea	$925.00	$250.00	$180.00	$1,355.00	$1,355
Gate Valve, 6"	5	ea	$910.00	$175.00	$85.00	$1,170.00	$5,850
Check valve, 6"	2	ea	$1,050.00	$175.00	$85.00	$1,310.00	$2,620
Quick connect hose coupling	1	ea	$400.00	$100.00	$85.00	$585.00	$585
90 bend, FExFE, 6"	3	ea	$1,005.00	$150.00	$85.00	$1,240.00	$3,720
Tee, FExFE, 6"	1	ea	$1,250.00	$225.00	$85.00	$1,560.00	$1,560
45 bend, MJ, 6"	4	ea	$935.00	$150.00	$85.00	$1,170.00	$4,680
Wye, MJ, 6"	2	ea	$1,270.00	$225.00	$85.00	$1,580.00	$3,160
Plug, MJ, 6"	1	ea	$685.00	$75.00	$85.00	$845.00	$845
DI pipe, FE, 6"	80	LF	$185.00	$25.00	$15.00	$225.00	$18,000
DI pipe, MJ, 6"	150	LF	$180.00	$25.00	$15.00	$220.00	$33,000

Sewer trench excavation, soft	700	cy		$ 25.00	$ 7.00	$ 32.00	$ 22,400
Sewer trench excavation, rock	0	cy		$ 175.00	$ 35.00	$ 210.00	$ -
Haul Spoils	700	cy		$ 13.00	$ 8.00	$ 21.00	$ 14,700
Trench Shoring, 0-10 ft	9400	sf	$ 2.00	$ 5.00	$ 3.00	$ 10.00	$ 94,000
Trench Shoring 10-20 ft	1880	sf	$ 2.50	$ 7.00	$ 3.00	$ 12.50	$ 23,500
Trench Shoring 20-27 ft, rock	0	sf	$ 3.50	$ 9.00	$ 5.00	$ 17.50	$ -
Septage pumping (keep LCC low)	0	mo	$ 6,000.00	$ 4,800.00	$ 1,500.00	$ 12,300.00	$ -
Septage hauling	0	mo		$ 14,400.00	$ 3,000.00	$ 17,400.00	$ -
Influent sewer, 14" DI, lined	470	LF	$ 260.00	$ 45.00	$ 25.00	$ 330.00	$ 155,100
Reinf conc jkt	0	cy	$ 950.00	$ 350.00	$ 55.00	$ 1,355.00	$ -
CLSM Backfill	0	cy	$ 300.00	$ 5.00	$ 10.00	$ 315.00	$ -
Engineered Backfill	41	cy	$ 47.00	$ 42.00	$ 20.00	$ 109.00	$ 4,469
Manhole (10 ft)	3	ea	$ 3,900.00	$ 1,800.00	$ 600.00	$ 6,300.00	$ 18,900
Manhole interior coating	180	sf	$ 85.00	$ 20.00	$ 10.00	$ 115.00	$ 20,700
SMH exterior moisture protection	152	sf	$ 12.00	$ 10.00	$ 2.00	$ 24.00	$ 3,648
SFM trench excavation, soft	0	cy		$ 25.00	$ 7.00	$ 32.00	$ -
Haul Spoils	0	cy		$ 13.00	$ 8.00	$ 21.00	$ -
Trench Shoring, 0-10 ft	0	sf	$ 2.00	$ 5.00	$ 3.00	$ 10.00	$ -
SFM, 6" DI, coated and lined	0	LF	$ 180.00	$ 25.00	$ 15.00	$ 220.00	$ -
Engineered Backfill	0	cy	$ 47.00	$ 42.00	$ 20.00	$ 109.00	$ -
Odor control unit	1	ea	$7,150.00	$6,000.00	$400.00	$13,550.00	$13,550
Generator Bldg	520	sf	$250.00	$265.00	$10.00	$525.00	$273,000
Roofing membrane	8.4	sq	$3,000.00	$2,000.00	$170.00	$5,170.00	$43,428
Block sealant and paint	1105	sf	$11.00	$10.00	$4.00	$25.00	$27,625
Acoustic insulation	700	sf	$90.00	$20.00	$5.00	$115.00	$80,500
Acoustic louvers	144	sf	$245.00	$50.00	$60.00	$355.00	$51,120
Generator w/base mounted tank	1	ea	$127,000.00	$35,000.00	$800.00	$162,800.00	$162,800
Conc inertia pad for generator	6	cy	$950.00	$450.00	$85.00	$1,485.00	$8,910
Conc fueling pad	3.5	cy	$750.00	$225.00	$12.00	$987.00	$3,455
Pervious pavement road	5000	sf	$ 50.00	$ 30.00	$ 9.00	$89.00	$445,000
3' Grade adjustment wall	370	LF	$ 625.00	$ 475.00	$ 5.00	$1,105.00	$408,850
Fence	360	LF	$45.00	$35.00	$5.00	$85.00	$30,600

Gate	1	ea	$950.00	$500.00	$30.00	$1,480.00	$1,480
6" water service	500	LF	$ 120.00	$ 25.00	$ 15.00	$ 160.00	$ 80,000
6" detector check in vault	1	ea	$ 8,000.00	$ 6,000.00	$ 1,000.00	$ 15,000.00	$ 15,000
Fire standpipe	1	ea	$ 1,500.00	$ 900.00	$ 20.00	$ 2,420.00	$ 2,420
2" water service	120	LF	$ 75.00	$ 9.00	$ 2.00	$ 86.00	$ 10,320
2" water meter box	1	ea	$ 250.00	$ 200.00	$ 15.00	$ 465.00	$ 465
Water meter	1	LS				$ 1,500.00	$ 1,500
General civil site work	8000	sf				$20.00	$160,000
HELCO xfrmr and fees	1	LS				$225,000.00	$225,000
SCADA and security system	1	LS				$95,000.00	$95,000
Electrical, incl instrumentation	1	LS				$406,364.33	$406,364
Additional gravel road	17,000	sf	$1.75	$1.60	$0.75	$4.10	$69,700
						SUBTOTAL	$4,675,323
						CONTINGENCY (30%)	$1,402,597
						TOTAL	$6,077,920

Kuahiwi Contractors Site, Minimum
Conventional Dig and Shore

DESCRIPTION	QTY	UM	MATERIAL	LABOR	EQUIPMENT	UNIT COST	TOTAL
Mobilization	1	LS				$ -	$ -
Clearing and grubbing	8,000	sf		$ 8.00	$ 3.00	$ 11.00	$ 88,000
Excavation soft material	175	cy		$ 164.71	$ 85.00	$ 249.71	$ 43,699
Excavation rock	0	cy		$ 500.00	$ 175.00	$ 675.00	$ -
Haul Spoils	175	cy		$ 13.00	$ 8.00	$ 21.00	$ 3,675
Shoring, 0-10 ft	640	sf	$ 45.00	$ 200.00	$ 120.00	$ 365.00	$ 233,600
Shoring 10-18 ft	384	sf	$ 65.00	$ 320.00	$ 200.00	$ 585.00	$ 224,640
Shoring 20-35 ft, rock	0	sf	$ 160.00	$ 320.00	$ 225.00	$ 705.00	$ -
Concrete mat foundation	20	cy	$ 750.00	$ 225.00	$ 12.00	$ 987.00	$ 19,740
Wet well structure; 8' dia, 9" wall	15	ft	$ 500.00	$ 100.00	$ 250.00	$ 850.00	$ 12,750
Wet well base	1	ea	$ 1,750.00	$ 800.00	$ 300.00	$ 2,850.00	$ 2,850
Wet well top slab, 12'x12'x10"thk	4	cy	$ 950.00	$ 450.00	$ 85.00	$ 1,485.00	$ 5,940
Wet well hatch, ss and aluminum	1	ea	$ 2,300.00	$ 500.00	$ 90.00	$ 2,890.00	$ 2,890
Wet well interior coating	480	sf	$ 85.00	$ 20.00	$ 10.00	$ 115.00	$ 55,200
Wet well exterior moisture prot	445	sf	$ 12.00	$ 10.00	$ 2.00	$ 24.00	$ 10,680
Engineered backfill	136	cy	$ 47.00	$ 42.00	$ 20.00	$ 109.00	$ 14,824
Subm Pumps, 400 gpm, 80 ft TDH	2	ea	$ 3,000.00	$ 1,800.00	$ 180.00	$ 4,980.00	$ 9,960
Disch elbows and guides	2	ea	$ 1,500.00	$ 1,200.00	$ 180.00	$ 2,880.00	$ 5,760
Valve vault structure	1	ea	$ 925.00	$ 250.00	$ 180.00	$ 1,355.00	$ 1,355
Emergency pump conn vault	1	ea	$ 925.00	$ 250.00	$ 180.00	$ 1,355.00	$ 1,355
Gate Valve, 6"	5	ea	$ 910.00	$ 175.00	$ 85.00	$ 1,170.00	$ 5,850
Check valve, 6"	2	ea	$ 1,050.00	$ 175.00	$ 85.00	$ 1,310.00	$ 2,620
Quick connect hose coupling	1	ea	$ 400.00	$ 100.00	$ 85.00	$ 585.00	$ 585
90 bend, FExFE, 6"	3	ea	$ 1,005.00	$ 150.00	$ 85.00	$ 1,240.00	$ 3,720
Tee, FExFE, 6"	1	ea	$ 1,250.00	$ 225.00	$ 85.00	$ 1,560.00	$ 1,560
45 bend, MJ, 6"	4	ea	$ 935.00	$ 150.00	$ 85.00	$ 1,170.00	$ 4,680
Wye, MJ, 6"	2	ea	$ 1,270.00	$ 225.00	$ 85.00	$ 1,580.00	$ 3,160
Plug, MJ, 6"	1	ea	$ 685.00	$ 75.00	$ 85.00	$ 845.00	$ 845
DI pipe, FE, 6"	80	LF	$ 185.00	$ 25.00	$ 15.00	$ 225.00	$ 18,000
DI pipe, MJ, 6"	150	LF	$ 180.00	$ 25.00	$ 15.00	$ 220.00	$ 33,000
Sewer trench excavation, soft	700	cy		$ 25.00	$ 7.00	$ 32.00	$ 22,400
Sewer trench excavation, rock	0	cy		$ 175.00	$ 35.00	$ 210.00	$ -
Haul Spoils	700	cy		$ 13.00	$ 8.00	$ 21.00	$ 14,700
Trench Shoring, 0-10 ft	9400	sf	$ 2.00	$ 5.00	$ 3.00	$ 10.00	$ 94,000
Trench Shoring 10-20 ft	1880	sf	$ 2.50	$ 7.00	$ 3.00	$ 12.50	$ 23,500
Trench Shoring 20-27 ft, rock	0	sf	$ 3.50	$ 9.00	$ 5.00	$ 17.50	$ -
Septage pumping (keep LCC low)	0	mo	$ 6,000.00	$ 4,800.00	$ 1,500.00	$ 12,300.00	$ -
Septage hauling	0	mo		$ 14,400.00	$ 3,000.00	$ 17,400.00	$ -
Influent sewer, 14" DI, lined	470	LF	$ 260.00	$ 45.00	$ 25.00	$ 330.00	$ 155,100
Reinf conc jkt	0	cy	$ 950.00	$ 350.00	$ 55.00	$ 1,355.00	$ -
CLSM Backfill	0	cy	$ 300.00	$ 5.00	$ 10.00	$ 315.00	$ -
Engineered Backfill	41	cy	$ 47.00	$ 42.00	$ 20.00	$ 109.00	$ 4,469
Manhole (10 ft)	3	ea	$ 3,900.00	$ 1,800.00	$ 600.00	$ 6,300.00	$ 18,900
Manhole interior coating	180	sf	$ 85.00	$ 20.00	$ 10.00	$ 115.00	$ 20,700
SMH exterior moisture protection	152	sf	$ 12.00	$ 10.00	$ 2.00	$ 24.00	$ 3,648
SFM trench excavation, soft	0	cy		$ 25.00	$ 7.00	$ 32.00	$ -
Haul Spoils	0	cy		$ 13.00	$ 8.00	$ 21.00	$ -
Trench Shoring, 0-10 ft	0	sf	$ 2.00	$ 5.00	$ 3.00	$ 10.00	$ -
SFM, 6" DI, coated and lined	0	LF	$ 180.00	$ 25.00	$ 15.00	$ 220.00	$ -
Engineered Backfill	0	cy	$ 47.00	$ 42.00	$ 20.00	$ 109.00	$ -
Odor control unit	1	ea	$ 7,150.00	$ 6,000.00	$ 400.00	$ 13,550.00	$ 13,550
Generator Bldg	520	sf	$ 250.00	$ 265.00	$ 10.00	$ 525.00	$ 273,000
Roofing membrane	8.4	sq	$ 3,000.00	$ 2,000.00	$ 170.00	$ 5,170.00	$ 43,428
Block sealant and paint	1105	sf	$ 11.00	$ 10.00	$ 4.00	$ 25.00	$ 27,625
Acoustic insulation	700	sf	$ 90.00	$ 20.00	$ 5.00	$ 115.00	$ 80,500
Acoustic louvers	144	sf	$ 245.00	$ 50.00	$ 60.00	$ 355.00	$ 51,120
Generator w/base mounted tank	1	ea	$ 127,000.00	$ 35,000.00	$ 800.00	$ 162,800.00	$ 162,800
Conc inertia pad for generator	6	cy	$ 950.00	$ 450.00	$ 85.00	$ 1,485.00	$ 8,910
Conc fueling pad	3.5	cy	$ 750.00	$ 225.00	$ 12.00	$ 987.00	$ 3,455

Kuahiwi Contractors Site, Large
Conventional Dig and Shore

DESCRIPTION	QTY	UM	MATERIAL	LABOR	EQUIPMENT	UNIT COST	TOTAL
Mobilization	1	LS				$0.00	$ -
Clearing and grubbing	8,000	sf		$8.00	$3.00	$11.00	$ 88,000
Excavation soft material	175	cy		$164.71	$85.00	$249.71	$ 43,699
Excavation rock	0	cy		$500.00	$175.00	$675.00	$ -
Haul Spoils	175	cy		$13.00	$8.00	$21.00	$ 3,675
Shoring, 0-10 ft	640	sf	$45.00	$200.00	$120.00	$365.00	$ 233,600
Shoring 10-18 ft	384	sf	$65.00	$320.00	$200.00	$585.00	$ 224,640
Shoring 20-35 ft, rock	0	sf	$160.00	$320.00	$225.00	$705.00	$ -
Concrete mat foundation	20	cy	$750.00	$225.00	$12.00	$987.00	$ 19,740
Wet well structure; 8' dia, 9" wall	15	ft	$500.00	$100.00	$250.00	$850.00	$ 12,750
Wet well base	1	ea	$1,750.00	$800.00	$300.00	$2,850.00	$ 2,850
Wet well top slab, 12'x12'x10"thk	4	cy	$950.00	$450.00	$85.00	$1,485.00	$ 5,940
Wet well hatch, ss and aluminum	1	ea	$2,300.00	$500.00	$90.00	$2,890.00	$ 2,890
Wet well interior coating	480	sf	$85.00	$20.00	$10.00	$115.00	$ 55,200
Wet well exterior moisture prot	445	sf	$12.00	$10.00	$2.00	$24.00	$ 10,680
Engineered backfill	136	cy	$47.00	$42.00	$20.00	$109.00	$ 14,824
Subm Pumps, 400 gpm, 80 ft TDH	2	ea	$3,000.00	$1,800.00	$180.00	$4,980.00	$ 9,960
Disch elbows and guides	2	ea	$1,500.00	$1,200.00	$180.00	$2,880.00	$ 5,760
Valve vault structure	1	ea	$925.00	$250.00	$180.00	$1,355.00	$ 1,355
Emergency pump conn vault	1	ea	$925.00	$250.00	$180.00	$1,355.00	$ 1,355
Gate Valve, 6"	5	ea	$910.00	$175.00	$85.00	$1,170.00	$ 5,850
Check valve, 6"	2	ea	$1,050.00	$175.00	$85.00	$1,310.00	$ 2,620
Quick connect hose coupling	1	ea	$400.00	$100.00	$85.00	$585.00	$ 585
90 bend, FExFE, 6"	3	ea	$1,005.00	$150.00	$85.00	$1,240.00	$ 3,720
Tee, FExFE, 6"	1	ea	$1,250.00	$225.00	$85.00	$1,560.00	$ 1,560
45 bend, MJ, 6"	4	ea	$935.00	$150.00	$85.00	$1,170.00	$ 4,680
Wye, MJ, 6"	2	ea	$1,270.00	$225.00	$85.00	$1,580.00	$ 3,160
Plug, MJ, 6"	1	ea	$685.00	$75.00	$85.00	$845.00	$ 845
DI pipe, FE, 6"	80	LF	$185.00	$25.00	$15.00	$225.00	$ 18,000

Pervious pavement road	5000	sf	$ 50.00	$ 30.00	$ 9.00	$89.00	$445,000
3' Grade adjustment wall	370	LF	$ 625.00	$ 475.00	$ 5.00	$1,105.00	$408,850
Fence	360	LF	$ 45.00	$ 35.00	$ 5.00	$ 85.00	$ 30,600
Gate	1	ea	$ 950.00	$ 500.00	$ 30.00	$ 1,480.00	$ 1,480
6" water service	500	LF	$ 120.00	$ 25.00	$ 15.00	$ 160.00	$ 80,000
6" detector check in vault	1	ea	$ 8,000.00	$ 6,000.00	$ 1,000.00	$ 15,000.00	$ 15,000
Fire standpipe	1	ea	$ 1,500.00	$ 900.00	$ 20.00	$ 2,420.00	$ 2,420
2" water service	120	LF	$ 75.00	$ 9.00	$ 2.00	$ 86.00	$ 10,320
2" water meter box	1	ea	$ 250.00	$ 200.00	$ 15.00	$ 465.00	$ 465
Water meter	1	LS				$ 1,500.00	$ 1,500
General civil site work	8000	sf				$ 20.00	$ 160,000
HELCO xfrmr and fees	1	LS				$ 225,000.00	$ 225,000
SCADA and security system	1	LS				$ 95,000.00	$ 95,000
Electrical, incl instrumentation	1	LS				$ 407,214.53	$ 407,215
Additional gravel road	17,000	sf	$ 1.75	$ 1.60	$ 0.75	$ 4.10	$ 69,700
						SUBTOTAL	$ 3,785,292
						CONTINGENCY (30%)	$ 1,135,588
						TOTAL	$ 4,920,880

DI pipe, MJ, 6"	150	LF	$180.00	$25.00	$15.00	$220.00	$ 33,000
Sewer trench excavation, soft	700	cy		$ 25.00	$ 7.00	$ 32.00	$ 22,400
Sewer trench excavation, rock	0	cy		$ 175.00	$ 35.00	$ 210.00	$ -
Haul Spoils	700	cy		$ 13.00	$ 8.00	$ 21.00	$ 14,700
Trench Shoring, 0-10 ft	9400	sf	$ 2.00	$ 5.00	$ 3.00	$ 10.00	$ 94,000
Trench Shoring 10-20 ft	1880	sf	$ 2.50	$ 7.00	$ 3.00	$ 12.50	$ 23,500
Trench Shoring 20-27 ft, rock	0	sf	$ 3.50	$ 9.00	$ 5.00	$ 17.50	$ -
Septage pumping (keep LCC low)	0	mo	$ 6,000.00	$ 4,800.00	$ 1,500.00	$ 12,300.00	$ -
Septage hauling	0	mo		$ 14,400.00	$ 3,000.00	$ 17,400.00	$ -
Influent sewer, 14" DI, lined	470	LF	$ 260.00	$ 45.00	$ 25.00	$ 330.00	$ 155,100
Reinf conc jkt	0	cy	$ 950.00	$ 350.00	$ 55.00	$ 1,355.00	$ -
CLSM Backfill	0	cy	$ 300.00	$ 5.00	$ 10.00	$ 315.00	$ -
Engineered Backfill	41	cy	$ 47.00	$ 42.00	$ 20.00	$ 109.00	$ 4,469
Manhole (10 ft)	3	ea	$ 3,900.00	$ 1,800.00	$ 600.00	$ 6,300.00	$ 18,900
Manhole interior coating	180	sf	$ 85.00	$ 20.00	$ 10.00	$ 115.00	$ 20,700
SMH exterior moisture protection	152	sf	$ 12.00	$ 10.00	$ 2.00	$ 24.00	$ 3,648
SFM trench excavation, soft	0	cy		$ 25.00	$ 7.00	$ 32.00	$ -
Haul Spoils	0	cy		$ 13.00	$ 8.00	$ 21.00	$ -
Trench Shoring, 0-10 ft	0	sf	$ 2.00	$ 5.00	$ 3.00	$ 10.00	$ -
SFM, 6" DI, coated and lined	0	LF	$ 180.00	$ 25.00	$ 15.00	$ 220.00	$ -
Engineered Backfill	0	cy	$ 47.00	$ 42.00	$ 20.00	$ 109.00	$ -
Odor control unit	1	ea	$7,150.00	$6,000.00	$400.00	$13,550.00	$ 13,550
Generator Bldg	520	sf	$250.00	$265.00	$10.00	$525.00	$ 273,000
Roofing membrane	8.4	sq	$3,000.00	$2,000.00	$170.00	$5,170.00	$ 43,428
Block sealant and paint	1105	sf	$11.00	$10.00	$4.00	$25.00	$ 27,625
Acoustic insulation	700	sf	$90.00	$20.00	$5.00	$115.00	$ 80,500
Acoustic louvers	144	sf	$245.00	$50.00	$60.00	$355.00	$ 51,120
Generator w/base mounted tank	1	ea	$127,000.00	$35,000.00	$800.00	$162,800.00	$ 162,800
Conc inertia pad for generator	6	cy	$950.00	$450.00	$85.00	$1,485.00	$ 8,910
Conc fueling pad	3.5	cy	$750.00	$225.00	$12.00	$987.00	$ 3,455
Pervious pavement road	7000	sf	$ 50.00	$ 30.00	$ 9.00	$89.00	$623,000

3' Grade adjustment wall	484	LF	$ 625.00	$ 475.00	$ 5.00	$1,105.00	$534,820
Fence	480	LF	$45.00	$35.00	$5.00	$85.00	$ 40,800
Gate	1	ea	$950.00	$500.00	$30.00	$1,480.00	$ 1,480
6" water service	500	LF	$ 120.00	$ 25.00	$ 15.00	$ 160.00	$ 80,000
6" detector check in vault	1	ea	$ 8,000.00	$ 6,000.00	$ 1,000.00	$ 15,000.00	$ 15,000
Fire standpipe	1	ea	$ 1,500.00	$ 900.00	$ 20.00	$ 2,420.00	$ 2,420
2" water service	120	LF	$ 75.00	$ 9.00	$ 2.00	$ 86.00	$ 10,320
2" water meter box	1	ea	$ 250.00	$ 200.00	$ 15.00	$ 465.00	$ 465
Water meter	1	LS				$ 1,500.00	$ 1,500
General civil site work	15000	sf				$20.00	$ 300,000
HELCO xfrmr and fees	1	LS				$225,000.00	$ 225,000
SCADA and security system	1	LS				$95,000.00	$ 95,000
Electrical, incl instrumentation	1	LS				$475,340.03	$ 475,340
Additional gravel road	17,000	sf	$1.75	$1.60	$0.75	$4.10	$ 69,700
						SUBTOTAL	$ 4,307,588
						CONTINGENCY (30%)	$ 1,292,276
						TOTAL	$ 5,599,864

PART B: IWS Approach

PART B

Nāʻālehu Individual Wastewater System Preliminary Engineering Report

Prepared for
Brown and Caldwell
&
County of Hawaiʻi, Department of Environmental Management

August 2023

THIS WORK (PART B) WAS PREPARED BY ME OR UNDER MY SUPERVISION

Yen Wen Fang

Yen Wen Fang

April 30, 2024

Expiration Date of the License

ENGINEERING PARTNERS

Part B - IWS Approach

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Individual Wastewater System (IWS)

1. Introduction

In Hawaiʻi, Individual Wastewater System (IWS) is defined by the Department of Health (DOH) as a wastewater system for an individual property that receives less than 1,000 gallons per day of wastewater flow or serves five bedrooms or less. An IWS can be a cesspool, a traditional septic system, an aerobic treatment unit (ATU), or other means of treatment achieving National Sanitation Foundation (NSF) 40 quality effluent. Since 2016, the State of Hawaiʻi banned the use of new cesspools due to their poor treatment quality. Both ATUs and NSF 40 type systems are considered secondary treatment and will result in higher operating and maintenance requirements.

2. Different Types of IWS

2.1 Septic System

A typical IWS system consists of three main components: the septic tank, distribution box, and leach field (also known as absorption bed or drain field). The septic tank is typically buried underground and receives wastewater from the building's plumbing fixtures (Figure 1.1). From the septic tank which has one or two compartments, effluent flows to a distribution box, which evenly distributes the wastewater to the leach field. The leach field or absorption bed is a network of perforated pipes or chambers laid in trenches or beds, buried in the soil. A seepage pit, which is a vertical excavation typically lined with concrete perforated rings, can be used in place of an absorption bed when a variance application has been approved by the DOH. Typical IWS layout with an absorption bed, seepage pit etc. is outlined in Appendix F.

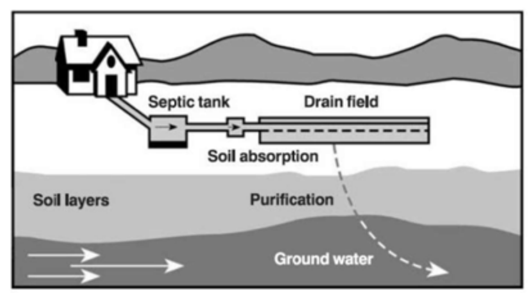


Figure 1.1: Typical IWS flow diagram.

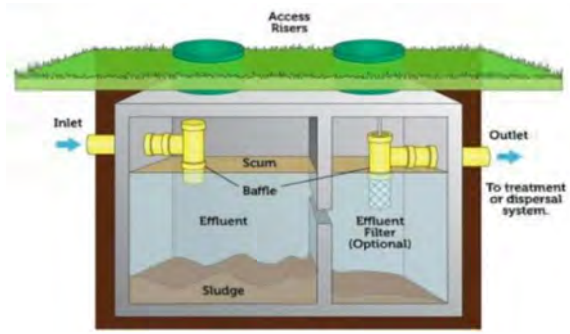


Figure 1.2: Side-view of a typical two-chambered septic tank (Carollo, 2021).

The underground septic tank is typically made of concrete, fiberglass, or plastic, and serves as a primary settling chamber to remove bulk solids and floatable substances such as oil and grease. Septic tanks usually have an inlet pipe where wastewater enters and an outlet pipe through which partially treated effluent flows out to the distribution box. Inside the septic tank, solid waste settles to the bottom forming sludge, while lighter materials like grease and oils float to the top as scum. The middle layer consists of partially clarified effluent.

The size of the septic tank is determined based on the number of bedrooms in the house or the daily wastewater flow rate. In Hawaiʻi, typical septic tank sizes for residential properties may range from 1,000 gallons to 1,250 gallons, or more, depending on the household's wastewater generation. Septic tanks are the most common conversion treatment technology in Hawaiʻi.

The tank contains a mixture of wastewater and anaerobic bacteria. While the primary function of the septic tank is to physically separate the solids and liquid into three layers: a top layer of scum, a middle layer of liquid effluent, and a bottom layer of sludge (Figure 1.2), the anaerobic bacteria further break down the solids that remain in the tank. The liquid effluent flows out of the tank and into a disposal system, where it is further treated by means of soil filtration and dispersed into the soil. The sludge and scum remain in the tank and must be periodically pumped out by a professional septic service approximately every three to five years, depending on usage. The drainfield can fail prematurely if periodic pumping is not completed. If solids overflow into the drainfield, they can clog up the soil pores physically and biologically due to excessive bio-mat growth.

The local IWS contractors are familiar with the nuances of septic system construction, which minimizes potential installation mistakes. The other advantages of the Traditional IWS are

that it operates without the need for electricity, so operational cost is minimal and there are no mechanical or electrical components to repair or replace.

Residential septic systems on their own remove about half of the organics in the wastewater stream and none of the nitrogen. The overall level of treatment is thought to be much higher when well-maintained and operating with a fully functional absorption bed (Table 1.1).

Because the level of treatment is highly dependable on the soil filtration which can vary greatly from site to site, it is a common practice in Hawaiʻi to utilize a 3-foot soil replacement below the drainfield to simulate a good soil filtration layer when percolation rate is expected to be faster than one minute per inch.

Due to their simple design, septic systems are applicable for consideration to be used for the project and will be evaluated further. Septic systems also cause less disturbance to the public Right-of-Way (ROW) in comparison to the installation of a new wastewater collection system.

Table 1.1: Typical septic system performance in Hawaiʻi (Carollo, 2021).

Contaminant	Typical Raw Residential Wastewater [1]	Typical Septic Tank Effluent Quality [2]	Typical Effluent Quality Following Soil Absorption System [2]
Total Nitrogen, mg N/L [4]	14-40	39-82	~1
TSS (mg/L)	100-400	49-161	~4
BOD (mg/L)	100-400	132-217	<30
Fecal Coliform, MPN/100ml [3]	~10^6	1-10^6	~13

1 From Table 2-1 (Water Resources Center (WRRC) University of Hawaii-Manoa, 2008).
2 From Table 4-1 in the Onsite Wastewater Treatment Survey and Assessment Study (WRRC, 2008).
3 MPN/100mL = most probably number per 100 milliliters.

2.2 Residential Aerobic Treatment Units (ATU)

An ATU is a type of wastewater treatment system that utilizes oxygen and aerobic bacteria to break down and treat household sewage. ATUs come in many proprietary shapes and sizes but at a minimum, systems typically include a primary settling chamber (similar to a septic tank), an aeration chamber, where the wastewater is blended with air or oxygen while suspended bacteria/microbes are able to grow and thrive and a clarifier chamber, where microbes are allowed to settle out of the water (Figure 1.3). The effluent from the ATU will discharge into the drainfield similar to the Traditional IWS.

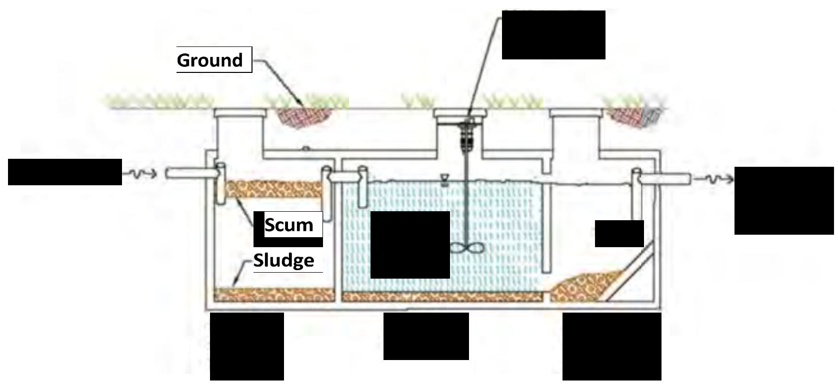
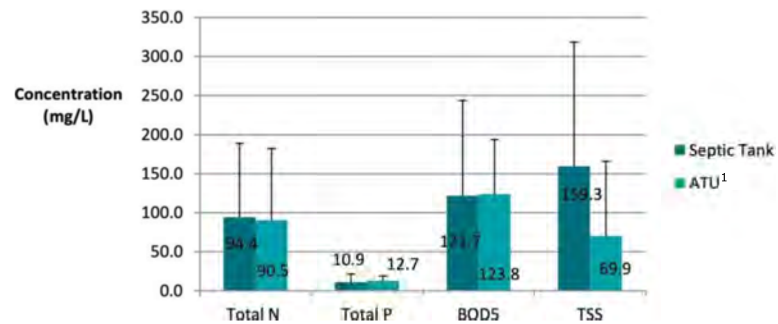


Figure 1.3: Side-view of typical aerobic treatment unit (Carollo, 2021)

With the introduction of air and/or oxygen into the wastewater within the settling chamber, ATU systems provide higher organic and nutrient removal rates than traditional septic systems, making ATUs optimal for operation upstream of sensitive receiving environments. Conversely, the added mechanical and electrical componentry leads to more frequent system downtime. Downtime can occur when mechanical parts such as blowers, pumps, and control systems need to be replaced, and when the ATU system requires cleaning, monitoring, and airflow adjustments. In addition, power outages can halt the treatment process due to the mechanical components' reliance of electricity, which can result in downtime until power is restored.

Without an effective maintenance strategy, the performance of ATUs in Hawaiʻi has been proven to be similar to septic tanks (Figure 1.4). ATUs are less affordable than septic tanks, as they have a higher up-front cost and a much higher O&M cost due to the requirement of contracting a certified wastewater treatment operator by the DOH, and due to the reliance of electricity. The continuous operation of mechanical components and exposure to moisture and organic matter can lead to ATUs having a shorter service lifetime than septic systems, as the components are more prone to wear and malfunction over time.

Installation of ATUs may be applicable for this project when a single dwelling has more than five bedrooms, in accordance with the DOH Chapter 11-62 guidelines.



[1] ATU effluent quality, if not properly maintained without an effective maintenance strategy, can perform similar to septic tanks in Hawaiʻi as stated in paragraph 2 in section 2.2.

Figure 1.4: Effluent quality of septic systems vs. ATUs in Hawaiʻi (Babcock, 2012)

2.3 Intermittent Sand Filter (ISF)

Intermittent Sand Filter (ISF) systems provide secondary treatment that effectively eliminate contaminants through the means of physical, chemical and biological treatment processes for primary treated wastewater or septic tank effluent (Figure 1.5). ISFs are made in a variety of packed-bed filters composed of sand or other granular materials (EPA, 2002). Septic tanks are used as a preliminary treatment step before sending wastewater to an ISF. The septic tank's primary function is to separate and settle out solids from the incoming wastewater. This helps to reduce the organic load and solids entering the ISF, thus extending its lifespan and improving its overall performance. Following the septic tank, the effluent is either pumped or gravity fed to the ISF.

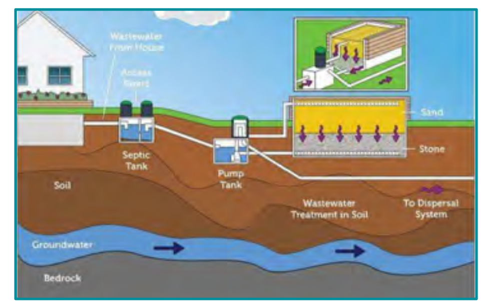


Figure 1.5: Pumped discharge ISF following a septic tank (EPA, 2023)

Wastewater is dosed onto the sand surface through a distribution network, percolating through the sand layer to reach the underdrain system. Filtered effluent is collected for further treatment or discharged to a leach field through a system of perforated pipes. These systems involve an excavation or structure lined with impermeable PVC on sand bedding filled with washed sand.

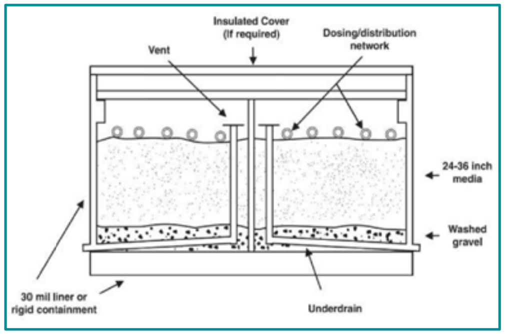


Figure 1.6: Generic, open intermittent sand filter (EPA, 2002)

Most biochemical treatment occurs in the top six inches, effectively removing suspended solids and carbonaceous biochemical oxygen demand (BOD). Microorganisms absorb wastewater constituents, nearly eliminating BOD. Decreasing carbonaceous BOD allows nitrifying microorganisms to thrive deeper, promoting nitrification.

There are several different types of ISFs:

- **Gravity Discharge ISFs**: These filters use gravity to distribute wastewater onto the sand surface usually on a sloped surface. Gravity allows for the effluent to exit the bottom of the sand filter, where it is transferred to a drainfield through a system of perforated pipes. The bottom of the sand filter needs to be several feet higher than the drainfield area.

- **Pumped Discharge ISFs**: Pumped discharge ISFs utilize a separate pump station to distribute treated effluent from the filter to a drainfield, allowing for more controlled and flexible effluent distribution regardless of topography, unlike gravity discharge ISFs. The integrity of the sand filter liner is safeguarded with discharge piping positioned above it.

- **Bottomless ISFs**: The bottomless ISF lacks an impermeable liner and doesn't release wastewater to a drainfield. Instead, it directly infiltrates into the soil beneath the sand.

ISFs present a more intricate setup that includes various components like a dosing tank, pump or siphon, distribution network, and a filter bed equipped with an underdrain system. Regular maintenance will increase the cost due to the electricity and labor for pumping/dosing, and overall O&M labor. There is a potential risk of the filter media in intermittent sand filters becoming clogged, and finding local replacements for the media

could be challenging in Hawaiʻi.

For the Nāʻālehu LCC Replacement project, ISFs are not the most suitable IWS choice for residential installation. This is due to each dwelling having limited yard space to allow area for a septic tank, ISF, drainfield, and potentially a pump station. In addition, the sand needed for ISFs would be difficult to source in Hawaiʻi.

Usage Case: Sand filters are a practical alternative when site conditions hinder proper wastewater treatment and disposal through percolative beds/trenches. They are suitable for sites with shallow soil, poor permeability, high groundwater, and limited land.

2.4 Passive Treatment Beds

Passive treatment beds are a type of secondary, decentralized wastewater treatment technology designed to treat domestic or small-scale municipal wastewater. Passive treatment beds need to be installed together with a septic tank and do not require the use of electricity. This technology uses a natural process to prevent suspended solids from sealing the underlying soil by incorporating aeration and a larger surface area for bacterial treatment than traditional systems (Presby Environmental, Inc. 2017). Treated water is typically discharged directly to the soil below the treatment system via a soil absorption system (New Zealand Distributors, 2018).

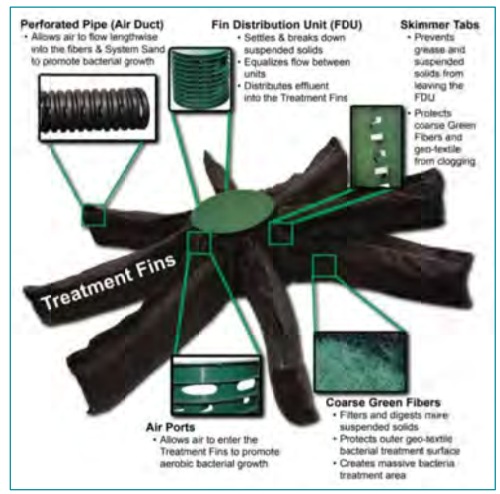


Figure 1.7: Schematic of Presby's Enviro-Fin Passive Treatment Bed (Presby Environmental)

Presby Environmental, Inc. specializes in the development and manufacturing of several passive wastewater treatment technologies, including Enviro-Fin (EF), Advanced Enviro-Septic (AES), and Enviro-Septic (ES), and Simple-Septic (SS). The Enviro-Fin system (Figure 1.7) consists of a centrally located Fin Distribution Unit (FDU), a basin and a sump made of plastic. The sump has a waterproof area at the bottom and small holes around it. Inside the sump, there is a pipe that helps equalize the wastewater between different parts of the system. The septic tank effluent flows into the FDU and then gets distributed to eight Treatment Fins that extrude radially from the center and treat the wastewater. Small holes in the plastic air ducts supply oxygen to the surfaces containing bacteria, which help break down the suspended solids in the wastewater. The system also has green plastic fibers packed underneath the air ducts, and specially designed fabric around the Treatment Fins and FDU, which increases the surface area for bacterial growth and wastewater treatment.

AES (Figure 1.8) consists of a pipe made of corrugated, perforated plastic and a Bio-Accelerator® fabric along its bottom. This fabric is surrounded by a layer of randomized plastic fibers and sewn geo-textile fabric. Together, these materials create an ecosystem within the pipe that efficiently treats the wastewater (Presby Environmental, Inc. 2017). The AES technology represents the evolution of Presby's ES system, incorporating the proprietary Bio-Accelerator® enhancement. This enhancement not only filters additional solids from the effluent but also accelerates the treatment processes, ensures even distribution, and provides a larger surface area for bacterial activity. Each foot of the AES pipe offers more than 40 square feet of total surface area for bacterial activity. The overall sizes of the AES system are similar to an absorption bed and depend on the number of bedrooms in a dwelling, and the percolation rate of the soil. Due to the higher rate of filtration, the pipes of an AES system can be installed in closer proximity compared to the perforated pipes in an absorption bed, which decreases the overall width of the disposal surface area needed.

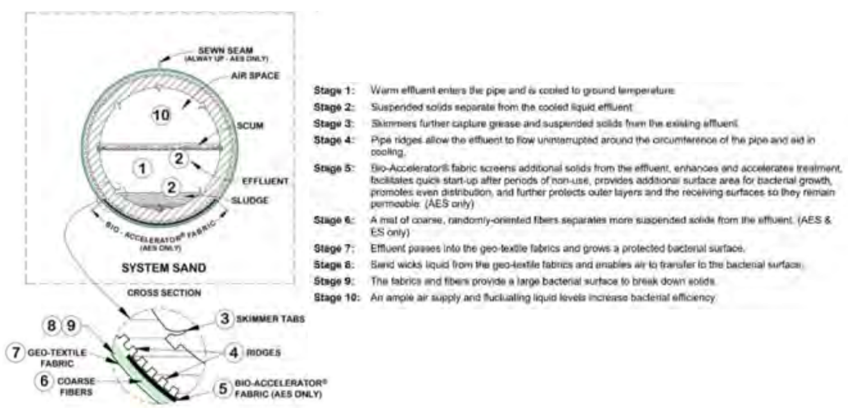


Figure 1.8: AES, Enviro-Septic, and Simple-Septic 10 stages of treatment.

The ES technology is composed in a similar fashion to the AES pipe but offers only 25 square feet of surface area for bacterial activity for every foot of pipe. The SS pipe is comprised of a single-layer geo-textile fabric, large diameter, gravelless pipe (LDGP) system, coupled with

Presby's patented skimmer tabs and cooling ridges which increase bacterial growth on the surface area of the fabric. For every foot of SS pipe, there is 15 square feet of total surface area for bacteria to grow.

Presby has claimed that each treatment system output effluent that has been tested and certified to NSF 40, Class I standards. The use of the Presby Passive Onsite Wastewater Treatment & Dispersal System is permitted under Section 11-62-35(b) of the Hawaiʻi Administrative Rules (HAR) by the Department of Health (DOH). The DOH acknowledges this is an innovative solution that could be beneficial to the State. In addition, the DOH requires that operational data be submitted upon request within the first twelve months after installation when Presby products are used in place of soil absorption systems.

In general, the cost of an AES or Enviro-Fin system may be comparable to or slightly higher than that of an ATU. Both systems require upfront investment for equipment, materials, and installation. However, it is important to consider that the long-term costs of maintenance and operation can differ between the two systems. ATUs typically require ongoing electrical power for aeration and additional maintenance, such as replacing mechanical components and monitoring systems. These factors can contribute to higher operational costs over time. On the other hand, AES systems are designed to operate passively without the need for electricity or mechanical components. They rely on natural processes and have fewer moving parts, which can lead to lower long-term maintenance and operational costs. Enviro-Septic or Simple-Septic systems have a lower system complexity than AES or Enviro-Fin Presby technologies and are generally less expensive alternatives but require a bigger footprint.

Presby offers both in-person and online training options, covering various aspects of system design, installation, maintenance, and regulatory requirements. Proper installation techniques, system components, troubleshooting, and best practices for achieving optimal performance of wastewater treatment systems are provided in the training.

While these passive treatment bed systems offer higher effluent quality without mechanical components, they are new to the market and are not familiar to local contractors. Furthermore, one of the key components of these systems is the requirement of "System Sand" which is a granular material with a very specific gradation. At the time of this report, it is not known if the local rock quarry can produce aggregates that meet that specification.

Based on the increased regulatory requirements, unfamiliarity of local contractors, and supply chain limitations for the aggregates needed, AES, EF, SS, and ES solutions may not be suitable treatment processes for the project.

2.5 Composting Toilet

A composting toilet is a type of toilet that uses a combination of heat and aerobic microbial action to break down human waste into a nutrient-rich compost. Composting toilets typically come in three varieties:

- **Individual Composting Toilets:** These waterless toilets combine human waste with bulking material such as sawdust, leaves, or peat moss in a single chamber (Figure 1.9). The waste dries and composts in-situ until the container fills and then needs to be hauled to a landfill that can process solid waste in accordance with DOH standards. Some composting toilets also use electrical or mechanical systems, such as an exhaust fan, to aid in the breakdown of waste and limit odors. These toilets do not require water or a connection to a sewer system, making them an eco-friendly alternative to traditional flush toilets.

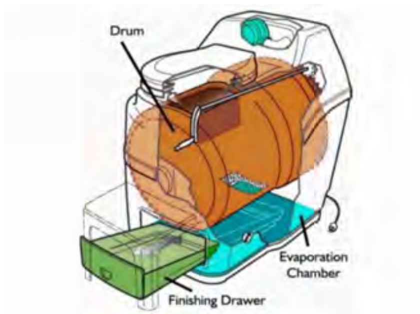


Figure 1.9: Component view of a typical individual composting toilet (Sun-Mar, 2023)

- **Urine Diverting Toilets:** Urine diverting toilets typically have two chambers: one for urine and one for solid waste (Figure 1.10). The urine is typically stored and used as a fertilizer, while the solid waste is broken down into compost.

Figure 1.10: Top view of a typical urine separating toilet (Separett, 2023)

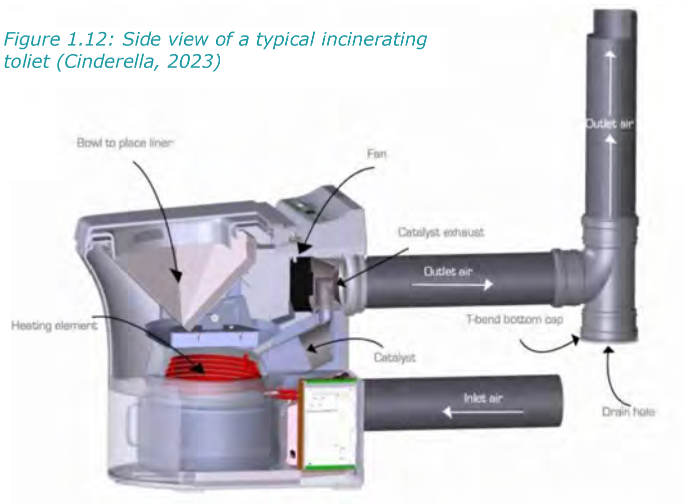
- **Central Composting Units:** These composters are installed outside the home and work in conjunction with pint-flush toilets. Toilet blackwater (along with a scoop of wood chips) flows through a 4" gravity sewer to the composter

where it is introduced to a horizontal drum that collects the solids and allows liquids to drain into the base of the enclosure (Figure 1.11). The drum must be rotated in the forward direction once every two days to fluff the retained solids and rotated in the reverse direction once every two months to drop the retained solids into an aging drawer where the composting process is completed. The outputs are a drawer of composted manure and drained liquid. A single central composting unit can serve an entire home and solid wastes and any odors are kept entirely outdoors.

Figure 1.11: Top view of a central composting unit (Sun-Mar, 2023)

Composting toilets are reviewed and approved by the DOH on a case-by-case basis. Solids generated from composting toilets that are land applied must meet the requirements of HAR 11-62 Subchapter 4: Wastewater Sludge Use and Disposal. This treatment process may not be applicable for this project due to the regulations pertaining to the disposal of solid waste, which could require disposal at a municipal solid waste landfill unit in compliance with the sludge related conditions in a permit issued by the DOH. Septic tanks require less active involvement from homeowners and do not typically require regular emptying if properly sized and maintained. Composting toilets can also emit strong odors if not properly maintained.

Figure 1.12: Side view of a typical incinerating toliet (Cinderella, 2023)



2.6 Incineration Toilet

An incineration toilet, also known as a thermal toilet, is a type of toilet that uses heat to turn human waste into ash (Figure 1.12). The waste is placed into a combustion chamber where it is heated to high temperatures, typically around 800-1000 degrees Fahrenheit, by a gas or electric burner. This process kills any harmful bacteria and viruses and reduces the volume of waste by up to 90%. The ash that is left can be safely disposed of in a landfill or used as a fertilizer. Incineration toilets do not require any water, making them suitable for remote locations or areas with limited water resources.

They also produce very little smell and have no need for a septic system or connection to a sewer. However, they do require electricity or gas to operate, and can be relatively expensive to purchase and maintain. Further, they do not comprise a complete treatment solution. While the remaining household gray water can be disposed of with minimal treatment, a septic tank or other treatment unit is still required to treat kitchen blackwater, eliminating the economic advantage.

No matter the variety, composting toilets and incineration toilet technologies are significantly lower cost than septic tanks and other IWS. Unfortunately, they do not comprise a complete treatment solution, making them not applicable for this project.

2.7 Graywater Reuse

Graywater systems are systems that collect and reuse wastewater from sources such as sinks, showers, and laundry machines. The collected water is then treated and can be used for landscape irrigation once separated from blackwater. The wastewater streams can be separated through the implementation of two separate wastewater piping systems in the household. Graywater can be treated to a re-use level for distribution strictly below the soil surface or should be disposed of to an IWS or county sewer system (CS).

In Hawaiʻi, the use of graywater systems is regulated by the State Department of Health, which sets guidelines for the treatment and reuse of graywater. Overall, these systems are typically expensive to install and maintain as they are installed in addition to a traditional wastewater treatment system that's still required to treat household blackwater. For simplicity of design, graywater systems are less applicable for this project than a traditional septic tank system, as access to a CS is not readily available in Nāʻālehu, which would require the reuse system to have both a septic and graywater holding tank.

Usage Case: Used on lots with source separated plumbing that prioritizes wastewater reuse.

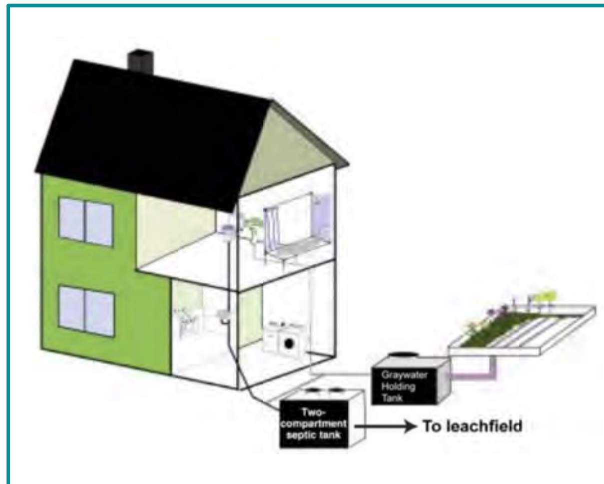


Figure 1.13: Typical graywater reuse system installed in parallel with a septic tank (DOH, 2009)

3. Types of IWS Disposal Systems

3.1 Absorption Bed

Absorption beds are the most common form of IWS disposal system installed in Hawaiʻi today. They consist of a network of perforated pipes, each a maximum of 100 feet long and laid in trenches 1.5-3 feet below the finished grade 4-6 feet apart (Figure 1.14). Each line is laid level to allow the gravity dispersal of treated effluent below and above each pipe, with a filter fabric covering the top of gravel, to prevent the gravel from clogging. A minimum of 6 inches of gravel is provided below each pipe. If the percolation rate is faster than one minute per inch, a depth of 3-foot soil replacement shall be installed to underlie the entire absorption bed. Soil replacement shall be washed #4 sand or cinder-soil mix with a percolation rate not faster than one minute per inch.

These systems are easy to maintain when following an effective treatment system and microorganisms in the soil offer an added degree of treatment to the effluent as it filters through the upper oxic layers of the soil matrix. Absorption beds, however, have a significant space requirement, which increases with decreasing hydraulic conductivity of the soil. Additionally, absorption beds can only be installed on a grade of less than 8%.

While conventional perforated pipe adsorption beds are not traffic rated, companies such as Infiltrator offer a chambered dispersion product with an H-20 load rating that can also reduce the absorption bed space requirement by 17%.

Absorption beds are applicable for this project when space permits, as they utilize natural soil and microbial processes to treat and filter wastewater, minimizing the environmental impact. Additionally, the relatively simple design and lower maintenance requirements make them cost-effective and practical for residential properties.

Usage Case: Used on typical lots without spatial, groundwater level, grade, or percolation rate constraints. Installed on flat/mild sloped terrain.

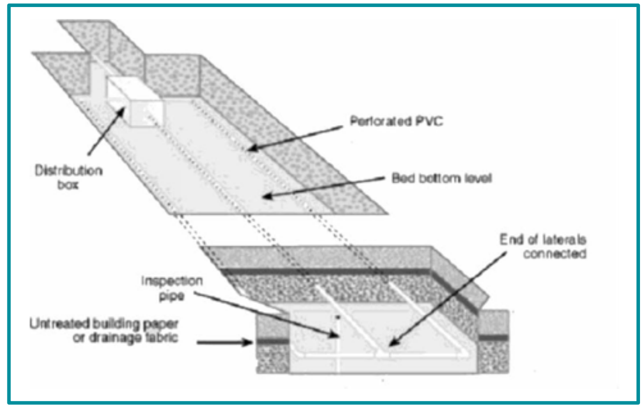


Figure 1.14: Typical absorption field installed following a septic tank (Babcock, 2019)

3.2 Leach Filed

Leach fields consist of absorption trenches installed parallel to the contour line on ground slopes up to 12%, making them suitable for steeper terrain. These trenches are non-traffic rated, and consist of gravel, which serves as a natural filter that permits gradual seepage into the adjacent soil. Perforated PVC pipes are commonly used to distribute wastewater into the trenches. Additionally, filter fabric lining can be installed to prevent the gravel from becoming clogged with soil or debris.

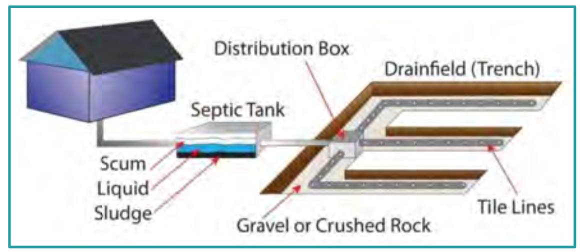


Figure 1.15: Leach filed schematic (Nuflw Wide Bay, 2015)

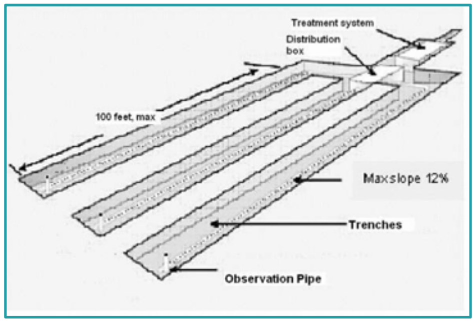


Figure 1.16: Absorption Trenches Diagram (Water Resources Research Center, & Engineering Solutions, Inc. (2008).

The DOH design requirements state absorption trenches should have a width ranging from eighteen to thirty-six inches. Additionally, there should be a minimum vertical separation of three feet between the bottom of the trenches and the underlying groundwater or bedrock.

Leach fields with absorption trenches are applicable for this project when the site has a grade between 8%-12% and will be discussed further in the report.

Usage Case: Absorption trenches are typically used on steeper terrain.

3.3 Seepage Pits

Seepage pits are a vertical means of achieving the percolation area requirements for a disposal system. These systems typically consist of a 15-30-foot-deep pit lined with stacked precast perforated concrete rings or CMUs, to an internal diameter of 6-8 ft. Seepage pits are both less area intensive and less expensive than absorption beds, if converted from an existing cesspool. A seepage pit must include a cover which extends at least 12 inches beyond the seepage pit excavation or over a provided concrete lining. An access hatch must be provided in the concrete cover to allow inspection and maintenance of the pit. The seepage pit may be designed to be traffic rated by providing the sufficient strength required in the design of the concrete lining and cover.

The effective area of the seepage pit is equal to the vertical wall area corresponding to the effective depth of the pit. Slow percolation rates translate to a larger required absorption area and deeper pit (Figure 1.21).

While seepage pits are an approved means of disposal in Hawaiʻi, they are often only permitted when it can be demonstrated that an alternative means of disposal was not possible, i.e.,

insufficient land area, steep terrain (>12%) or very slow percolation rates (>60 min/inch). Where slow percolation rates present, seepage pits will need to be dug through the basalt rock layer to reach more porous soils or a variance will be required from HAR 11-62-34 d(1)b:

> *Seepage pits shall not be constructed in soils having a percolation rate slower than ten minutes per inch (weighted average) or where rapid percolation through such soils may result in contamination of water-bearing formations or surface water.*

Seepage pits are applicable for consideration to be used for this project for site conditions mentioned above and will be evaluated further.

Usage Case: Used on highly spatially constrained, slope constrained, or geologically constrained lots where sufficient percolation rates can be achieved.

3.4 Subsurface Drip Irrigation

Subsurface drip irrigation is an extremely water efficient means of wastewater disposal, slowly delivering effluent into the existing vegetation present on site within the disposal area, promoting efficient uptake of nutrients by the microbes and plants in the soil medium (Figure 1.17). Installation of subsurface systems often requires less disruption to the absorption area though in Hawaiʻi, they traditionally cost more. Regular maintenance is required to ensure the continued operation of the irrigation pump and manage biofouling in the distribution lines.

Subsurface drip irrigation may not be suitable for the project, as more O&M is required compared to alternative wastewater disposal systems, in order to flush the drip lines to mitigate clogging from debris. Chlorination to remove biological growth from the drip lines would also be needed, which has a greater environmental impact than other means of disposal. Additionally, each IWS with subsurface drip irrigation would require the incorporation of an ATU to properly treat wastewater for reuse.

Usage Case: Used on lots that prioritize wastewater reuse, are served by an ATU, and have a robust maintenance strategy.

Figure 1.17: Typical subsurface drip irrigation installed following a septic tank (EPA, 2023)

3.5 Evaporation Beds

Evaporation beds, or evapotranspiration (ET) wastewater treatment systems, are utilized to remove effluent by direct evaporation and by plant transpiration. If soil infiltration is desired, evapotranspiration/infiltration (ETI) process can dispose of effluent by employing both evapotranspiration and soil penetration. ET and ETI systems follow primary pretreatment units which filter out settleable and floatable soils.

Nāʻālehu Individual Wastewater System Preliminary Engineering Report

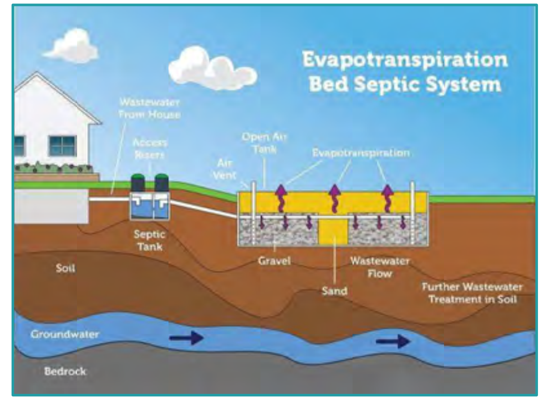


Figure 1.18: Evapotranspiration (ET) bed (EPA, 2018)

The septic tank effluent enters the ET or ETI units through distribution pipes and reaches a porous bed. To prevent water from seeping out, a liner is used below the bed in ET systems. Aquatic plants are grown on the surface of the sand bed to aid in transpiration of the effluent. In ETI systems, the effluent can percolate into the underlying soil with the absence of a liner.

Evaporation beds are sizable disposal systems that may experience overflow if the evapotranspiration rate does not exceed the monthly precipitation by more than 2 inches a month. ET/ETIs are reviewed on a case-by-case basis by the Department of Health.

Evaporation beds may not be appropriate for this project, as Nāʻālehu has a tropical climate with abundant rainfall throughout the year. Additional maintenance is also required to prune and monitor plant health to ensure the system functions effectively.

Usage Case: Arid climates where evaporation exceeds precipitation. Sensitive locations where no subsurface disposal is desired/allowed. These disposal units are most appropriate following ATUs but are occasionally employed after septic tanks.

3.6 Mound Septic System

When greater vertical distance from groundwater is needed, or when the soil quality or slope is not conducive for an absorption bed or trench system, above-ground mounds of sand or soil can be implemented to achieve desired conditions (Water Resources Research Center, & Engineering Solutions, Inc., 2008). The process begins by preparing the land where the mound will be situated through tilling. Afterward, a layer of sand is spread across the tilled area along with a distribution system. Next, the top of the mound is covered with soil from the surrounding area and given an aesthetically pleasing landscape. A pump system is necessary due to the influent disposal point being at a higher elevation than the treatment system. This factor raises the overall cost of the system since electricity is required.

Figure 1.19: Elevated Mound System (EPA, 2018)

The Department of Health (DOH) evaluates the design criteria for mound disposal systems on a case-by-case basis when systems are outside the percolation rate range of trenches and beds. There is a three feet minimum required separation from any existing groundwater.

Mound septic systems may not be suitable for this project as the cost can be more expensive to install and maintain compared to traditional wastewater disposal systems. This is due to the additional design components required, such as the construction of the mound itself and specialized fill material. Mound systems require a larger land area than other disposal systems which can be a limitation on smaller lots.

Usage Case: In areas where limitations exist due to poor soil or proximity to groundwater.

4. Traditional IWS Recommendation

When considering an IWS alternative, existing regulations, environmental concerns, site constraints, economics, and performance shall be taken into consideration. Overall, each

household IWS could cost between $30,000-$150,000 to install and roughly $1,000 per year to operate and maintain. However, associated O&M fees for household IWS are dependent on the management model implemented, which is further discussed in Section 11.

Based on the EPA requirements for this project, the installation of traditional septic tanks with standard absorption bed is recommended for Nāʻālehu. Per the revised AOC, IWS is a possible alternative to be considered, however technical and environmental analysis will still need to be conducted for Hawaiʻi County to make an informed decision. Septic tanks coupled with absorption beds offer the lowest cost, least complex solution, with low maintenance requirements in comparison to the other options previously discussed. Where space and grading constraints prevent the installation of an absorption bed, an existing cesspool (if present) can be repurposed as a seepage pit for disposal, or a new seepage pit can be installed. This alternative is being considered for three reasons:

- **Passive Operation:** The traditional septic IWS offers a passive operation with minimal O&M cost. While the ATUs offer the promise of improved performance, in practice in Hawaiʻi, the added mechanical and electrical complexity and the operator requirement results in higher-than-average O&M costs or facing the risk of falling into similar treatment performance comparable to septic tanks.
- **Adaptive to Small Lots:** The option of disposing to seepage pits allows septic systems to be installed particularly on spatially and geographically constrained lots.
- **Familiarity:** Hawaiʻi's engineers, regulators, contractors, and septic pumpers are familiar with septic tanks, absorption beds, and seepage pits. The ATU and CTDS, on the other hand, are less known. Furthermore, the lack of certified wastewater operators throughout the State will result in higher costs and reduced performance for ATU and CTDS options.
- **Cost:** Traditional septic tanks don't have moving parts or require significant mechanical components, which can reduce maintenance and repair costs over time. Energy cost savings are also significant since septic tanks rely on natural processes for wastewater treatment, compared to some other IWS that involve mechanical or electrical components.
- **O&M:** The absence of complex components in septic tanks simplifies maintenance. There are no pumps, blowers, or electronic controls to manage or repair, making maintenance tasks more straightforward.
- **Environmental:** Septic tanks are more energy efficient than other IWS alternatives such as ATUs, which require energy-intensive processes (aeration) for effective treatment. Additionally, other IWS alternatives may require the use of chemicals for treatment processes. Septic tanks generally involve fewer chemical inputs, contributing to a lower environmental impact.

5. Traditional IWS Components

5.1 Types of IWS Tanks

There are several septic tank providers commonly used in Hawaiʻi offering tanks of a variety of price points and materials. Septic tanks can be made from concrete, plastic, and fiberglass (Figure 1.20), each of which having its own set of pros and cons (Table 1.2). Where a septic tank is located beneath a vehicular traffic area, a traffic rated concrete septic tank can be used or a structural concrete slab designed for H-20 loading spanning a non-traffic tank may be used.

The yellow plastic tank displayed in Figure 1.20 is manufactured locally by Chemtainer in Keaau, Hawaiʻi. This HDPE tank is the most economical type of septic tank. However, because the material is flimsy, it is prone to be installed improperly, and has more restrictions on the location to which it can be installed.

Septic tank manufacturers and distributers in Hawaiʻi include Jensen Precast, Ferguson (Infiltrator Chambers), Chemtainer, and Orenco.

Figure 1.20: Common septic tank materials and shapes in Hawaiʻi (Carollo, 2021).

Rectangular, Concrete Tank Tank

Oval, Concrete Tank

Cylindrical, Concrete

Rectangular, Plastic Tank

Fiberglass, Oval Tank

Steel, Horizontal, Cylindrical Tank

Table 1.2: Advantages and Disadvantages of Septic Tank Materials (Carollo, 2021).

Septic Tank Material	Advantages	Disadvantages
Concrete	• Durable • Suitable for installation in traffic area • Less susceptible to collapse and floatation • May be cast-in-place for custom shape	• Precast tanks can be more expensive than plastic or FRP due to shipping and installation costs • Typically requires use of a crane for installation • Concrete may corrode over time due to acidic sewer gases
Plastic (polyethylene)	• Less expensive than precast concrete tanks (lower shipping and installation costs) • Manufactured locally on the island • Plastics are typically resistant to corrosion • May not require a crane for installation	• Plastic tanks may deform depending upon quality of the plastic and potential structural weaknesses of the material • If not installed properly, plastic tanks can float if flooded
Plastic (polypropylene)	• Less expensive than precast concrete tanks (lower shipping and installation costs) • Plastics are typically resistant to corrosion • Locally stocked • Higher tank rigidity. More tolerant impact and backfill loads • May not require a crane for installation	• Not a traffic rated tank without additional structural slab • A two half-clam shell construction. Requires proper factory assembly to achieve watertightness
Fiberglass-reinforced polyester (FRP)	• Less expensive than precast concrete tanks (lower shipping and installation costs) • Variety of manufacturers and sizes for desired footprint • Fiberglass is typically resistant to corrosion • May not require a crane for installation • More rigid and sturdy than plastic tanks	• Less structurally strong than concrete tanks • If not installed properly, fiberglass tanks can float if flooded

Ultimately, the choice of septic tank material will depend on availability, budget, and site constraints (Table 1.3). At a minimum, septic tanks in Hawaiʻi must comply with International Association of Plumbing and Mechanical Officials (IAPMO) material and property standards for septic tanks. Further, sizing and installation criteria are regulated by HAR 11-62-33. The minimum septic tank capacity is 1,000 gallons for a household of 4 bedrooms or less and 1250 gallons minimum for households of 5 bedrooms. Septic tanks serving households greater than 5 bedrooms will require a variance from the DOH.

Table 1.3: Common single family home septic tank products in Hawaiʻi.

Product	Material	Traffic Rated	Capacity (Gal)	Length (in)	Width (in)	Height (in)	Weight (lbs)	Local List Price[1]
Chem-tainer	HDPE	No	1250	96	58	62	400	$3,189
Infiltrator (via Ferguson)	PP	No	1287	127	62.2	54.7	320	$2,863
Orenco (via Custom Concrete & Septic)	DCPD	No	1500	168	72	64.5	620	$6,850
Jensen Precast	Concrete	Yes	1250	138	70	57	16,700	$6,850

[1] Local list price does not include tax, contractor markup, transportation, or installation.

6. Design of IWS: DOH Chapter 11-62 Guidelines

Per the EPA Revised Administrative Order on Consent (AOC), SDWA-UIC-AOC-2017-002, dated August 22, 2022, the County must provide wastewater services for 194 properties, and close the Nāʻālehu Community Cesspools. The Department of Health's Hawaiʻi Administrative Rules, HAR 11-62-31.1, outlines general requirements for individual wastewater systems used in lieu of wastewater treatment works. Lots to be served in the community vary in size from 0.12 to 1.94 acres with a median size of 0.16 acres. The current Hawaiʻi Administrative Rules for IWS installation require a minimum of 10,000 ft^2 (0.23 acres) of usable land for each system for lots constructed and documented after August 30, 1991. The Nāʻālehu subdivision was approved for recordation in April 1966, and is exempt from this rule and considered grandfathered in.

The maximum permitted wastewater volume entering a single wastewater system must not surpass one thousand gallons, and this system is not allowed to cater to more than five bedrooms, regardless of whether these bedrooms are in one dwelling unit or distributed across two.

Table 1.4: Septic sizing guide per DOH

DOH Septic Tank Sizing Guide	
No. of Bedrooms	**Minimum Capacity (Gallons)**
4 or less	1000
5	1250

If a single household has more than five bedrooms and requires an IWS to handle the wastewater, then an Aerobic Treatment Units (ATUs) needs to be installed, which can handle a larger wastewater load.

6.1 Percolation Testing

Prior to installing the IWS, a percolation test is performed to assess the soil's ability to accept and treat the effluent. The results of this test help determine the appropriate size and design of the system. Per HAR 11-62, soil percolation tests must be carried out at a depth of at least three feet. If the soil composition varies between the three-foot and five-foot depths during construction, an additional percolation test should be conducted at the level corresponding to the bottom of the absorption system.

6.2 Sizing of Absorption Beds and Disposal Systems

The sizing for absorption beds and disposal systems is outlined in Figure 1.21 from HAR 11-62. Absorption beds cannot be built in soil with a percolation rate slower than sixty minutes per inch.

Appendix A contains preliminary absorption bed sizing calculations for the properties in Nāʻālehu using the HAR11-62 Absorption Bed Sizing Table. Percolation rates ranging from 10-15 min/in per site were used for the basis of this calculation, which is reflective of the higher end of the percolation test results.

Percolation Rate (min/inch) Less than or equal to	Required Absorption Area (ft2/bedroom or 200 gallons)	Percolation Rate (min/inch) Less than or equal to	Required Absorption Area (ft2/bedroom or 200 gallons)
1	70	31	253
2	85	32	257
3	100	33	260
4	115	34	263
5	125	35	267
6	133	36	270
7	141	37	273
8	149	38	277
9	157	39	280
10	165	40	283
11	170	41	287
12	175	42	290
13	180	43	293
14	185	44	297
15	190	45	300
16	194	46	302
17	198	47	304
18	202	48	306
19	206	49	308
20	210	50	310
21	214	51	312
22	218	52	314
23	222	53	316
24	226	54	318
25	230	55	320
26	234	56	322
27	238	57	324
28	242	58	326
29	246	59	328
30	250	60	330

Figure 1.21: HAR 11-62 Table III Absorption bed sizing table.

6.3 DOH Required Setbacks

The actual location of treatment and disposal infrastructure is limited by setback requirements. DOH-required setbacks are presented below (Table 1.5). From a system design perspective, it is recommended that systems should also be a minimum of 20 feet from any cut-face slopes present on a site to avoid surfacing of treated effluent. This is a particular constriction to heavily sloped sites.

Table 1.5: DOH required setbacks for wastewater systems: Table II, HAR 11-62.

Minimum Horizontal Distance From	Cesspool (ft)	Treatment Unit (ft)	Seepage Pit (ft)	Soil Absorption System (ft)
Wall line of any structure or building	5	5	5	5
Property line	9	5	9	5
Stream, the ocean at the shoreline certification, pond, lake, or other surface water body	50	50	50	50
Large trees	10	5	10	10
Treatment unit	5	5	5	5
Seepage pit	18	5	12	5
Cesspool	18	5	18	5
Soil absorption system	5	5	5	5
Potable water sources serving public water systems	1000	500	1000	1000

6.4 DOH Variance

The Nāʻālehu LCC Replacement project will likely encounter the following situations where a DOH Variance request would be needed:

- Absorption field placement due to percolation rates and property size.
- Seepage pit installation when space is limited.
- Septic tanks serving households with more than 5 bedrooms.

Variance application and review usually adds approximately two months to the permitting process following design package review but the DOH has expressed willingness to allow the request for variance to be included with the initial design package.

7. Typical IWS Permitting and Construction Process

The permitting and construction process for IWS begins with the Engineer of Record (EoR) preparing and submitting a design package for DOH approval. Once DOH reviews and approves the design package, DOH issues an "Approval for Construction" letter. While during DOH review process, the plumbing contractor submits the Plumbing Permit application with County DPW Building Division for building sewer line modification. Once both permits are issued, the contractor can start excavation of the septic tank, drainfield and pipe trenches, while the existing sewer lines are protected in place, or a temporary bypass is installed to keep the existing system in service. The EoR will perform a site-specific percolation test at the bottom of the drainfield excavation to further verify the actual percolation rate and adjust drainfield sizing as necessary. Per HAR 11-62, retesting is only required however when the soil profile at 5 feet depth is different than the soil profile that was performed during the percolation tests. After the installation of drain rocks, drainfield piping and the septic tank, the engineer performs a final inspection and document as-built of the installed system before final backfilling and files a final inspection report to DOH for review. If everything is in order, the DOH returns an "Approval for Use" letter and the building waste line can be changed over to the newly installed IWS.

The Nāʻālehu LCC Replacement project will use a project specific approach in three principal ways:

- **Properties to be Permitted in Bulk:** The DOH has expressed the capacity to receive packages in groups of 10 or more properties. This will serve to expedite the DOH review process.
- **Variance Requests:** Due to preliminary data on percolation rates and property sizes, it's expected that DOH variances to setback constraints will be required to accommodate the IWS installation. Where space is still overly constrained, DOH variances will be required to allow for seepage pit installation. During the design phase, the specific lots requiring variances will be identified, which the variance application can be submitted prior to submitting the design application to construct, which will enable the permitting process to go more efficiently.
- **Optioned Design:** The geological conditions present at a given site will not be known until construction on that site commences. These conditions will have a significant impact on the disposal system design. To accommodate this uncertainty in the design and facilitate permitting, an optioned design package shall be submitted to the DOH to allow for a field determination according to the actual percolation rates and soil composition encountered. We would expect the in-situ soil stratum to change from 4-5 feet deep of volcanic ash soil at the surface to solid or fractured basaltic rock below 6 feet deep. The percolation rates between the volcanic ash soil and the basalt rock are great, so as comparing fractured and unfractured rock. Since the absorption bed sizing greatly depends on the percolation rate, location and the depth of required excavation, it is best to perform the percolation test at the bottom of the excavation to represent actual conditions of design.

The timeline and deliverables for this procedure is outlined on the following page (Table 1.6).

Table 1.6: Hawai'i Permitting and Construction Process[1]

Step	Timeline	Party	Deliverables
Design Package + Variance Application Preparation	4-6 months	Engineer	• Site Evaluation/Percolation Test Result • IWS Calculation • Parcel map • Plot Plan • Simple Building Floor Plan for number of bedroom determination • IWS Layout • IWS Profile • IWS Details • Owner Certification form • $100 IWS Application Fee
Design Package Review	2-4 weeks	DOH	Letter of Approval
Variance Application Review	2 months	DOH	Letter of Approval for Construction
Construction	1-2 weeks/property	Contractor	Completed IWS
Final Inspection and Final Inspection Report (FIR)	1 day/property 1 month/report	Engineer	• Final Inspection Report (FIR) • As-Builts
FIR Review	1 month	DOH	Approval for Use

[1] Timelines are estimates, as it needs to be clarified if the design/DOH review is for the group of 10 lots or all 194 lots.

7.1 Project Schedule

Phasing for this project should reflect deadlines as well as workforce and product availability. The AOC requires the County to implement the selected wastewater treatment alternative for the 194 properties and to close the Nāʻālehu Community Cesspools no later than December 31, 2027. The County still needs to make a decision if the project will be bid out in groups of IWS (multiple bid packages) or if the project will be bid out in its entirety. Two different options for the project schedule are proposed as follows:

- Scheduling of the sites could be in accordance with the three currently open LCCs, which are displayed in Figure 1.22 below. The smaller two LCCs, LCC 4 and 5, which serve 16 and 8 lots respectively, could be grouped together to streamline the bidding process and timeframe. The construction of the smaller LCCs could also be treated as a pilot stage, with lessons learned to be integrated into the design of LCC 3, which serves approximately 138 lots. This option would streamline the amount of coordination required to inspect each of the three groups of connected properties and is displayed in Table 1.7.

During construction, lots should be grouped and approached with a top-down approach, starting with lots on the north end of Nāʻālehu and working down, keeping the previous sewer mains in mind and keeping the existing collective system active. This will enable the households downstream to not be affected by the construction. Multiple contractors could be awarded construction contracts for each bidding cycle which overlaps for increased time efficiency. The County could also choose to do the procurement and construction process separately for each of the three LCCs, starting with the smallest, LCC 5 with 8 lots as a pilot phase, and assign multiple contractors to each LCC. However, this would increase the total time of the project due to the additional round of bidding that would occur from ungrouping the construction of LCC 4 and 5.

- A pilot consisting of 10 sites consisting of LCC connected properties could be first permitted and constructed prior to the remaining parcels. Lessons learned from the pilot would be integrated into the design and permitting of the next phase of 154 LCC connected properties. Multiple contractors would be awarded construction contracts in 10-lot bundles that may be completed simultaneously.

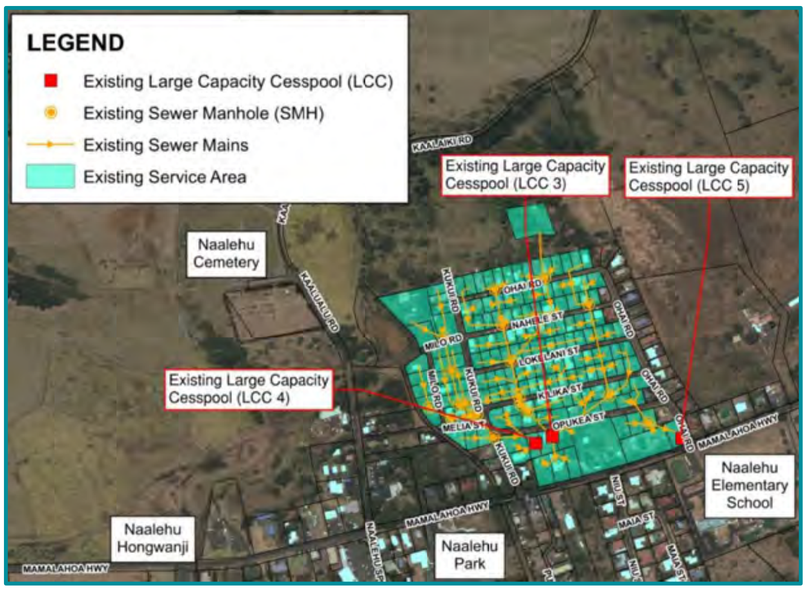
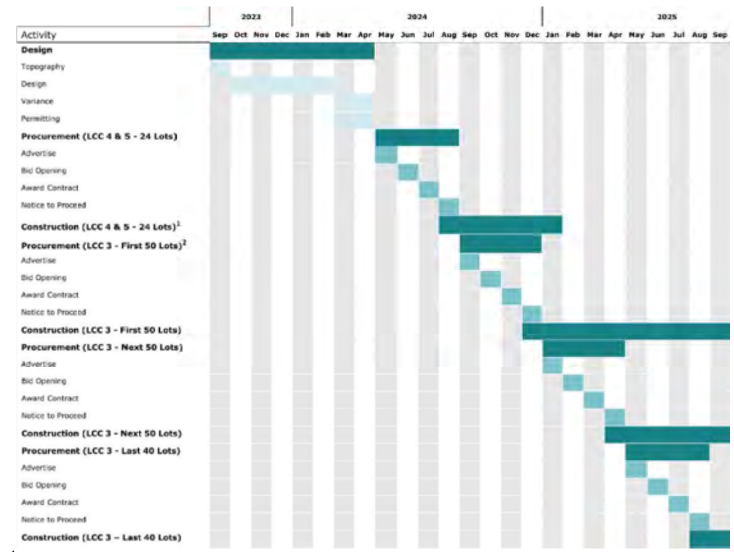


Figure 1.22: Existing Large Capacity Cesspools: LCC 4, LCC 3, and LCC 5 (Brown & Caldwell, 2023).

Table 1.7: Nāʻālehu LCC Replacement Schedule



[1] IWS construction time is an estimate. For a single contractor, it is estimated an IWS can be installed at a rate of one site per week for simple sites, and one site every two weeks where soil conditions and a contractors could have multiple crews which would allow them to complete more lots per week.
[2] Grouping of lots for LCC 3 can be modified to best keep the existing collection system active.

8. IWS Constructability Challenges & Solutions

8.1 Lack of Yard Space

Lots to be served in the Nāʻālehu community vary in size from 0.12 to 1.94 acres with a median size of 0.16 acres. Space available for IWS installation on these properties is further limited by the presence of existing structures. As a solution, seepage pits can be installed in lieu of absorption beds in space constrained lots, and IWS installations could be installed encroaching into County Right-of-Way, if permitted by Hawaiʻi County.

8.2 Landscaping

Wastewater infiltration and dispersion can be affected by landform position, and thus the selection of the IWS location needs to account for each site's unique landscape during the design and construction phase.

Additionally, disturbance of existing landscape can occur during the installation of an IWS, which can be a relatively invasive process requiring large equipment like excavators, dump trucks and cranes. Front-yard IWS installations can be utilized as an alternative to back-yard installations if this helps to minimize the disturbance of landscape. Thorough site assessments can help identify existing landscape features such as vegetation, trees, retaining walls, fence walls and natural drainage patterns which can help preserve key elements in the design. Trees may be temporarily removed and properly stored, and then later reinstalled to restore vegetation back to the original location. Speed and care in the restoration of any displaced and disturbed landscapes should be taken to increase homeowner satisfaction and to restore the site to pre-construction conditions or better.

8.3 Ground slope

When analyzing the topography of the site, key features offer more design flexibility than others. Long, planar slopes or plateaus should be prioritized when constructing an IWS over ridges, knolls, or other mounded or steeply sloping sites. Considering the ground slope is crucial in the design of an absorption bed to be downstream of the dwelling and septic tank. According to the EPA Manual, subsurface flows can accumulate in the presence of swales, depressions, or floodplains, and optimal landscape positions consist of convex slopes and flat areas with deep, permeable soils (EPA, 2002).

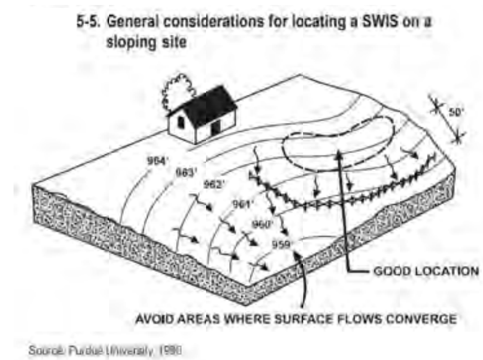


Figure 1.23: EPA Manual recommendation for placement of subsurface wastewater infiltration system (SWIS)

Sites in Nāʻālehu have slopes that vary from 6-10% (Appendix C). This is likely to affect the constructability of absorption beds as a method of wastewater disposal. Per HAR 11-62-34, absorption beds shall not be installed on land with a slope gradient greater than 8%, while absorption trenches are permitted on a slope of up to 12%. In case this slope requirement cannot be fulfilled, the DOH would allow a seepage pit to be installed instead of an absorption bed.

8.4 Cut Slope

Constructing an individual wastewater system (IWS) near a cut face can present challenges, particularly in relation to potential side seepage. The excavation or cut face may pose a risk of allowing wastewater to permeate the surrounding soil or potentially contaminate nearby groundwater sources.

To mitigate potential side seepage into adjacent cut face slopes, the IWS should be designed to consider the proximity to the cut face by adjusting the location and depth of the components, such as septic tanks or absorption beds. Installing the bottom of the absorption bed 20 feet away from the cut face slope ensures adequate distance for potential side seepage not to occur.

8.5 Site Geology

The National Resources Conservation Service Soil Survey was consulted for site soils information (Appendix D). The site is principally composed of Nāʻālehu medial silty clay loam and Puueo-Nāʻālehu complex. The surface of both compositions features silty loam, but the Puueo-Nāʻālehu complex gives way to lithic bedrock at a depth of approximately 20-40 inches.

This data was reinforced by the boring logs from a 2007 Geotechnical Investigation Report conducted by Masa Fujioka & Associates (Appendix E):

> ***"The Naalehu site has been mapped by the SCS as consisting of NaC and NaD, Naalehu series soils.***
>
> ***NaC and NaD are Naalehu series soils, which consists of well-drained silty clay loams that formed in volcanic ash. This soil normally overlies pahoehoe or a'a lava flows at depths of more than 40 inches.***
>
> ***During our site reconnaissance, we noted that the Naalehu site had been graded to form terraces with a road and adjacent homes on each terrace. Between terraces, we noted that the between terrace slopes consist of relatively thin near surface volcanic ash soils overlying basaltic rock.***
>
> ***The boring at the Septic Tank site area was drilled to a depth of 25 feet. This boring encountered topsoil (one foot) overlying ash soil to a depth of 4.5 feet. Broken and highly vesicular basaltic rock was encountered for the first 15 feet. The deeper rock appeared to become moderately fractured and vesicular, with higher recovery and RQD."***

Figure 1.24: Boring hole locations in Nāʻālehu, adapted from Masa Fujioka & Associates.

Figure 1.24 displays the boring hole locations from the analysis conducted by Masa Fujioka & Associates in Nāʻālehu. The detailed boring logs of these seven locations is located in Appendix E.

The underlying basalt found at the site will significantly increase the size and installation cost of IWS. As a solution, the engineer could show in the bid document/construction drawing that basalt rock layer is likely to be encountered, where the depth of the rock layer varies. The Contractor should price in dealing with rock layer in the bid. Further, it will be important to exercise caution during excavation due to the potential to encounter underground cavities and lava tubes. Appendix G outlines the proposed solution if lava tubes are encountered.

8.6 Soil Permeability: Percolation Test Results

IWS sizing is based on the percolation rate of the receiving soil. Percolation rates were conducted on July 31st and August 7th, 2023, at the Nāʻālehu site and ranged from 7-15 minutes/inch. The tests were conducted to a depth of 4-4.5 feet at four sites distributed across the project (Figure 1.25). Mainly soft dirt with occasional rocks with varying sizes was encountered during the tests with the full percolation test reports included in Appendix H.

Figure 1.25: Percolation test locations in Nāʻālehu.

Table 1.8: Percolation test results

Measure	TMK Number	2023 EPI Nāʻālehu LCC Replacement PER (min/in)	Test Date
Test 1	(3) 9-5-025:019	10 @ 4 ft	07/31/23 8:00am
Test 2	(3) 9-5-024:011	7 @ 4.5 ft	07/31/23 1:30pm
Test 3	(3) 9-5-024:068	8 @ 4 ft	08/07/23 12:00pm
Test 4	(3) 9-5-026:071	15 @ 4ft	08/07/23 8:00pm

8.7 Traffic Area

It is generally not good practice to install an IWS under a trafficked or otherwise concreted area. The presence of concrete or traffic compresses the soil in distribution systems and affects the accessibility of the system for maintenance. However, it is sometimes unavoidable on particularly spatially constrained properties. In this event, a system may be installed underneath a driveway or vehicle path of travel provided the system is designed to that end and traffic rated treatment components are used. These may include products such as concrete septic tanks and/or H-20 traffic related chambered disposal beds.

Furthermore, for front-yard IWS installations, it would be necessary to incorporate traffic-rated IWS components in potential parking areas. One alternative could be constructing barriers (wall, bollards, etc.) to prevent vehicle traffic over the system, allowing the need for traffic-rated IWS components to be alleviated.

8.8 Existing Building Structures

Existing structures limit available space for IWS installation. There is a possibility that some of the existing structures are unpermitted, but the amount/extent of unpermitted structures present is unknown. Not only can structures obstruct access points to the IWS components, making maintenance and servicing more challenging, unpermitted building additions can increase the wastewater flow to the IWS beyond its original design capacity. Previous conversations with the State of Hawaiʻi Department of Health have concluded that the design of each in Nāʻālehu should only account for the number of permitted bedrooms for each TMK parcel. Unpermitted buildings will not contribute to the design of the IWS capacity. Unpermitted structures will require further coordination and discussions between the County and homeowner on addressing unpermitted structures and including existing permitted obstructing structures that may need to be temporarily removed and reconstructed.

8.9 Access of Large Construction Equipment

Excavators, loaders, and cranes are examples of some of the large construction equipment needed to install an IWS. Access for this equipment is often obstructed by low roof overhang, blockage by permanent structures, overhead utilities, vegetation, or from insufficient path widths. Accommodating such equipment on especially small lots often requires temporarily removing and reconstructing of fencing, walls, existing landscaping, and in some cases small structures.

Access should be considered for installation as well as future maintenance activities. Opportunities to resolve access issues include:

- **IWS Placement:** Front-yard installations are recommended for homes without sufficient path widths to accommodate equipment access into the backyard.
- **Lightweight or Cast-in-Place Technologies:** The use of a crane can be avoided by specifying cast-in-place concrete septic tanks instead of precast varieties for particularly inaccessible locations. Alternatively, plastic and fiberglass offer lightweight alternatives for simplified installation.
- **Alternate Access Routes:** Access to a property's backyard may be accessed from an adjoining neighbor's property. Such access will need to obtain permission of the neighboring homeowner.

8.10 Access of Maintenance Equipment

IWS maintenance typically includes regular inspections, septage pumping, and periodic cleaning when a traditional septic tank is used. If systems are not inspected, septic tanks should be pumped every 3 to 5 years depending on the size of the tank, the number of building occupants, and household appliances and habits (EPA, 2002). In order to remove wastewater and/or sludge from the tank, the lid must be removed, and the tank is pumped through an access port. Debris surrounding the system must be removed, and access must be available for the pump hose which will pump wastewater to the pump truck parked in close proximity. Pump hoses are typically 150 feet long and can usually access the backyard of a property from the County Right-of-Way where the pump truck is parked.

8.11 Coordination with Landowners or Tenants

The successful completion of this project necessitates that homeowners/tenants cooperate in the design, permitting process, and during the construction phase of the project. It is recommended for the County to continuously notify landowners or tenants of project milestones, such as the selection of which IWS system will be installed. The County will obtain individual Right-of-Entry (ROE) forms to access properties during the design site assessment and topographic surveys. Separate ROE forms will be obtained for construction activities during the construction phase. The County will need to maintain a continuous dialogue and coordination with homeowners/tenants through the duration of the project for the project to be successful.

Potential challenges can occur if the homeowner has a preference on the location of the IWS. If the IWS is not in a favorable location for the homeowner, the IWS layout can be moved to a location with less disturbance to the homeowner to try to accommodate this request. Solutions may include altering the system layout by adding pumps, excavating deeper, etc.

8.12 Absorption Beds vs. Seepage Pits

When setback requirements and absorption bed sizing requirements cannot be reached due to lack of horizontal yard space, seepage pits can be employed to dispose of wastewater in a vertical manner.

Based on a visual walk through within the ROW roadway of the site on July 20, 2023 (Section 9), a preliminary estimate of 83 seepage pits will need to be installed in lieu of absorption beds. This estimate was made by visual inspection and would need to be confirmed by further surveys, as backyard space was not always visual from the public roads. Sites lacking the necessary space in the backyard for an absorption bed were assumed to require a seepage pit, unless significant space was present in the side or front yard. Appendix A estimates the yard area required for an absorption bed, which ranged from 330 sq. ft. to 1,330 sq. ft., based on the upper range of the percolation rate of the soil found (10 and 15 minutes/inch) and the number of permitted bedrooms in each dwelling.

8.13 Availability of Resources and Contractors

As an island state, Hawaiʻi faces unique challenges when it comes to the availability of IWS. The entire IWS market in Hawaiʻi grew from 1192 units per year in 2018 to 1414 units per year in 2021. Based on permits issued, sourcing the 194 treatment units required for this project will require an increase in statewide treatment unit supply and workforce size by 14% (DOH, 2022). This will require advanced planning to overcome this logistic hurdle.

Locally based septic manufacturers include Jensen Precast on Oʻahu and Chemtainer on Hawaiʻi Island. At present, Jensen produces approximately 40 concrete septic tanks per year. With that said, the company has stated that they have the capacity to build one septic tank per day to keep up with the needs of the project. The bottleneck to their current production rate has been cited as a shortage of inspectors, contractors, and engineers in the local market. Chemtainer manufactures polyethylene septic systems on Hawaiʻi Island but was unwilling to share their annual production rates. Mainland treatment system manufacturers like Orenco and Infiltrator have significantly higher production rates but will also face increased shipping costs in transporting the units to Hawaiʻi. Material availability and delivery will be the critical path item during construction, and the design of the IWS needs to ensure the possibility of different manufacturers being utilized is accommodated.

9. Technically Challenging Sites

A visual walk-through within the ROW was conducted at Nāʻālehu by EPI on July 20th, 2023. The aim of this site visit was to identify common conditions that are present in the community that would render an IWS installation technically difficult, due to the challenges of IWS construction. Five properties were initially flagged during the walk-through to have such challenging conditions, however the total number of properties with potential technical challenges is not limited to following households identified. Each dwelling may or may not have its own unique challenges and this section serves as an example of which challenges may be encountered during IWS design and construction.

Figure 1.26: Examples of sites with technically challenging conditions are marked in yellow (but are not limited to these five properties).

Table 1.9: Examples of Nāʻālehu Problematic Sites

Site	Problem Description	Photo
1	Site 1 has physical barriers such as concrete retaining walls and stairs that limit available space for IWS installation and will be costly to remove and reinstall. The IWS components will likely need to be installed under the driveway, which is at a higher elevation than the house, which may require a pump to be included in the system design. The IWS will also need to be traffic-rated. The IWS components could also be installed 3-4 feet deeper than usual under the driveway to ensure proper wastewater drainage from the household, and to negate the need for a pump. The driveway will not allow sufficient space for an absorption bed, and thus a seepage pit will need to be installed in addition to the septic tank. Installing a seepage pit in lieu of an absorption bed will require a variance application to the DOH. The seepage pit will also not meet the defined setback requirements to the property line and existing structures and will thus require an additional variance application.	  Address: 95-1204 Kukui Rd, Nāʻālehu, HI 96772
2	Site 2 has limited available accessible space for IWS installation. Communication with the homeowner will need to be made to see which household items can be relocated or removed to ensure space for the IWS components. The front and side yards do not allow sufficient space for an absorption bed, and thus a seepage pit will need to be installed in addition to the septic tank. Installing a seepage pit in lieu of an absorption bed will require a variance application to the DOH. The seepage pit will also not meet the defined setback requirements to the property line and existing structures and will thus require an additional variance application.	 Address: 95-5586 Nahele St, Nāʻālehu, HI 96772
3	Site 3 is situated on a slope, which may be difficult to maneuver with installation equipment. During installation, a temporary ramp may need to be constructed with material such as gravel for the equipment to be able to reach the lower level of the yard. Physical barriers such as the estimated 6-7 feet high retaining wall may need to be removed to access the available yard space. In addition, this site contains a basement that is estimated to 6 feet below the street grade, which will require deeper installation of IWS components or a pump.	 Address: 95-5581 Nahele St, Nāʻālehu, HI 96772

	The available yard space and driveway does not allow sufficient room for an absorption bed, and thus a seepage pit will need to be installed in addition to the septic tank. Installing a seepage pit in lieu of an absorption bed will require a variance application to the DOH. The seepage pit will also not meet the defined setback requirements to the property line and existing structures and will thus require an additional variance application.	
4	Site 4 has limited yard space for installation in the front and sides, and the front yard is difficult to access due to physical barriers and the sloped nature of the site. The driveway/parking area is located up higher than the house and the backyard drops in elevation, which would require the septic system be installed deep into the ground, if the backyard is not accessible by neighboring sites. The property does not have sufficient space for an absorption bed, and thus a seepage pit will need to be installed in addition to the septic tank. Installing a seepage pit in lieu of an absorption bed will require a variance application to the DOH. The seepage pit will also not meet the defined setback requirements to the property line and existing structures and will thus require an additional variance application.	 Address: 95-5573 Nahele St, Nāʻālehu, HI 96772
5	Site 5 has limited yard space, is situated on a slope, and contains physical barriers that will need to be removed. The basement level is lower than the street, which may require a pump to be installed in the IWS system if a front-yard installation is chosen, or a deeper installation. This site also appears to be abandoned. The driveway and front yard do not have sufficient space for an absorption bed, and thus a seepage pit will need to be installed in addition to the septic tank. Installing a seepage pit in lieu of an absorption bed will require a variance application to the DOH. The seepage pit will also not meet the defined setback requirements to the property line and existing structures and will thus require an additional variance application.	 Address: 95-5557 Nahele St, Nāʻālehu, HI 96772

10. Operational Considerations

An effective Individual Wastewater System (IWS) management strategy is crucial to ensuring distributed treatment systems are maintained and operated in a way that ensures they are functioning properly and effectively treating wastewater. This strategy may include but is not limited to:

- **Monitoring:** Regular inspections of system components, such as septic tanks and drain fields, ensure they are functioning properly and identify and address any issues that may arise.
- **Maintenance:** Proper maintenance of the system is also crucial, including regular pumping of septic tanks, cleaning and maintenance of the distribution systems, and proper maintenance of the treatment components. Regular maintenance can help prevent issues such as clogs and backups, which can lead to costly repairs and potential health hazards.
- **Regulatory Compliance:** Necessary permits and licenses are obtained for the system, and required inspection and reporting schedules are met with the local regulator.
- **Community Education:** Information and training on proper usage and maintenance of the systems are provided to homeowners, and any concerns or questions that may arise are addressed.

In Hawaiʻi, centralized wastewater treatment plants and cluster systems are regulated and inspected by the Department of Health (DOH) Wastewater Branch (Hawaiʻi Administrative Rules 11-62).

State-licensed WWTP operators are required for oversight of Wastewater Treatment plants to ensure that systems are inspected, operated, and maintained as required. A similar regulatory requirement does not exist for IWS in Hawaiʻi. The State DOH Wastewater Branch is responsible for regulating IWS while operation and maintenance are currently the responsibility of the individual homeowner. If IWS were selected to serve Nāʻālehu Community, maintenance responsibilities could be distributed in a number of ways. Per Voluntary National Guidelines for Management of Onsite and Clustered (Decentralized) Wastewater Treatment System, the EPA outlined five management models that can be used for the operation and maintenance of IWS (Table 1.10).

When selecting an appropriate management model for a network of IWS it is important to take into account the regulatory and cultural framework within which the IWS is situated. As it stands in Hawaiʻi, IWS are currently managed similar to a combination of management Models 1 and 2 (DOH, 2016):

- **Model 1: Homeowner Awareness.** The DOH allows septic systems to be managed by the homeowner under this model. Homeowners own and operate their own IWS and are responsible for keeping the system in good working order.
- **Model 2: Maintenance Contracts.** The DOH requires that Aerobic Treatment Units

(ATUs) are managed by a state licensed wastewater operator using this model. Homeowners are required to have an active service contract with a certified operator or factory certified representative, and a copy of that active service contract must be submitted annually to the DOH (DOH, 2016). Elevated regulation around the operation of ATUs is a reflection of their increased mechanical complexity and associated maintenance demands.

Table 1.10: The five management models for IWS maintenance (EPA, 2003)

The Five Management Models				
Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Homeowner Awareness:	**Maintenance Contracts:**	**Operating Permits:**	**Responsible Management Entity (R:ME) Operation and Maintenance:**	**RME Ownership:**
specifies appropriate program elements and activities where treatment systems are owned and operated by individual property owners in areas of low environmental sensitivity. This program is adequate where treatment technologies are limited to conventional systems that require little owner attention. To help ensure that timely maintenance is performed, the regulatory authority mails maintenance reminders to owners at appropriate intervals.	specifies program elements and activities where more complex designs are employed to enhance the capacity of conventional systems to accept and treat wastewater. Because of treatment complexity, contracts with qualified technicians are needed to ensure proper and timely maintenance.	specifies program elements and activities where sustained performance of treatment systems is critical to protect public health and water quality. Limited-term operating permits are issued to the owner and are renewable for another term if the owner demonstrates that the system is in compliance with the terms and conditions of the permit. Performance--based designs may be incorporated into programs with management controls at this level.	specifies program elements and activities where frequent and highly reliable operation and maintenance of decentralized systems is required to ensure water resource protection in sensitive environments. Under this model, the operating permit is issued to an RME instead of the property owner to provide the needed assurance that the appropriate maintenance is performed.	specifies that program elements and activities for treatment systems are owned, operated, and maintained by the RME, which removes the property owner from responsibility for the system. This program is analogous to central sewerage and provides the greatest assurance of system performance in the most sensitive of environments.

The AOC stipulates that the County of Hawaiʻi must administer a more active management strategy than is typical in Hawaiʻi, either a Model 2 (Maintenance Contract) or Model 3 (Operating Permit) management strategy for a network of IWS at Nāʻālehu. These models reflect varying degrees of responsibility to the County and homeowner (Table 1.11). Four potential variations of these models are outlined here for implementation on this project:

- **Management Model 2A: Maintenance Contract with County In-House Staff**
  The County employs and trains an in-house IWS management team; purchases and maintains its own pumping/hauling equipment; and administers the management program. The homeowner pays a monthly sewer fee that covers a portion of the costs.
- **Management Model 2B: Maintenance Contract with Third-Party Service**
  The County administers the management program, keeps an operations and maintenance (O&M) schedule, and contracts out O&M activities to a third-party service provider. The homeowner pays a monthly sewer fee that covers a portion of the costs.
- **Management Model 3A: Operating Permits with O&M by Users**
  The County issues an operating permit to the homeowner; keeps an O&M schedule; and sends out maintenance reminders to homeowners. The homeowner is responsible for contracting a third-party service provider to conduct maintenance.
- **Management Model 3B: Operating Permits with O&M Voucher by County**
  The County issues an operating permit to the homeowner; keeps an O&M schedule; and sends out maintenance reminders with service vouchers to homeowners. The homeowner pays a sewer fee and is responsible for contracting a third-party service provider to conduct annual maintenance using the voucher.

These management strategies presented here are required by the AOC but are also unique to Hawaiʻi and will present a number of barriers for implementation at the legislative, regulatory, and public levels. The Nāʻālehu Community and Hawaiʻi's stakeholders at large are accustomed to Management Model 1, which is the standard practice across the State of Hawaiʻi.

Table 1.11: County and homeowner responsibilities under variations of the EPA Management Models 2 and 3

Management Model	Brief Description of Management Model	County's Responsibility	Homeowner / User's Responsibility	Pros	Cons
2A	Maintenance Contract w/ County in-house staff	• Funds design and construction of IWS • Purchase equipment & train IWS operator • O&M of IWS including trouble calls • Keeping record of O&M log • Send out notices and reminders to homeowners • Submit IWS inspection reports and variance renewals to State DOH	• Report IWS problem to County • Cooperates and allows County staff to enter private property and provide maintenance of IWS • Maintain clearance to IWS for easy access	1. Best control on O&M schedule 2. Ensure best IWS performance	1. Highest cost 2. May not receive cooperation from some homeowners/users 3. Homeowner may have more trouble calls 4. Potential dispute between homeowner & County on plumbing repair cost & IWS repair cost
2B	Maintenance Contract w/ 3rd Party Service	• Funds design and construction of IWS • Select/prequalify certain 3rd party service provider (Pumper) • Issue PO to Pumper & plumber for annual inspection and trouble calls • Keeping record of O&M log • Send out notices and reminders to homeowners • Submit IWS inspection reports and variance renewals to State DOH	• Report IWS problem to County • Cooperates and allows service providers to enter private property and provide maintenance of IWS • Maintain clearance to IWS for easy access	1. Better control on O&M schedule 2. Ensure better IWS performance 3. Less County staff to train 4. No pumping/hauling equipment to purchase & maintain	1. Higher cost 2. May not receive cooperation from some homeowners/users 3. Homeowner may have more trouble calls 4. Potential dispute between homeowner & County on plumbing repair cost & IWS repair cost
3A	Operating Permits w/ O&M by Users	• Funds design and construction of IWS • Keeping record of O&M log • Send out notices and reminders to homeowners • Enforce rules and regulations • Issues permit to homeowner to use, operate & maintain the IWS	• Contracts with preferred pumper / plumber to maintain the IWS • Pay for the O&M service • Submit O&M record to County • Submit IWS inspection reports and variance renewals to State DOH	1. Least cost to County 2. No O&M staff or equipment 3. No trouble calls	1. Least control for IWS compliance & performance 2. Conflict with non-compliant homeowners 3. Highest cost to homeowner
3B	Operating Permits w/ O&M Voucher by County	• Funds design and construction of IWS • Keeping record of O&M log • Send out notices and reminders to homeowners • Enforce rules and regulations • Pre-select qualifying service providers • Issue vouchers to homeowners for annual inspections and pumping • Issues permit to homeowner to use, operate & maintain the IWS	• Contracts with preferred pre-qualified pumper / plumber to maintain the IWS • Pay for the annual O&M service with voucher • Submit O&M record to County by pumper • Submit IWS inspection reports and variance renewals to State DOH	1. Reasonable control on O&M 2. Reasonable IWS performance 3. Less County staff to train 4. No pumping/hauling equipment to purchase & maintain 5. Trouble calls to be paid for by homeowner	1. High cost to County 2. Less control of all IWS

11. Economic Considerations

When assessing the overall cost of a given system, it is important to consider the net present value lifecycle cost taking system lifetime and installation, maintenance, and operation costs into account. These costs can be affected by a variety of factors, including:

- **Type of treatment and disposal system:** The selection of different types of treatment systems such as traffic rated tanks or aerobic treatment significantly affects overall installed cost. For disposal, seepage pits are significantly lower cost than absorption fields when it is possible to convert an existing cesspool. Site specific conditions will control which options are required. For residential IWS installations subject to State procurement regulations, capital costs per household are typically in the range of $30,000-$100,000 (Table 1.12). Due to the potential need for repair and reconstruction of property site elements (fencing, walls, structures, etc.) that may need to be removed during IWS installation, the cost per household in Nāʻālehu can be up to $150,000. At this stage of the project, it is fully unknown the extent of reconstruction of existing site elements, and this would need to be further determined during the design phase of the project, which can impact the stated estimated cost.

Table 1.12: Installation cost estimates for a standard septic tank installed in conjunction with an absorption bed (left) and seepage pit (right). Figures are based on a 3-bedroom house and a percolation rate no slower than 5 min/inch.

	Standard Absorption Bed		Seepage Pit	
	Low (non-traffic)	High (Traffic Rated)	Low (non-traffic)	High (Traffic Rated)
Septic Tank	3,000.00	7,000.00	3,000.00	7,000.00
D-Box	750.00	2000 .00	–	–
Sewer pipe	250.00	250.00	250.00	250.00
Leach field-pipe/ chamber	500.00	3,000.00	–	–
Leach field-gravel	1,000.00	500.00	–	–
Cone. Ring	–	–	3,000.00	3,000.00
Cone. Cover	–	–	2,500.00	4,000.00
Soil replacement	1,500.00	1,500.00	–	–
Inspection ports	500.00	500.00	–	–
Misc. material	2,000.00	2,000.00	2,000.00	2,000.00
Material Total	**$ 9,500.00**	**$ 16,750.00**	**$ 10,750.00**	**$ 16,250.00**
Labor / Equipment	7,500.00	15,000.00	7,500.00	15,000.00
Remoteness	5,000.00	5,000.00	5,000.00	5,000.00
Trucking for spoils	3,000.00	3,000.00	3,000.00	3,000.00
Tight working space	3,000.00	10,000.00	3,000.00	10,000.00
Relocate/reinstall/ repair	5,000.00	100,000.00	5,000.00	100,000.00
TOTAL	**$ 33,000.00**	**$ 149,750.00**	**$ 34,250.00**	**$ 149,250.00**

- **Operations and Maintenance cost:** Operations and maintenance cost also play a big role in the overall cost of IWS. Annual maintenance costs to the County and homeowner vary depending on the management strategy. It is estimated that bringing maintenance in-house is the most affordable option (Table 1.13). Annual costs over a 20-year service lifetime are further expounded in Appendix B.

Table 1.13: The costs associated with four IWS management models, assuming septic systems with leach fields (Appendix B).

Management Model	Average Annual Cost to County		Average Annual Cost to Homeowner		Net Annual Cost to County	Total Annual Dollars Spent
	Third-Party Service Provider	In-House	Third-Party Service Provider	County Sewer Bill[1]		
2A: Maintenance Contract w/ County in-house staff	–	($956)	-	$600	($356)	($956)
2B: Maintenance Contract w/ 3rd Party Service	($783)	($572)	-	$600	($755)	($1,355)
3A: Operating Permits w/ O&M by Users	–	($572)	($733)	-	($572)	($1,305)
3B: Operating Permits w/ O&M Voucher by County	($533)	($572)	-	$600	($505)	($1,105)

[1] The annual average County sewer bill is based on an average of $50/month sewer bill for households in Hawaiʻi.

References

Babcock, R., Barnes, M., Fung, A., Goodell, W., & Oleson, K. (2019). ***Investigation of Cesspool Upgrade Alternatives in Upcountry Maui Final Report***. University of Hawaii Manoa.

Babcock, R., Lamichhane, K. M., Cummings, M. J., & Cheong, G. H. (2014). Condition assessment survey of onsite sewage disposal systems (OSDSs) in Hawaii. ***Water Science and Technology***, 70(6), 1083–1089. https://doi.org/10.2166/wst.2014.336

Carollo Engineers (2021). ***Cesspool Conversion Technologies Research Summary Report***. Hawaii State Department of Health.

Hawaii County Code, Chapter 21 Sewers (2016). https://www.hawaiicounty.gov/home/showpublisheddocument/46/637032750278570000

Hawaii State Department of Business, Economic Development and Tourism. (2021). ***The State of Hawaii Data Book: A Statistical Abstract***. State of Hawaii Department of Business, Economic Development, and Tourism. https://files.hawaii.gov/dbedt/economic/databook/db2021/DB2021_final.pdf

Environmental Protection Agency. (1996, June). ***Wastewater Treatment: Alternatives to Septic Systems***. Environmental Protection Agency. https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=20013JJ8.txt

Environmental Protection Agency. (2002). ***USEPA Onsite Wastewater Treatment Systems Manual***. In *United States Environmental Protection Agency* (pp. 1–367). https://www.epa.gov/sites/default/files/2015-06/documents/2004_07_07_septics_septic_2002_osdm_all.pdf

Environmental Protection Agency (2003). ***Voluntary National Guidelines for Management of Onsite and Clustered (Decentralized) Wastewater Treatment Systems***. Environmental Protection Agency. https://www.epa.gov/sites/default/files/2015-06/documents/septic_guidelines.pdf

Environmental Protection Agency. (2018) ***Types of Septic Systems*** [Overviews and Factsheets]. https://www.epa.gov/septic/types-septic-systems

Environmental Protection Agency (2010). Code of Federal Regulations, 40 C.F.R §144.80 Title 40—Protection of Environment. https://www.govinfo.gov/content/pkg/CFR-2014-title40-vol23/xml/CFR-2014-title40-vol23-part144.xml

Evergreen. (2023). ***Separett Villa urine separating toilet***. Evergreen. https://evergreen.eco/en-us/products/urine-separating-toilet-villa-9020-12v-230v

Hawaii State Department of Health. (2009). ***Guidelines for the Reuse of Gray Water***. Hawaii Department of Health Wastewater Branch. https://health.hawaii.gov/wastewater/

files/2016/03/14_Gray_Water_GL.pdf

Hawaii State Department of Health. (2016) HAR 11-62 Wastewater Systems. https://health.hawaii.gov/opppd/files/2015/06/11-62-Wastewater-Systems.pdf

Hawaii State Department of Health. (2017). ***Relating to Cesspools and Prioritization for Replacement***. https://health.hawaii.gov/opppd/files/2017/12/Act-125-HB1244-HD1-SD3-CD1-29th-Legislature-Cesspool-Report.pdf

Hawaii State Department of Health. (2022). ***IWS Final Approval Date Report (04/01/2017-04/01/2022)***. Hawaii State Department of Health Wastewater Branch.

Incinerating Toilets Inc. (2023). ***Cinderella Comfort Incinerating Toilets***. Incinerating Toilets Inc. https://incineratingtoilets.com/us/product/cinderella-comfort/

Infiltrator. (2023). ***Advanced Enviro-Septic***. Infiltrator Water Technologies. https://www.infiltratorwater.com/products/presby-environmental/advanced-enviro-septic/

Lekven, C. (2019). ***Pahala Wastewater Treatment Plant Preliminary Engineering Report***. Brown and Caldwell. https://www.epa.gov/sites/default/files/2020-03/documents/pahala_final_ea_vol_2_508_2020-02-24.pdf

Mezzacapo, M., & Shuler, C. (2021). 2021 ***Hawaii Cesspool Hazard Assessment and Prioritization Tool***. University of Hawaii. https://health.hawaii.gov/wastewater/files/2022/01/priortizationtoolreport.pdf

Mohamed, R. (2009). Why households in the United States do not maintain their septic systems and why state-led regulations are necessary: Explanations from public goods theory. ***International Journal of Sustainable Development and Planning***, 4, 143–157. https://doi.org/10.2495/SDP-V4-N2-143-157

New Zealand Distributors. (2018). AES Homeowners Manual AES (Advanced Enviro-Septic TM) Owners Manual (pp. 1–12).

Nuflow Wide Bay. (2015, September 15). *Blocked Drains Bundaberg*. Nuflow Wide Bay. https://www.nuflowwidebay.com.au/understanding-the-mysteries-of-septic-tanks/

Peterson, A. (2010, May 2). Plantation Era Is Gone, and Pahala Lives On: Historic Preservationist Julia Neal Uses Hammer and Wood to Pull the Community Together. ***Ke Ola Magazine***. https://keolamagazine.com/community/plantation-era-gone-pahala-lives-on/

Pine Creek Structures. (2023). ***Excel NE Sun-Mar Composting Toilet***. https://www.storageshedspa.com/sheds/other-products/17759/excel-ne-sun-mar-composting-toilet

Presby Environmental, Inc. (2017). *The Presby Wastewater Treatment System Design and Installation Specifications for Advanced Enviro-Septic ®, Enviro-Septic ® and Simple-Septic ® Wastewater Treatment Systems Minimizes the Expense*

Protects the Environment Preserves the Site. wwww.PresbyEnvironmental.com

Presby Environmental, Inc. (n.d.). *The Next Generation of Wastewater Treatment Technology Brochure*.

ShopTinyHouses. (2023). ***Sun-Mar Centrex 3000 Composting Toilet System***. ShopTinyHouses.Com. https://www.shoptinyhouses.com/products/sun-mar-centrex-3000-central-composting-toilet-system

Water Resources Research Center, & Engineering Solutions, Inc. (2008). ***ONSITE WASTEWATER TREATMENT SURVEY AND ASSESSMENT***. In *State of Hawaii, Department of Health*. https://health.hawaii.gov/wastewater/files/2013/06/onsitesurvey.pdf

A

Appendix A - LCC Closure Properties

Naalehu LLC Closure							Absorption Field DOH HAR Chapter 11-62 Absorption Field Size (sqr ft)		
TMK#	Address	Land Area (acres)	# of Bldgs	# of Bedrms	Est. WW Gen. (gpd)	Septic Tank (gal)	for Perc Rate: 10min/in.	for Perc Rate: 15min/in.	Remarks
9-5-008-022	95-1214 KUKUI ROAD	1.0540	1	4	800	1000	660	760	
9-5-025-032	95-1199 A MILO ROAD	1.1810	2	2	400	1000	330	380	
9-5-025-031	95-1211 KUKUI ROAD	0.1818	1	3	600	1000	495	570	
9-5-025-030	95-1209 KUKUI ROAD	0.1818	1	3	600	1000	495	570	
9-5-025-029	95-1207 KUKUI ROAD	0.1818	1	3	600	1000	495	570	
9-5-025-028	95-1201 KUKUI ROAD	0.4198	1	4	800	1000	660	760	
9-5-025-014	95-1199 MILO ROAD	0.4037	1	4	800	1000	660	760	
9-5-025-013	95-1195 MILO ROAD	0.2673	1	3	600	1000	495	570	
9-5-025-012	95-1193 MILO ROAD	0.2335	1	3	600	1000	495	570	
9-5-025-011	95-1189 MILO ROAD	0.2210	1	3	600	1000	495	570	
9-5-025-010	95-1187 MILO ROAD	0.2017	1	3	600	1000	495	570	
9-5-025-009	95-1181 MILO ROAD	0.2182	1	2	400	1000	330	380	
9-5-025-015	95-1202 MILO ROAD	0.1744	1	3	600	1000	495	570	
9-5-025-016	95-1194 MILO ROAD	0.1826	1	3	600	1000	495	570	
9-5-025-017	95-1192 MILO ROAD	0.1637	1	3	600	1000	495	570	
9-5-025-018	95-1188 MILO ROAD	0.1616	1	3	600	1000	495	570	
9-5-025-019	95-1186 MILO ROAD	0.1606	1	3	600	1000	495	570	
9-5-025-020	95-1184 MILO ROAD	0.1533	1	3	600	1000	495	570	
9-5-025-021	95-5598 MELIA STREET	0.1896	1	3	600	1000	495	570	
9-5-025-022	95-5596 MELIA STREET	0.1900	1	2	400	1000	330	380	
9-5-025-023	95-1185 KUKUI ROAD	0.1666	1	3	600	1000	495	570	
9-5-025-024	95-1187 KUKUI ROAD	0.1590	1	3	600	1000	495	570	
9-5-025-025	95-1191 KUKUI ROAD	0.1569	1	3	600	1000	495	570	
9-5-025-026	95-1193 KUKUI ROAD	0.1751	1	5	1000	**1250**	825	950	**Note: 1250 gal Septic Tank**
9-5-025-027	95-1206 MILO ROAD	0.1765	1	3	600	1000	495	570	
9-5-025-008	95-5599 MELIA STREET	0.2129	1	3	600	1000	495	570	
9-5-025-007	95-5595 MELIA STREET	0.2112	1	2	400	1000	330	380	
9-5-025-006	95-1173 KUKUI ROAD	0.2013	1	1	200	1000	165	190	
9-5-025-005	95-1171 KUKUI ROAD	0.3108	1	3	600	1000	495	570	
9-5-025-004	95-1165 KUKUI ROAD	0.2190	1	3	600	1000	495	570	
9-5-025-003	95-1163 KUKUI ROAD	0.3522	1	3	600	1000	495	570	
9-5-026-080	95-1212 KUKUI ROAD	0.1731			0	1000	0	0	abandoned
9-5-026-079	95-1240 OHAI ROAD	0.1722			0	1000	0	0	no structure
9-5-026-078	95-1238 OHAI ROAD	0.1722	1	3	600	1000	495	570	
9-5-026-077	OHAI ROAD	0.1722			0	1000	0	0	no structure
9-5-026-076	95-1234 OHAI ROAD	0.1722	1	3	600	1000	495	570	
9-5-026-075	95-1232 OHAI ROAD	0.1722	1	2	400	1000	330	380	
9-5-026-074	95-1228 OHAI ROAD	0.1722	1	3	600	1000	495	570	
9-5-026-073	95-1226 OHAI ROAD	0.1722	1	3	600	1000	495	570	
9-5-026-072	95-1224 OHAI ROAD	0.1722	1	3	600	1000	495	570	
9-5-026-071	95-1222 OHAI ROAD	0.1722	1	3	600	1000	495	570	
9-5-026-070	95-1220 OHAI ROAD	0.1722	1	3	600	1000	495	570	
9-5-026-069	95-1216 OHAI ROAD	0.1722	1	3	600	1000	495	570	
9-5-026-068	95-1214 OHAI ROAD	0.1722	1	2	400	1000	330	380	
9-5-026-067	95-1212 OHAI ROAD	0.1722	1	3	600	1000	495	570	
9-5-026-066	OHAI ROAD	0.1835	0	0	0	1000	0	0	
9-5-026-065	95-1208 OHAI ROAD	0.2703	1	3	600	1000	495	570	
9-5-026-064	95-1206 OHAI ROAD	0.2399	1	3	600	1000	495	570	
9-5-026-063	95-1204 OHAI ROAD	0.2077	1	3	600	1000	495	570	
9-5-026-062	95-1202 OHAI ROAD	0.2204	1	3	600	1000	495	570	
9-5-026-061	95-1198 OHAI ROAD	0.2146	1	3	600	1000	495	570	
9-5-026-060	95-1196 OHAI ROAD	0.2066	1	3	600	1000	495	570	
9-5-026-059	95-5548 LOKELANI STREET	0.2046	1	3	600	1000	495	570	
9-5-024-075		0.1417	0	0	0	1000	0	0	
9-5-024-074	95-5547 LOKELANI STREET	0.2046	1	3	600	1000	495	570	
9-5-024-073	95-1184 OHAI ROAD	0.2066	1	3	600	1000	495	570	
9-5-024-072	95-1182 OHAI ROAD	0.2066	1	3	600	1000	495	570	
9-5-024-071	95-1178 OHAI ROAD	0.2111	1	3	600	1000	495	570	
9-5-024-070	95-1174 OHAI ROAD	0.2301	1	3	600	1000	495	570	
9-5-024-069	OHAI ROAD	0.1286	0	0	0	1000	0	0	
9-5-024-068	95-1166 OHAI ROAD	0.2537	1	3	600	1000	495	570	
9-5-026-031	95-5554 NAHELE STREET	0.1421	1	2	400	1000	330	380	
9-5-026-032	NAHELE STREET	0.1336	1	3	600	1000	495	570	
9-5-026-033	95-5558 NAHELE STREET	0.1336	1	3	600	1000	495	570	

9-5-026-034	95-5562 NAHELE STREET	0.1703	1	3	600	1000	495	570	
9-5-026-035	95-5564 NAHELE STREET	0.1703	1	3	600	1000	495	570	
9-5-026-036	95-5568 NAHELE STREET	0.1871	1	6	1200	**1500**	990	1140	**Note: 1500 gal Septic Tank with DOH Variance**
9-5-026-037	95-5570 NAHELE STREET	0.1336	1	3	600	1000	495	570	
9-5-026-038	95-5572 NAHELE STREET	0.1336	1	3	600	1000	495	570	
9-5-026-039	95-5576 NAHELE STREET	0.1336	1	3	600	1000	495	570	
9-5-026-040	95-5578 NAHELE STREET	0.1425	1	3	600	1000	495	570	
9-5-026-041	95-5580 NAHELE STREET	0.1247	1	3	600	1000	495	570	
9-5-026-042	95-5582 NAHELE STREET	0.1336	1	3	600	1000	495	570	
9-5-026-043	95-5586 NAHELE STREET	0.1336	1	3	600	1000	495	570	
9-5-026-044	95-1204 KUKUI ROAD	0.1361	1	3	600	1000	495	570	
9-5-026-045	95-1241 OHAI ROAD	0.1494	1	2	400	1000	330	380	
9-5-026-046	95-1239 OHAI ROAD	0.1603	1	3	600	1000	495	570	
9-5-026-047	95-1237 OHAI ROAD	0.1603	1	3	600	1000	495	570	
9-5-026-048	95-1235 OHAI ROAD	0.1336	1	3	600	1000	495	570	
9-5-026-049	95-1231 OHAI ROAD	0.1336	1	3	600	1000	495	570	
9-5-026-050	95-1227 OHAI ROAD	0.1336	1	3	600	1000	495	570	
9-5-026-051	95-1225 OHAI ROAD	0.1336	1	3	600	1000	495	570	
9-5-026-052	95-1223 OHAI ROAD	0.1336	1	3	600	1000	495	570	
9-5-026-053	95-1221 OHAI ROAD	0.1336	1	3	600	1000	495	570	
9-5-026-054	95-1219 OHAI ROAD	0.1336	1	3	600	1000	495	570	
9-5-026-055	95-1217 OHAI ROAD	0.1336	1	3	600	1000	495	570	
9-5-026-056	95-1215 OHAI ROAD	0.2316	1	3	600	1000	495	570	
9-5-026-058	95-1207 OHAI ROAD	0.1990	1	3	600	1000	495	570	
9-5-026-001	95-5554 LOKELANI STREET	0.1442	1	3	600	1000	495	570	
9-5-026-002	95-5556 LOKELANI STREET	0.1336	1	3	600	1000	495	570	
9-5-026-003	95-5558 LOKELANI STREET	0.1336	1	3	600	1000	495	570	
9-5-026-004	95-5560 LOKELANI STREET	0.1336	1	3	600	1000	495	570	
9-5-026-005	95-5562 LOKELANI STREET	0.1336	1	3	600	1000	495	570	
9-5-026-006	95-5566 LOKELANI STREET	0.1336	1	3	600	1000	495	570	
9-5-026-007	95-5568 LOKELANI STREET	0.1336	1	3	600	1000	495	570	
9-5-026-008	95-5570 LOKELANI STREET	0.1336	1	3	600	1000	495	570	
9-5-026-009	95-5574 LOKELANI STREET	0.2120	1	3	600	1000	495	570	
9-5-026-010	95-5576 LOKELANI STREET	0.1386	1	3	600	1000	495	570	
9-5-026-011	95-5580 LOKELANI STREET	0.1336	1	3	600	1000	495	570	
9-5-026-012	95-5582 LOKELANI STREET	0.1394	1	3	600	1000	495	570	
9-5-026-013	95-5584 LOKELANI STREET	0.1336	1	3	600	1000	495	570	
9-5-026-014	95-5586 LOKELANI STREET	0.1336	1	3	600	1000	495	570	
9-5-026-015	95-5588 LOKELANI STREET	0.1316	1	3	600	1000	495	570	
9-5-026-016	95-1198 KUKUI ROAD	0.1316	1	2	400	1000	330	380	
9-5-026-017	95-5583 NAHELE STREET	0.1336	1	3	600	1000	495	570	
9-5-026-018	95-5581 NAHELE STREET	0.1336	1	7	1400	**1750**	1155	1330	**Note: 1750 gal Septic Tank with DOH Variance**
9-5-026-019	95-5579 NAHELE STREET	0.1336	1	3	600	1000	495	570	
9-5-026-020	95-5577 NAHELE STREET	0.1269	1	3	600	1000	495	570	
9-5-026-021	95-5575 NAHELE STREET	0.1425	1	3	600	1000	495	570	
9-5-026-022	95-5573 NAHELE STREET	0.1336	1	3	600	1000	495	570	
9-5-026-023	95-5569 NAHELE STREET	0.1336	1	3	600	1000	495	570	
9-5-026-024	95-5567 NAHELE STREET	0.1336	1	3	600	1000	495	570	
9-5-026-025	95-5565 NAHELE STREET	0.1336	1	3	600	1000	495	570	
9-5-026-026	95-5561 NAHELE STREET	0.1336	1	3	600	1000	495	570	
9-5-026-027	95-5559 NAHELE STREET	0.1336	1	5	1000	**1250**	825	950	**Note: 1250 gal Septic Tank**
9-5-026-028	95-5557 NAHELE STREET	0.1336	1	3	600	1000	495	570	
9-5-026-029	95-5555 NAHELE STREET	0.1336	1	3	600	1000	495	570	
9-5-026-030	95-5551 NAHELE STREET	0.1924	1	3	600	1000	495	570	
9-5-024-052	95-5553 LOKELANI STREET	0.1627	1	3	600	1000	495	570	
9-5-024-053	95-5555 LOKELANI STREET	0.1336	1	3	600	1000	495	570	
9-5-024-054	95-5557 LOKELANI STREET	0.2530	1	3	600	1000	495	570	
9-5-024-056	95-5561 LOKELANI STREET	0.1336	1	3	600	1000	495	570	
9-5-024-057	95-5565 LOKELANI STREET	0.1336	1	3	600	1000	495	570	
9-5-024-058	95-5567 LOKELANI STREET	0.1336	1	3	600	1000	495	570	
9-5-024-059	95-5569 LOKELANI STREET	0.1336	1	3	600	1250	495	570	
9-5-024-060	95-5571 LOKELANI STREET	0.1336	1	3	600	1000	495	570	
9-5-024-061	95-5573 LOKELANI STREET	0.1336	1	6	1200	**1500**	990	1140	**Note: 1500 gal Septic Tank with DOH Variance**
9-5-024-062	95-5577 LOKELANI STREET	0.1336	1	3	600	1000	495	570	
9-5-024-063	95-5579 LOKELANI STREET	0.1336	1	3	600	1000	495	570	
9-5-024-064	95-5581 LOKELANI STREET	0.1336	1	3	600	1000	495	570	
9-5-024-065	95-5583 LOKELANI STREET	0.1336	1	3	600	1000	495	570	
9-5-024-066	95-5585 LOKELANI STREET	0.1336	1	3	600	1000	495	570	

9-5-024-067	95-1188 KUKUI ROAD	0.1379	1	3	600	1000	495	570	
9-5-024-036	95-1184 KUKUI ROAD	0.1379	1	3	600	1000	495	570	
9-5-024-037	95-5588 KILIKA STREET	0.1336	1	3	600	1000	495	570	
9-5-024-038	95-5586 KILIKA STREET	0.1336	1	3	600	1000	495	570	
9-5-024-039	95-5584 KILIKA STREET	0.1336	1	5	1000	**1250**	825	950	**Note: 1250 gal Septic Tank**
9-5-024-040	95-5582 KILIKA STREET	0.1336	1	3	600	1000	495	570	
9-5-024-041	95-5578 KILIKA STREET	0.1247	1	3	600	1000	495	570	
9-5-024-042	95-5576 KILIKA STREET	0.1425	1	3	600	1000	495	570	
9-5-024-043	95-5574 KILIKA STREET	0.1336	1	3	600	1000	495	570	
9-5-024-044	95-5572 KILIKA STREET	0.1336	1	3	600	1000	495	570	
9-5-024-045	95-5570 KILIKA STREET	0.1336	1	3	600	1000	495	570	
9-5-024-046	95-5568 KILIKA STREET	0.1336	1	3	600	1000	495	570	
9-5-024-047	95-5564 KILIKA STREET	0.1336	1	3	600	1000	495	570	
9-5-024-048	95-5562 KILIKA STREET	0.1305	1	3	600	1000	495	570	
9-5-024-049	95-5560 KILIKA STREET	0.1336	1	3	600	1000	495	570	
9-5-024-050	95-5558 KILIKA STREET	0.1225	1	6	1200	**1500**	990	1140	**Note: 1500 gal Septic Tank with DOH Variance**
9-5-024-051	95-5554 KILIKA STREET	0.2015	1	4	800	1000	660	760	
9-5-024-014	95-1178 KUKUI ROAD	0.2650	1	3	600	1000	495	570	
9-5-024-015	95-5590 OPUKEA STREET	0.1778	1	3	600	1000	495	570	
9-5-024-016	95-5586 OPUKEA STREET	0.1768	1	3	600	1000	495	570	
9-5-024-017	95-5582 OPUKEA STREET	0.1688	1	3	600	1000	495	570	
9-5-024-018	95-5578 OPUKEA STREET	0.1800	1	3	600	1000	495	570	
9-5-024-019	95-5574 OPUKEA STREET	0.1725	1	3	600	1000	495	570	
9-5-024-020	95-5570 OPUKEA STREET	0.1795	1	3	600	1000	495	570	
9-5-024-021	95-5564 OPUKEA STREET	0.1779	1	3	600	1000	495	570	
9-5-024-022	95-5560 OPUKEA STREET	0.1771	1	3	600	1000	495	570	
9-5-024-023	95-5558 OPUKEA STREET	0.1605	1	3	600	1000	495	570	
9-5-024-024	95-5556 OPUKEA STREET	0.1433	1	3	600	1000	495	570	
9-5-024-025	95-5553 KILIKA STREET	0.1958	1	3	600	1000	495	570	
9-5-024-026	95-5555 KILIKA STREET	0.1228	1	3	600	1000	495	570	
9-5-024-027	95-5559 KILIKA STREET	0.1871	1	3	600	1000	495	570	
9-5-024-028	95-5563 KILIKA STREET	0.1739	1	3	600	1000	495	570	
9-5-024-029	95-5565 KILIKA STREET	0.1251	1	3	600	1000	495	570	
9-5-024-030	95-5567 KILIKA STREET	0.1220	1	3	600	1000	495	570	
9-5-024-031	95-5571 KILIKA STREET	0.1232	1	3	600	1000	495	570	
9-5-024-032	95-5573 KILIKA STREET	0.1538	1	3	600	1000	495	570	
9-5-024-033	95-5577 KILIKA STREET	0.1633	1	3	600	1000	495	570	
9-5-024-034	95-5581 KILIKA STREET	0.1507	1	4	800	1000	660	760	
9-5-024-035	95-5583 KILIKA STREET	0.1570	1	3	600	1000	495	570	
9-5-024-001	95-1163 OHAI ROAD	0.3013	1	3	600	1000	495	570	
9-5-024-002	95-5558 MAMALAHOA HIGHW	1.0000	1	2	400	1000	330	380	
9-5-024-003	95-1167 OHAI ROAD	0.2502	1	3	600	1000	495	570	
9-5-024-004	95-5555 OPUKEA STREET	0.2503	1	3	600	1000	495	570	
9-5-024-005	95-5559 OPUKEA STREET	0.2655	1	3	600	1000	495	570	
9-5-024-006	95-5561 OPUKEA STREET	0.2842	1	3	600	1000	495	570	
9-5-024-007	95-5572 MAMALAHOA HIGHW	1.9440			0		0	0	
9-5-024-008	59-553 KAALA ROAD	0.3990	1	3	600	1000	495	570	
9-5-024-009	95-5575 OPUKEA STREET	0.2916	1	3	600	1000	495	570	
9-5-024-010	95-5579 OPUKEA STREET	0.3293	1	3	600	1000	495	570	
9-5-024-011	OPUKEO STREET	0.2375	0	0	0		0	0	no structure
9-5-024-012	95-1168 KUKUI ROAD	0.2040	1	3	600	1000	495	570	
9-5-024-013	95-1172 KUKUI ROAD	0.3329	1	2	400	1000	330	380	
9-5-024-076	95-5586 MAMALAHOA HIGHW	0.4231	1	4	800	1000	660	760	
9-5-024-077	95-5582 MAMALAHOA HIGHW	0.3950	1	3	600	1000	495	570	
9-5-024-078	95-5580 MAMALAHOA HIGHW	0.3217	1	3	600	1000	495	570	

B

Appendix B - Cost Calculations

IWS Management Model 2A County In-House Maintenance Cost[1]

Year	Tasks	Capital	County O&M Staff Cost Cost/Household
0	IWS Installation		
0	Pumping & Hauling equipment	$250,000.00	$ 1,470.59
0	Personnel Training	$ 50,000.00	$ 294.12
1	Annual Inspection by & Trouble Calls by County staff – two IWS Operators / Plumbers		$ 822.00
2	Annual Inspection by & Trouble Calls by County staff - two IWS Operators / Plumbers		$ 822.00
3	Septic sludge pumping & disposal by County staff		$ 1,250.00
4	Annual Inspection by & Trouble Calls by County staff - two IWS Operators / Plumbers		$ 822.00
5	Annual Inspection by & Trouble Calls by County staff - two IWS Operators / Plumbers		$ 822.00
6	Septic sludge pumping & disposal by County staff		$ 1,250.00
7	Annual Inspection by & Trouble Calls by County staff - two IWS Operators / Plumbers		$ 822.00
8	Annual Inspection by & Trouble Calls by County staff - two IWS Operators / Plumbers		$ 822.00
9	Septic sludge pumping & disposal by County staff		$ 1,250.00
10	Annual Inspection by & Trouble Calls by County staff - two IWS Operators / Plumbers		$ 822.00
11	Annual Inspection by & Trouble Calls by County staff - two IWS Operators / Plumbers		$ 822.00
12	Septic sludge pumping & disposal by County staff		$ 1,250.00
13	Annual Inspection by & Trouble Calls by County staff - two IWS Operators / Plumbers		$ 822.00
14	Annual Inspection by & Trouble Calls by County staff - two IWS Operators / Plumbers		$ 822.00
15	Septic sludge pumping & disposal by County staff		$ 1,250.00
16	Annual Inspection by & Trouble Calls by County staff - two IWS Operators / Plumbers		$ 822.00
17	Annual Inspection by & Trouble Calls by County staff - two IWS Operators / Plumbers		$ 822.00
18	Septic sludge pumping & disposal by County staff		$ 1,250.00
19	Annual Inspection by & Trouble Calls by County staff - two IWS Operators / Plumbers		$ 822.00
20	Absorption bed replacement		$ 30,000.00
20	Pumping & Hauling equipment Replacement	$250,000.00	$ 1,470.59
21	Annual Inspection by & Trouble Calls by County staff - two IWS Operators / Plumbers		$ 822.00
	Average Annual Maintenance Cost		$ 956.44

[1] Cost of services are estimated from 2023 USD rates and would increase due to inflation.

IWS Management Model 2B Outsource Maintenance Cost

Year	Tasks	Outsource O&M Cost Capital Cost	County Admin Staff
0	IWS Installation		
1	IWS annual inspection & Trouble Calls	$ 550.00	$ 572.00
2	IWS annual inspection & Trouble Calls	$ 550.00	$ 572.00
3	Septic sludge pumping & disposal	$ 1,250.00	$ 572.00
4	IWS annual inspection & Trouble Calls	$ 550.00	$ 572.00
5	IWS annual inspection & Trouble Calls	$ 550.00	$ 572.00
6	Septic sludge pumping & disposal	$ 1,250.00	$ 572.00
7	IWS annual inspection & Trouble Calls	$ 550.00	$ 572.00
8	IWS annual inspection & Trouble Calls	$ 550.00	$ 572.00
9	Septic sludge pumping & disposal	$ 1,250.00	$ 572.00
10	IWS annual inspection & Trouble Calls	$ 550.00	$ 572.00
11	IWS annual inspection & Trouble Calls	$ 550.00	$ 572.00
12	Septic sludge pumping & disposal	$ 1,250.00	$ 572.00
13	IWS annual inspection & Trouble Calls	$ 550.00	$ 572.00
14	IWS annual inspection & Trouble Calls	$ 550.00	$ 572.00
15	Septic sludge pumping & disposal	$ 1,250.00	$ 572.00
16	IWS annual inspection & Trouble Calls	$ 550.00	$ 572.00
17	IWS annual inspection & Trouble Calls	$ 550.00	$ 572.00
18	Septic sludge pumping & disposal	$ 1,250.00	$ 572.00
19	IWS annual inspection & Trouble Calls	$ 550.00	$ 572.00
20	Absorption bed replacement	$ 30,000.00	$ 572.00
21	IWS annual inspection (repeat as Year 1)	$ 550.00	$ 572.00
	Average Annual Maintenance Cost	$ 783.33	$ 572.00

County WWD Admin Personnel Cost for Record Keeping and administering	Based on $100000/175 = $572
Trouble calls, emergency repairs per IWS per year	$ 500.00

B

IWS Management Model 3A Operating Permit User O&M Cost

Year	Tasks	O&M Cost to Homeowner/User	County Admin Cost
0	IWS Installation	0	Capital Cost
1	IWS annual inspection & Trouble calls	$ 500.00	$ 572.00
2	IWS annual inspection	$ 500.00	$ 572.00
3	Septic sludge pumping & disposal	$ 1,200.00	$ 572.00
4	IWS annual inspection	$ 500.00	$ 572.00
5	IWS annual inspection	$ 500.00	$ 572.00
6	Septic sludge pumping & disposal	$ 1,200.00	$ 572.00
7	IWS annual inspection	$ 500.00	$ 572.00
8	IWS annual inspection	$ 500.00	$ 572.00
9	Septic sludge pumping & disposal	$ 1,200.00	$ 572.00
10	IWS annual inspection	$ 500.00	$ 572.00
11	IWS annual inspection	$ 500.00	$ 572.00
12	Septic sludge pumping & disposal	$ 1,200.00	$ 572.00
13	IWS annual inspection	$ 500.00	$ 572.00
14	IWS annual inspection	$ 500.00	$ 572.00
15	Septic sludge pumping & disposal	$ 1,200.00	$ 572.00
16	IWS annual inspection	$ 500.00	$ 572.00
17	IWS annual inspection	$ 500.00	$ 572.00
18	Septic sludge pumping & disposal	$ 1,200.00	$ 572.00
19	IWS annual inspection	$ 500.00	$ 300.00
20	Absorption bed replacement	$ -	$ 30,000.00
21	IWS annual inspection (repeat as Year 1)	$ 500.00	$ 572.00
	Annual Average Cost	$ 733.33	$ 572.00

O&M Cost to Homeowner / User includes trouble calls — $300 + $200 = $500
County admin staff to provide recording keeping, regulation and enforcing — Based on $100000/175

B

IWS Management Model 3B County Voucher O&M Cost

Year	Tasks	Trouble call Cost to Homeowner/User	County Voucher Cost (present value)
0	IWS Installation	0	Capital Cost
1	IWS annual inspection & Trouble calls	$ 600.00	$ 872.00
2	IWS annual inspection	$ 600.00	$ 872.00
3	Septic sludge pumping & disposal	$ 600.00	$ 1,572.00
4	IWS annual inspection	$ 600.00	$ 872.00
5	IWS annual inspection	$ 600.00	$ 872.00
6	Septic sludge pumping & disposal	$ 600.00	$ 1,572.00
7	IWS annual inspection	$ 600.00	$ 872.00
8	IWS annual inspection	$ 600.00	$ 872.00
9	Septic sludge pumping & disposal	$ 600.00	$ 1,572.00
10	IWS annual inspection	$ 600.00	$ 872.00
11	IWS annual inspection	$ 600.00	$ 872.00
12	Septic sludge pumping & disposal	$ 600.00	$ 1,572.00
13	IWS annual inspection	$ 600.00	$ 872.00
14	IWS annual inspection	$ 600.00	$ 872.00
15	Septic sludge pumping & disposal	$ 600.00	$ 1,572.00
16	IWS annual inspection	$ 600.00	$ 872.00
17	IWS annual inspection	$ 600.00	$ 872.00
18	Septic sludge pumping & disposal	$ 600.00	$ 1,572.00
19	IWS annual inspection	$ 600.00	$ 872.00
20	Absorption bed replacement	$ -	$ 30,000.00
21	IWS annual inspection (repeat as Year 1)	$ 600.00	$ 872.00
	Annual Average Cost	$ 600.00	$ 1,105.33

County voucher cost: $572 + $300
Based on Admin staff cost $100000/175

C

Appendix C - Topography

D

Appendix D – USGS Soil Survey

Soil Map—Island of Hawaii Area, Hawaii
(Nā'ālehu Soil Survey)

Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

7/6/2023
Page 1 of 3

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Survey Areas
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Island of Hawaii Area, Hawaii
Survey Area Data: Version 15, Aug 30, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jan 3, 2019—Jun 28, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
521	Naalehu medial silty clay loam, 3 to 10 percent slopes	32.4	47.2%
522	Naalehu medial silty clay loam, 10 to 20 percent slopes	21.4	31.2%
538	Naalehu medial silt loam, 0 to 3 percent slopes	14.8	21.6%
Totals for Area of Interest		68.6	100.0%

E

Appendix E - Geotech Report

Masa Fujioka & Associates 98-021 Kamehameha Highway #337 Aiea, Hawaii ph (808)484-5366, FAX 484-0007	BORING LOG: N-1 Na'alehu Cesspool Conversion Na'alehu, Island of Hawaii, Hawaii	Page 1 Job Number: 05086-091 Elevation:
Driller: Geolabs	Drilling	Date:
Drill Method: Core Barrel	Started:	11/13/06
Sample Method: 2.5" Core	Finished:	11/13/06
Boring Diameter: 2.5" Water Level : n/a	Logged By: JR	Checked By: MF

Recovery	RQD	Sample Type	Depth (Ft)	USCS	Material Description	Test Results
			0	AS	Asphaltic-concrete pavement	
				GM	Basecourse	
				MH	Reddish-brown clayey SILT, med. stiff	
				BR	Black BASALT, highly vesicular & well fractured, mod. stiff	
20%	0%	Core 1	2			
			4			
			6		becomes moderately fractured	
100%	50%	Core 2	8			
			10		Boring terminated @ 10 ft bgs, no groundwater encountered	
			12			
			14			

Masa Fujioka & Associates

98-021 Kamehameha Highway #337
Aiea, Hawaii
ph (808)484-5366, FAX 484-0007

BORING LOG: N-2

Na'alehu Cesspool Conversion
Na'alehu, Island of Hawaii, Hawaii

Page 2
Job Number: 05086-091
Elevation:

Driller: Geolabs		Drilling	Date:
Drill Method: Core Barrel		Started:	11/13/06
Sample Method: 2.5" Core		Finished:	11/13/06
Boring Diameter: 2.5"	Water Level : n/a	Logged By: JR	Checked By: MF

Recovery	RQD	Depth (Ft) / Sample Type	USCS	Material Description	Test Results
		0	AS	Asphaltic-concrete pavement	
			GM	Basecourse	
			GM	Silty GRAVEL (Fill)	
20%	0%	Core 1 (0–5)	BR	Black BASALT, highly vesicular, fractured and broken	
				becomes moderately vesicular	
100%	87%	Core 2 (5–10)		colors brownish-black, becomes highly vesicular	
		10		Boring terminated @ 10 ft bgs, no groundwater encountered	
		12			
		14			

Masa Fujioka & Associates

98-021 Kamehameha Highway #337
Aiea, Hawaii
ph (808)484-5366, FAX 484-0007

BORING LOG: N-3

Na'alehu Cesspool Conversion
Na'alehu, Island of Hawaii, Hawaii

Page 3
Job Number: 05086-091
Elevation:

Driller: Geolabs		Drilling	Date:
Drill Method: Core Barrel		Started:	11/13/06
Sample Method: 2.5" Core		Finished:	11/13/06
Boring Diameter: 2.5"	Water Level : n/a	Logged By: JR	Checked By: MF

Recovery	RQD	Depth (Ft) / Sample Type	USCS	Material Description	Test Results
		0	AS	Asphaltic-concrete pavement	
			GM	Basecourse	
			GM	Silty GRAVEL (Fill)	
		Bulk	MH	Reddish-brown clayey SILT Sample collected from adjacent test pit	MC = 29 % CBR = 18 % Exp = 0.8 %
18%	7%	Core 1 (0–5)	BR	Black BASALT, fragmented	
				Decreases in vesicles w/ depth to 8'	
57%	17%	Core 2 (5–8)			
100%	46%	Core 3 (8–10)	BR	Brownish-black BASALT, moderately vesicular	
		10		Boring terminated @ 10 ft bgs, no groundwater encountered	
		12			
		14			

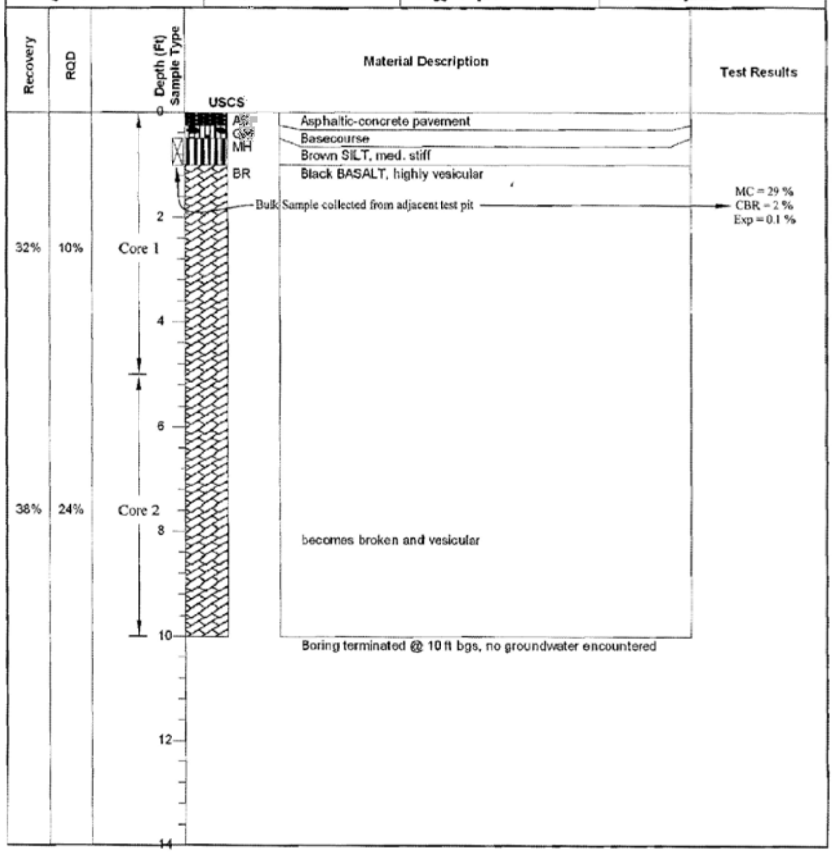
Masa Fujioka & Associates

98-021 Kamehameha Highway #337
Aiea, Hawaii
ph (808)484-5366, FAX 484-0007

BORING LOG: N-4

Na'alehu Cesspool Conversion
Na'alehu, Island of Hawaii, Hawaii

Page 4			
Job Number: 05086-091			
Elevation:			
Driller: Geolabs		Drilling	Date:
Drill Method: Core Barrel		Started:	11/13/06
Sample Method: 2.5" Core		Finished:	11/13/06
Boring Diameter: 2.5"	Water Level : n/a	Logged By: JR	Checked By: MF



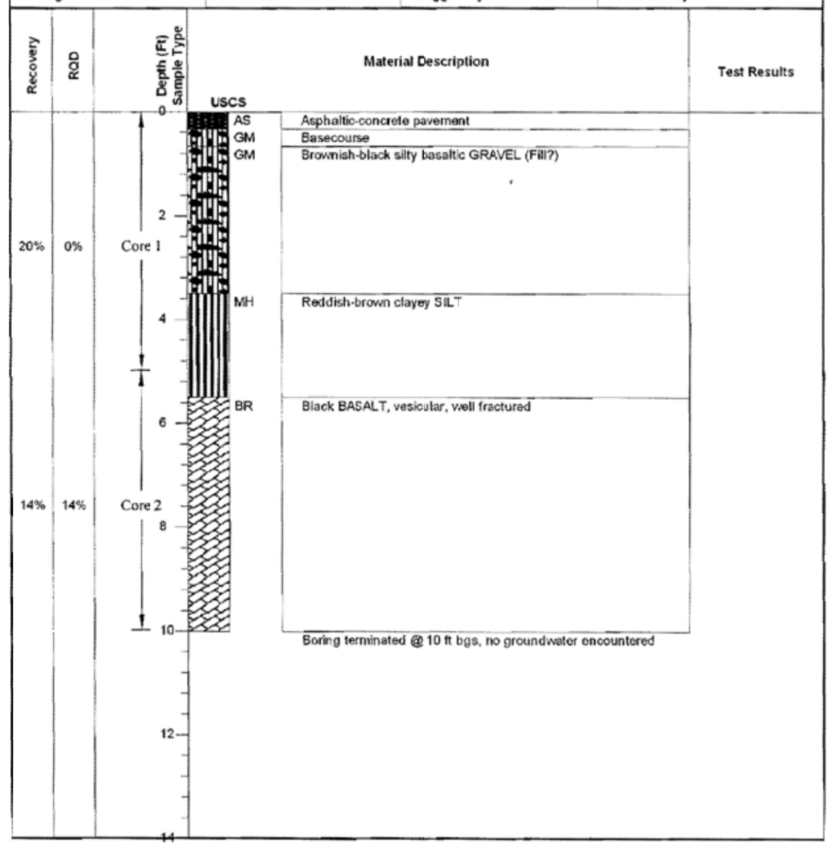
Masa Fujioka & Associates

98-021 Kamehameha Highway #337
Aiea, Hawaii
ph (808)484-5366, FAX 484-0007

BORING LOG: N-5

Na'alehu Cesspool Conversion
Na'alehu, Island of Hawaii, Hawaii

Page 5			
Job Number: 05086-091			
Elevation:			
Driller: Geolabs		Drilling	Date:
Drill Method: Core Barrel		Started:	11/13/06
Sample Method: 2.5" Core		Finished:	11/13/06
Boring Diameter: 2.5"	Water Level : n/a	Logged By: JR	Checked By: MF



Masa Fujioka & Associates 98-021 Kamehameha Highway #337 Aiea, Hawaii ph (808)484-5366, FAX 484-0007	BORING LOG: N-6 Na'alehu Cesspool Conversion Na'alehu, Island of Hawaii, Hawaii	Page 6 Job Number: 05086-091 Elevation:
Driller: Geolabs	Drilling	Date:
Drill Method: Core Barrel	Started:	11/13/06
Sample Method: 2.5" Core	Finished:	11/13/06
Boring Diameter: 2.5" / Water Level : n/a	Logged By: JR	Checked By: MF

Recovery	RQD	Depth (Ft) / Sample Type	USCS	Material Description	Test Results
		0	AS	Asphaltic-concrete pavement	
			GM	Basecourse	
10%	0%	Core 1 (0–5)	BR	Olivine-rich BASALT, moderately vesicular, well fractured and broken	
38%	15%	Core 2 (5–10)			
		8	BR	Grey BASALT, slightly vesicular, 3% plagioclase (a'a)	
		10		Boring terminated @ 10 ft bgs, no groundwater encountered	

Masa Fujioka & Associates 98-021 Kamehameha Highway #337 Aiea, Hawaii ph (808)484-5366, FAX 484-0007	BORING LOG: N-7 Na'alehu Cesspool Conversion Na'alehu, Island of Hawaii, Hawaii	Page 7 Job Number: 05086-091 Elevation:
Driller: Geolabs	Drilling	Date:
Drill Method: Core Barrel	Started:	11/13/06
Sample Method: 2.5" Core	Finished:	11/13/06
Boring Diameter: 2.5" / Water Level : n/a	Logged By: JR	Checked By: MF

Recovery	RQD	Depth (Ft) / Sample Type	USCS	Material Description	Test Results
		0	MH	Clayey SILT (top soil), with grass and roots	
30%	10%	Core 1 (0–5)	MH	Brown clayey SILT colors reddish-brown Bulk Sample collected from adjacent test pit	MC = 40 % CBR = 11 % Exp = 1.4 %
			BR	Black BASALT, broken and highly vesicular	
16%	0%	Core 2 (5–10)	BR	Blackish-brown BASALT, highly vesicular clinker	
10%	0%	Core 3 (10–14)	BR	Black BASALT, moderately vesicular	

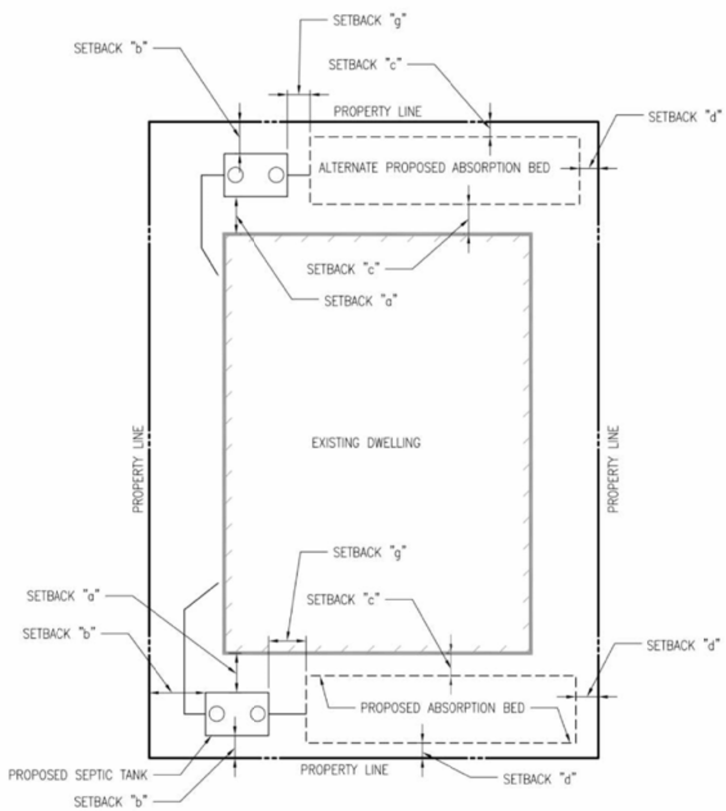
Masa Fujioka & Associates 98-021 Kamehameha Highway #337 Aiea, Hawaii ph (808)484-5366, FAX 484-0007	**BORING LOG: N-7** Na'alehu Cesspool Conversion Na'alehu, Island of Hawaii, Hawaii	Page 8 Job Number: 05086-091 Elevation:

Driller: Geolabs		Drilling	Date:
Drill Method: Core Barrel		Started:	11/13/06
Sample Method: 2.5" Core		Finished:	11/13/06
Boring Diameter: 2.5"	Water Level : n/a	Logged By: [illegible]	Checked By: MF

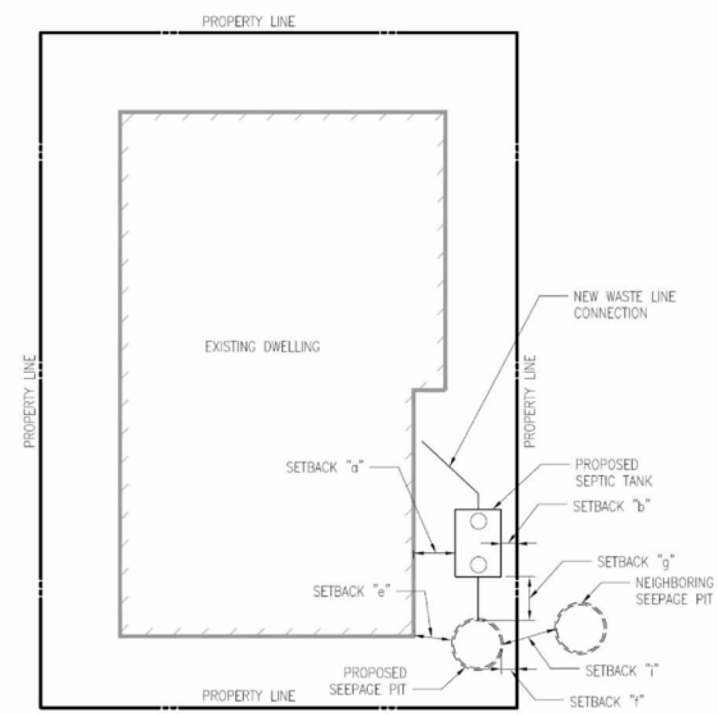
Recovery	RQD	Sample Type	Depth (Ft)	USCS	Material Description	Test Results
		Core 3	14	BR	Black BASALT, moderately vesicular	
			16			
62%	52%	Core 4	18			
			20	BR	Black BASALT, highly vesicular and fractured	
			22			
22%	12%	Core 5	24			
					Boring terminated @ 25 ft bgs, no groundwater encountered	
			26			
			28			

F

Appendix F - Typical IWS Layout & Components



TYPICAL IWS LAYOUT W/ ABSORPTION BED
See Schedule A for Required Setback Dimensions and Variance Request



TYPICAL IWS LAYOUT W/ SEEPAGE PIT
See Schedule A for Required Setback Dimensions and Variance Request

SCHEDULE A

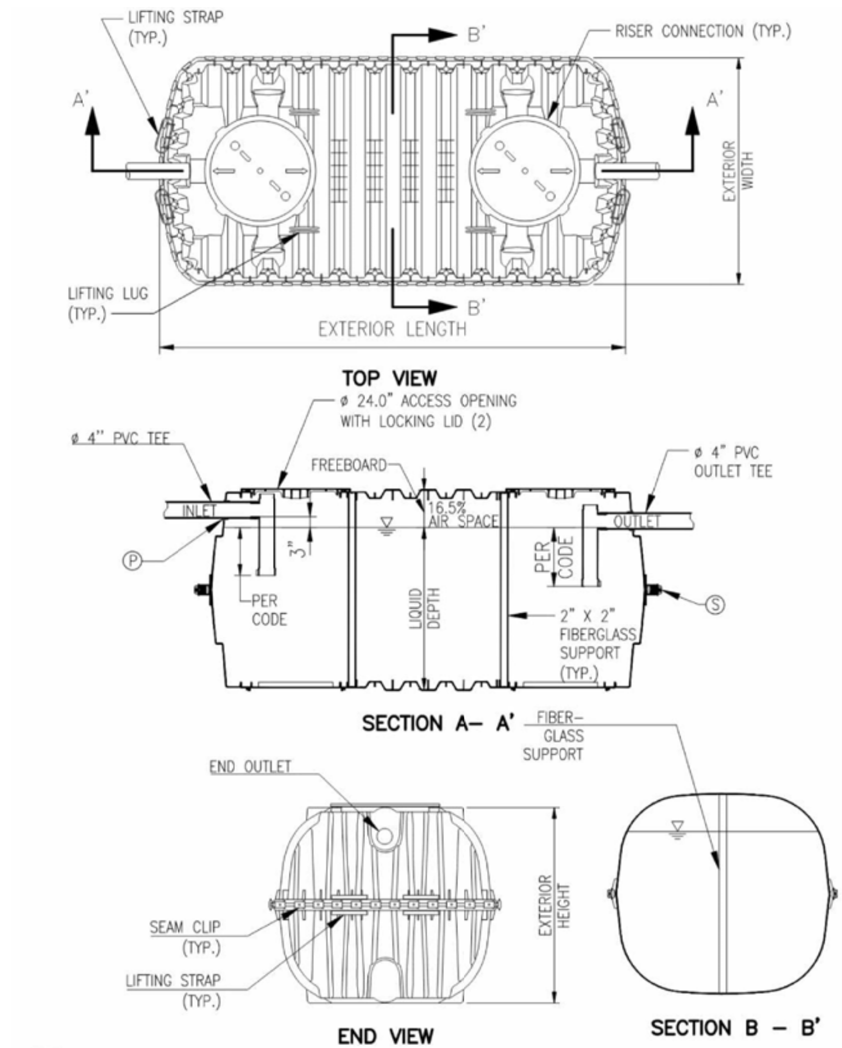
SETBACK TYPE	DESCRIPTION/MIN. PER DOH, TABLE (SEE NOTE 1)	VARIANCE REQUEST (SEE NOTE 1)
a	DIST. BTW BLDG & SEPTIC TANK / 5' MIN.	2' < "a" < 5'
	DIST. BTW PROPERTY LINE & SEPTIC TANK / 5' MIN.	1' < "b" < 5'
c	DIST. BTW BLDG & ABSORPTION BED / 5' MIN.	2' < c < 5'
"d"	DIST. BTW PROPERTY LINE & ABSORPTION BED / 5' MIN.	0 < "d" < 5'
"e"	DIST. BTW BLDG & SEEPAGE PIT / 5' MIN.	2' < "e" < 5'
"f"	DIST. BTW PROPERTY LINE & SEEPAGE PIT / 9' MIN.	1' < "f" < 5'
"g"	DIST. BTW SEPTIC TANK & ABSORPTION BED / 5' MIN.	2' < "g" < 5'
	DIST. BTW NEIGHBORING ABSORPTION BEDS / 5' MIN.	1' < "h" < 5'
	DIST. BTW NEIGHBORING SEEPAGE PITS / 12' MIN.	6' < "i" < 12'

ABSORPTION BED & SEEPAGE PIT SIZING

# OF BEDROMS SEPTIC TANK SIZE	NON-TRAFFIC RATED ABSORPTION BED SIZE (SEE NOTE 3)	TRAFFIC RATED ABSORPTION BED SIZE (SEE NOTE 3)	SEEPAGE PIT SIZE (SEE NOTE 4)
3 1000 GAL.	10' X 24' 12' X 20' 15' X 16'	9' 24' 12 18' 15 16'	6'r/J X 12' DEEP
4 1000 OR 1250 GAL.	10' X 32' 12' X 27' 15' X 22'	9' 30' 12 24' 15 18'	6'r/J X 15' DEEP 8'r/! X 12' DEEP
5 1250 GAL.	10' X 40' 12' X 34' 15' X 27'	9' 40' 12 28' 15 24'	8'r/! X 14' DEEP
6 1250 GAL. PER DWS (SEE NOTE 2)	10' X 48' 12' X 40' 15' X 32'	g' 48' 12 36' 15 28'	8'r/! X 17' DEEP
7 1250 GAL. PER DWS (SEE NOTE 2)	10' X 56' 12' X 47' 15' X 38'	g' 52' 12 40' 15 32'	8'r/! X 20' DEEP

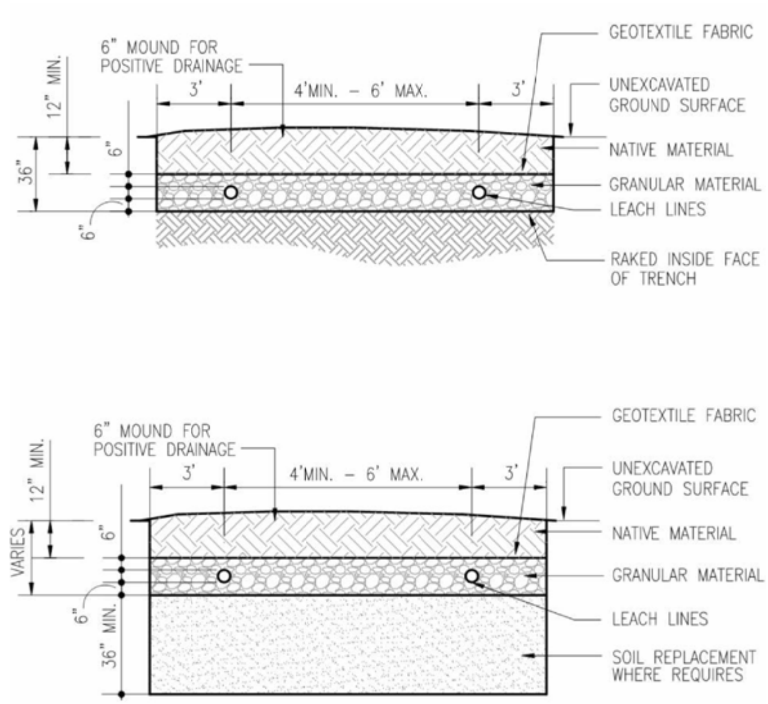
NOTES:

1. The request is for Variance from Section 11-62-22 Spacing of Individual Wastewater Systems, Table II in Appendix D and Section 11-62-31.1(1)(D) where states that one IWS cannot serve more than 5 bedrooms.
2. For dwellings with more than 5 bedrooms, we request a Variance to base the IWS design on the DWS water consumption record rather than based on number of bedrooms.
3. Absorption Bed for standard perforated pipe with gravel bed installation (non-traffic rated), a percolation rate of 2 min./inch is assumed. For gravel-less installation (Infiltrator Chambers) or traffic rated chambers, 17% reduction is taken for the required area of absorption bed.
4. For sizing of seepage pit, a percolation rate of 1 min/inch is assumed because the soil condition is likely to be granular or rocky type at that depth.



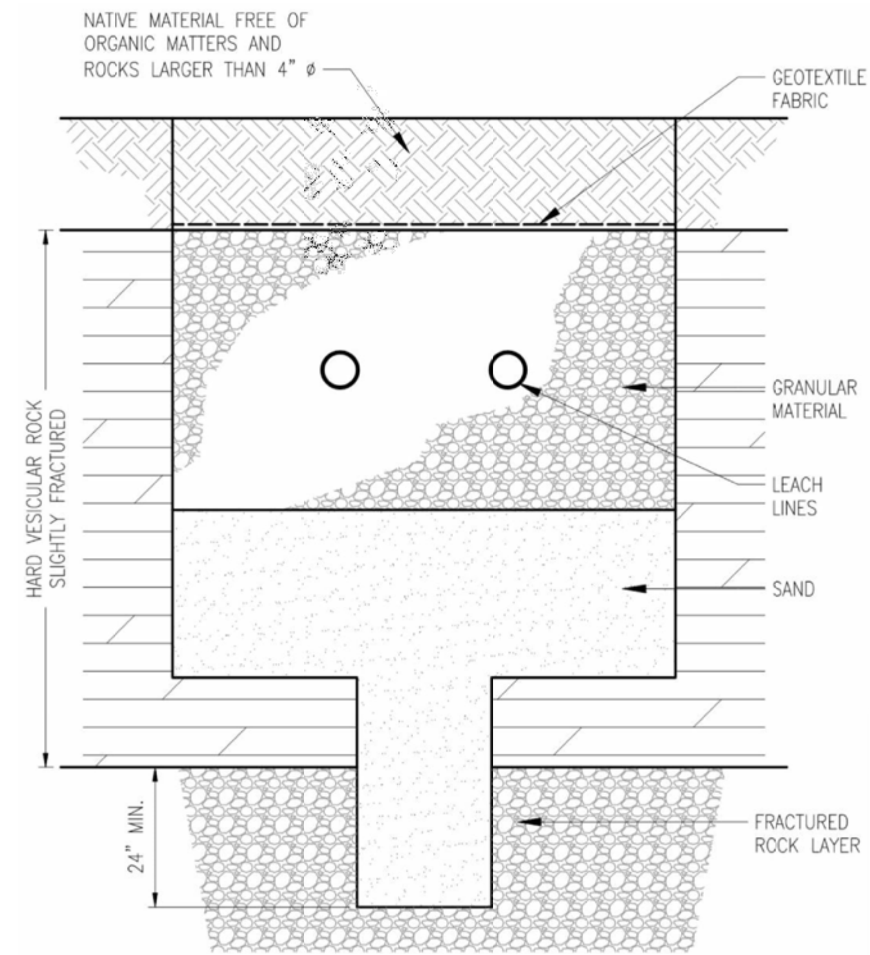
SEPTIC TANK DETAIL

SCALE: NOT TO SCALE



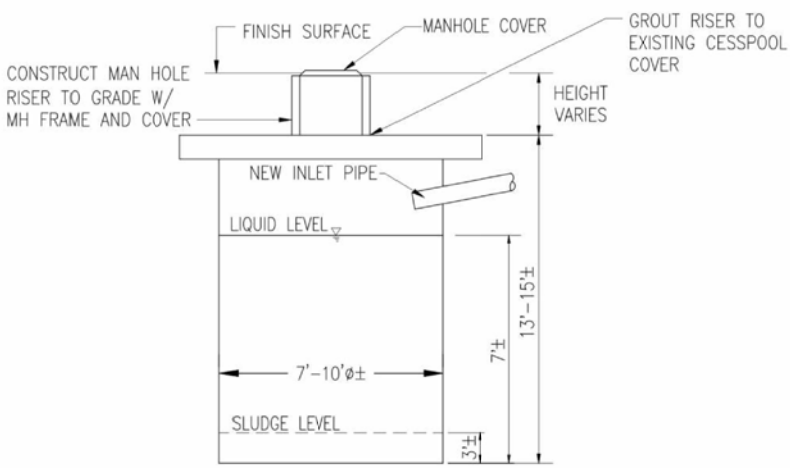
ABSORPTION BED TYP. DETAILS

SCALE: NOT TO SCALE



ABSORPTION BED TYP. DETAILS FOR HARD ROCK SOIL CONDITION

SCALE: NOT TO SCALE

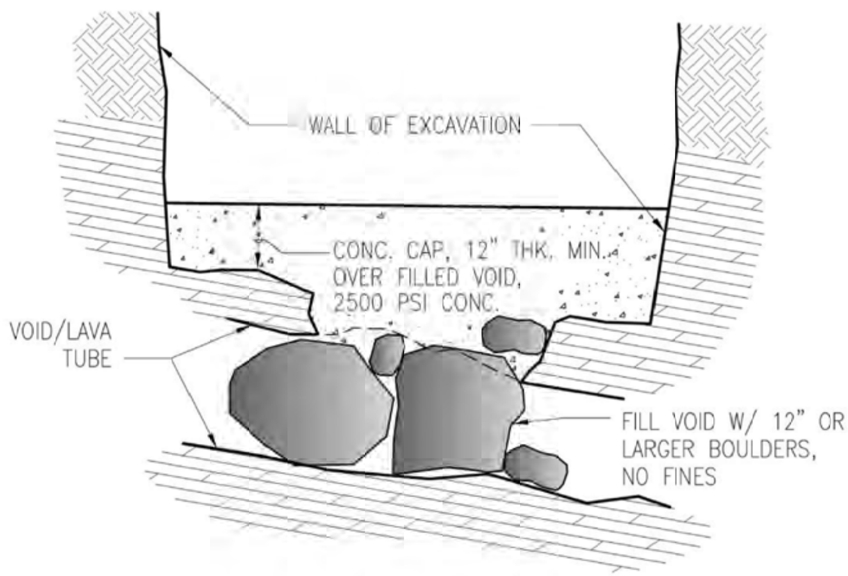


TYPICAL SEEPAGE PIT DETAIL

SCALE: NOT TO SCALE

G

Appendix G - Lava Tube Backfill Detail



- LAVA TUBE BACKFILL DET.

SCALE: NOT TO SCALE

H

Appendix H – Percolation Test Results

DEPARTMENT OF HEALTH - WASTEWATER BRANCH
INDIVIDUAL WASTEWATER SYSTEM (IWS) - SITE EVALUATION / PERCOLATION TEST

Date / Time: 7/31/23 8:00 am Test Performed by: Austin Ah Hee

Owner: Karl Stewart Ragan TMK: (3) 9 - 5 - 025 : 019

Elevation: 700 feet
Depth to Groundwater Table: N/A feet below grade
Depth to Bedrock (if observed): N/A feet below grade
Diameter of Hole: 12 inches
Depth to Hole Bottom: 4 feet below grade

Depth, inches below grade	Soil Profile (color, texture, other)
0-48	Soft brown dirt

PERCOLATION READINGS:
Time 12 inches of water to seep away: 93 minutes
Time 12 inches of water to seep away: 84 minutes

Check one:

___ Percolation tests in sandy soils, recorded time intervals and water drops at least every 10 minutes for at least 1 hour.

X Percolation tests in no-sandy soils, presoaked the test hole for at least 4 hours. Recorded time intervals and water drops at least every 10 minutes for 1 hour of time for the first 6 inches to seep away in greater than 30 minutes record time intervals and water drops at lest every 30 minutes for 4 hours or until 2 successive drops do not vary by more than 1/16 inch.

Time Interval	Drop in Inches	Time Interval	Drop in Inches
30	3-1/4"		
30	3-1/4"		

Percolation Rate (time/final water level drop): ~10 minutes/inches

As the engineer responsible for gathering and providing site information and percolation test results, I attest to the fact that above site information is accurate and that the site evaluation was conducted in accordance with the provisions of Chapter 11-62, "Wastewater Systems" and the results were acceptable. I also attest that three feet of suitable soil exist between the bottom of the soil absorption system and the groundwater table or any other limiting layer.

Engineer's Signature/Stamp Date

DEPARTMENT OF HEALTH - WASTEWATER BRANCH
INDIVIDUAL WASTEWATER SYSTEM (IWS) - SITE EVALUATION / PERCOLATION TEST

Date / Time: 7/31/23 1:30 pm Test Performed by: Austin Ah Hee

Owner: County of Hawai'i TMK: (3) 9 - 5 - 024 : 011

Elevation: 670 feet
Depth to Groundwater Table: N/A feet below grade
Depth to Bedrock (if observed): N/A feet below grade
Diameter of Hole: 12 inches
Depth to Hole Bottom: 4.5 feet below grade

Depth, inches below grade	Soil Profile (color, texture, other)
0-54	Soft brown dirt

PERCOLATION READINGS:
Time 12 inches of water to seep away: 83 minutes
Time 12 inches of water to seep away: 81 minutes

Check one:

___ Percolation tests in sandy soils, recorded time intervals and water drops at least every 10 minutes for at least 1 hour.

X Percolation tests in no-sandy soils, presoaked the test hole for at least 4 hours. Recorded time intervals and water drops at least every 10 minutes for 1 hour of time for the first 6 inches to seep away in greater than 30 minutes record time intervals and water drops at lest every 30 minutes for 4 hours or until 2 successive drops do not vary by more than 1/16 inch.

Time Interval	Drop in Inches	Time Interval	Drop in Inches
30	4-1/2"		
30	4-1/2"		

Percolation Rate (time/final water level drop): ~7 minutes/inches

As the engineer responsible for gathering and providing site information and percolation test results, I attest to the fact that above site information is accurate and that the site evaluation was conducted in accordance with the provisions of Chapter 11-62, "Wastewater Systems" and the results were acceptable. I also attest that three feet of suitable soil exist between the bottom of the soil absorption system and the groundwater table or any other limiting layer.

Engineer's Signature/Stamp Date

DEPARTMENT OF HEALTH - WASTEWATER BRANCH
INDIVIDUAL WASTEWATER SYSTEM (IWS) - SITE EVALUATION / PERCOLATION TEST

Date / Time: 8/7/23 8:00 pm Test Performed by: Austin Ah Hee

Owner: Sophia Rhonda Lorenzo TMK: (3) 9 - 5 - 026 : 071

Elevation: 760 feet
Depth to Groundwater Table: N/A feet below grade
Depth to Bedrock (if observed): N/A feet below grade
Diameter of Hole: 12 inches
Depth to Hole Bottom: 4 feet below grade

Depth, inches below grade	Soil Profile (color, texture, other)
0-48	Hard brown dirt, some rocks

PERCOLATION READINGS:
Time 12 inches of water to seep away: 180 minutes
Time 12 inches of water to seep away: 180 minutes

Check one:

___ Percolation tests in sandy soils, recorded time intervals and water drops at least every 10 minutes for at least 1 hour.

X Percolation tests in no-sandy soils, presoaked the test hole for at least 4 hours. Recorded time intervals and water drops at least every 10 minutes for 1 hour of time for the first 6 inches to seep away in greater than 30 minutes record time intervals and water drops at lest every 30 minutes for 4 hours or until 2 successive drops do not vary by more than 1/16 inch.

Time Interval	Drop in Inches	Time Interval	Drop in Inches
30	2"		
30	2"		

Percolation Rate (time/final water level drop): 15 minutes/inches

As the engineer responsible for gathering and providing site information and percolation test results, I attest to the fact that above site information is accurate and that the site evaluation was conducted in accordance with the provisions of Chapter 11-62, "Wastewater Systems" and the results were acceptable. I also attest that three feet of suitable soil exist between the bottom of the soil absorption system and the groundwater table or any other limiting layer.

Engineer's Signature/Stamp Date

DEPARTMENT OF HEALTH - WASTEWATER BRANCH
INDIVIDUAL WASTEWATER SYSTEM (IWS) - SITE EVALUATION / PERCOLATION TEST

Date / Time: 8/7/23 12:00 pm Test Performed by: Austin Ah Hee

Owner: Baron Yamamoto Trust TMK: (3) 9 - 5 - 024 : 068

Elevation: 665 feet
Depth to Groundwater Table: N/A feet below grade
Depth to Bedrock (if observed): N/A feet below grade
Diameter of Hole: 12 inches
Depth to Hole Bottom: 4 feet below grade

Depth, inches below grade	Soil Profile (color, texture, other)
0-48	Soft brown dirt, some small rocks

PERCOLATION READINGS:
Time 12 inches of water to seep away: 110 minutes
Time 12 inches of water to seep away: 94 minutes

Check one:

___ Percolation tests in sandy soils, recorded time intervals and water drops at least every 10 minutes for at least 1 hour.

X Percolation tests in no-sandy soils, presoaked the test hole for at least 4 hours. Recorded time intervals and water drops at least every 10 minutes for 1 hour of time for the first 6 inches to seep away in greater than 30 minutes record time intervals and water drops at lest every 30 minutes for 4 hours or until 2 successive drops do not vary by more than 1/16 inch.

Time Interval	Drop in Inches	Time Interval	Drop in Inches
30	4-1/4"		
30	4-1/4"		

Percolation Rate (time/final water level drop): 8 minutes/inches

As the engineer responsible for gathering and providing site information and percolation test results, I attest to the fact that above site information is accurate and that the site evaluation was conducted in accordance with the provisions of Chapter 11-62, "Wastewater Systems" and the results were acceptable. I also attest that three feet of suitable soil exist between the bottom of the soil absorption system and the groundwater table or any other limiting layer.

Engineer's Signature/Stamp Date

DEPARTMENT OF HEALTH - WASTEWATER BRANCH
INDIVIDUAL WASTEWATER SYSTEM

FALLING HEAD TEST PROCEDURE

I. Preparing Percolation Test Hole(s)
   1. Dig or bore a hole, four to twelve inches in diameter with vertical walls to the approximate depth of the soil absorption system (bottom of trench or bed).
   2. Scratch the side wall and bottom to remove any smeared soil and remove loose material.
   3. Place one inch of coarse sand or gravel on bottom.

B. Determine Percolation Rate
   1. Place twelve inches of water in hole and determine time to seep away. Record this time on the site evaluation form.
   2. Repeat step B.1. above. Also record this time on the site evaluation form.
   3. If the time of the second test is less than 10 minutes go to Step C, if not skip to Step D.

C. Sandy (granular) Soils
   1. Establish a fixed reference point, add water to six inches above gravel and measure water level drops every ten minutes for 1 hour.
   2. Use a shorter time interval if first six inches seeps away in ten minutes or less.
   3. Refill when necessary, do not exceed six inches of water.
   4. Record time intervals and water drops on site evaluation form.
   5. Use final water level drop interval to calculate percolation rate. (Step E)

D. Other Soils (non-granular, e.g. silt, loams & clays)
   1. Maintain at least twelve inches of water in the hole for at least four hours to presoak soil.
   2. Do not remove water remaining after four hours.
   3. Permit soil to swell at least 12 hours. (Dry clayey soils should be soaked and permitted to swell for longer periods to obtain stabilized percolation rates).
   4. After swelling, remove loose material on top of gravel.
   5. Use fixed referenced point, adjust water level to six inches above gravel and measure water level drop.
   6. If the first six inches of water seeps away in less than 30 minutes, measure water level drops every ten-minutes and run for one hour.
   7. If the first six inches of water takes longer than 20 minutes to seep away, use 30 minute time intervals for four hours or until two successive drops do not vary by more than one-sixteenth inch (stabilized rate).
   8. Refill with water only when necessary, but no adjustment during last three readings except to the limit of the last drop. Do no exceed six inches of water.

E. Use final drop interval to calculate percolation rate and record on site evaluation form:

$$\frac{\text{Time Interval}}{\text{Water Level Drop}} = \text{Percolation Rate}$$

APPENDIX B:

Natural Resource Assessment

AECOS, Inc.

AECOS No. 1613

A natural resources assessment for the Nāʻālehu WWTP, Nāʻālehu, Kaʻu District Island of Hawaiʻi (TMK 9-5-005:001 por.)

AECOS Inc.
45-939 Kamehameha Highway
Suite 104
Kāneʻohe, Hawaiʼi 96744

June 24, 2021

A natural resources assessment for the Nāʻālehu WWTP, Nāʻālehu, Kaʻu District Island of Hawaiʻi (TMK 9-5-005:001 por.)

June 24, 2021 | **DRAFT** | *AECOS* No. 1613

E. Guinther, D. Miranda, and R. David
AECOS Inc.
45-939 Kamehameha Highway Suite 104
Kāneʻohe, Hawaiʻi 96744
Phone: (808) 234-7770 ~ Email: guinther@aecos.com

Introduction

The Hawaiʻi County Department of Environmental Management, Wastewater Division is proposing to construct a wastewater treatment and disposal system to treat sewage collected in Nāʻālehu, Kaʻu District, Island of Hawaiʻi (the "Project"; Figure 1). Construction of the treatment and disposal system will allow the closure of three large capacity cesspools currently used to dispose of untreated sewage. The treatment and disposal facility will be located on an approximately 28-ac (11.3-ha) portion of State Department of Land and Natural Resources (DLNR) land to the southwest of town (*makai* and downslope; see Figure 2). Site work includes grading of a drainage diversion swale to realign the existing site drainage, beginning from a vegetated diversion channel at a point some 350 ft (100 m) downslope of Māmalahoa Highway to a point downslope and east of the Project site. Road access and a utility corridor would follow from off the existing Nāʻālehu Spur Road.

A collector system will initially service residences on the north (*mauka*) side of the main street, the Hawaii Belt Road (Mamalahoa Highway). The Project also includes a force main pump station (SPS) and a force main connecting to the WWTP. The latter was surveyed specifically where the force main would cross a drainage channel. Otherwise, the force main route follows existing roads.

AECOS Inc. was contracted by Wilson Okamoto Corporation to conduct a natural resources survey and assessment of the subject property (TMK 9-5-005:001

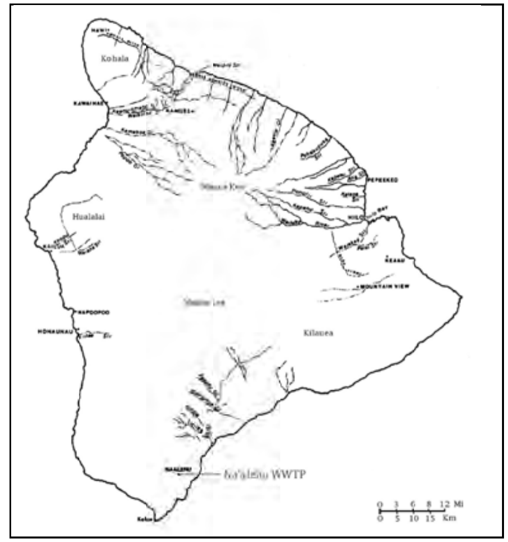


Figure 1. Project location on the Island of Hawaiʻi.

por.) and prepare this report of findings.[1] We make reference herein to a previous survey of a nearby location proposed for the WWTP nearly a decade ago (David & Guinther, 2012). As in 2012, our survey included the sewerage collector system as presently proposed, the latter covered by driving all of the streets to be impacted to establish that no environmental resources of conservation interest occur in those areas.

Site Description

The Project site is low sloping ground covered by pasture, in places mostly of cropped grasses (Figure 3), in other places a mixture of grasses and low growing shrubs (Figure 4); along the southern boundary, the vegetation merges

[1] This document is produced for inclusion in an EA for the subject Project and will become part of the public record.

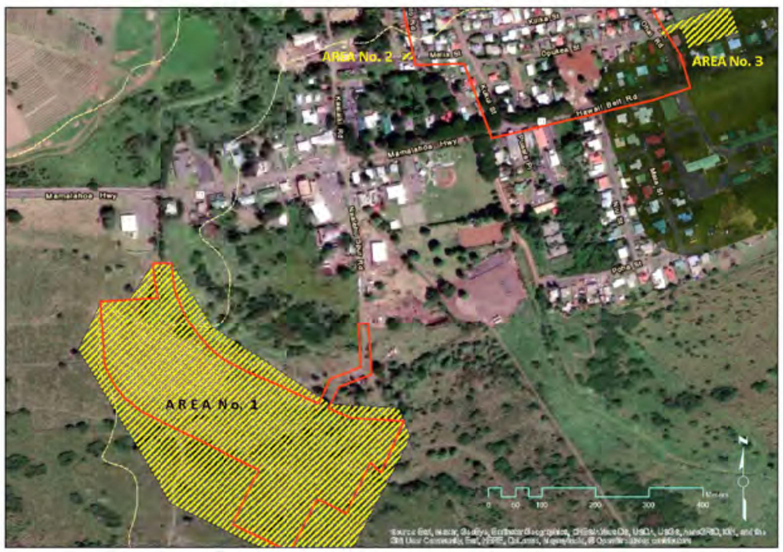


Figure 4. Survey areas

Figure 3. Grassland pasture area of cropped Guinea grass.

Figure 4. Pasture area of cropped grass and low shrubs.

into scrub growth (cover photo). Much of the grassland is dominated by Guinea grass (*Megathyrsus maximus*), Low shrub growth areas are dominated by lantana (*Lantana camara*). Taller shrub/scrub growth is entirely *koa haole* (*Leucaena leucocephala*). The proposed pump station site ("Area No. 3") is on the *mauka* side of Māmalahoa Highway in an overgrown pasture off ʻŌhai Road east of the intersection with Opukea Street. The force main runs west on Opukea Street to Melia Street then south on Kaʻaiʻāiki Rd and Nāʻālehu Spur Road to the proposed WWTP site. The pipe crosses a drainage channel on Melia Street ("Area No. 2").

Methods

Botanical Survey

The natural resources survey was undertaken by the botany team on February 18, 2020 and again on November 5, 2020. A survey area map (corresponding to the red outline on Fig. 2) was loaded on a Trimble 6000 Series GNSS unit (Trimble GeoXH and GeoXT for use during the surveys). The GNSS units recorded the progress tracks of the botanists, providing real time feedback on location and adequacy of coverage during a wandering (pedestrian) transect. The November survey encompassed the site for a sewerage pump station east of ʻŌhai Road, the force main crossing of a drainage channel off Melia Street, and an additional look along the southwest side of the WWTP site (Figure 2) that may not have been completely covered by the February visit owing to later adjustments in Project footprint.

Plant species were identified as they were encountered. Species names follow *Manual of the Flowering Plants of Hawaiʻi* (Wagner, Herbst, & Sohmer, 1990; Wagner & Herbst, 1999) for native and naturalized flowering plants, *Hawaiʻi's Ferns and Fern Allies* (Palmer, 2003) for ferns, and *A Tropical Garden Flora* (Staples & Herbst, 2005) for ornamental plants. More recent name changes for naturalized plant species follow Imada (2019).

Terrestrial Vertebrates Survey

A survey of extant birds and mammals was conducted on the morning of February 18, 2020 and the morning of November 5, 2020. Only the results from the November 5 survey are reported herein. Ten avian point-count stations were established covering the Project areas and a single eight-minute avian point-count made at each station. The avian counts were conducted in the morning hours between 0730 and 1030 am with the aid of Leica 8 X 42 binoculars and by listening for vocalizations. Weather conditions were ideal,

with unlimited visibility, light winds, and no rainfall. The avian phylogenetic order and nomenclature used in this report follow the AOU *Check-List of North and Middle American Birds* 2019 and the Sixtieth first Supplement to the Check-list of North American Birds (Chesser et al., 2019, 2020)

The survey of mammals was limited to visual and auditory detection, coupled with visual observation of scat, tracks, and other animal sign. We did not conduct a survey for Hawaiian hoary bat or *ʻōpeʻapeʻa* (*Lasiurus cinereus semotus*), the only native land mammal in the Islands. Bats are solitary and potentially widespread throughout Hawaiʻi, and detection requires night surveys and deployment of special detection equipment recording over a long period of time. Negative results cannot confirm the absence of this mammal. At a location. Mammal scientific names follow *Mammal species of the world: a taxonomic and geographic reference* (Wilson and Reeder, 2005).

Figure 5. "Area 3" proposed pump station site overgrown with Guinea grass.

Results

Vegetation

Vegetation across the site consists entirely of grass pasture (predominantly Guinea grass or *Megathyrsus maximus*) and areas of mostly low scrub growth, dominated by lantana. Trees are scattered around the site, especially along a shallow swale feature that transects the area from north to southeast.

The site ("Area No. 3" in Figure 2) of the proposed SPS is a former pasture dominated by tall Guinea grass (Figure 5, above). "Area No. 2" is an open area on Melia Street with a foot bridge crossing a concrete-lined drainage channel and surrounded by private houses (Figure 6).

Figure 6. "Area 2" in our survey is a section of concrete-lined drainage channel at Melia Street.

Flora

Table 1 is a listing of all the species of flowering plants (angiosperms) observed during the surveys with a total of 66 taxa identified from the three survey areas. The vast majority (91%) are naturalized or non-native) species. Three native indigenous plants (4.5%) and one early Polynesian species (3%). The native species are *ʻilima* (*Sida fallax*), *ʻilieʻe* (*Plumbago zeylanica*), and *ʻuhaloa* (*Waltheria indica*); all common plants. The early Polynesian introduction (so-called "canoe plant") is yellow wood sorrel (*ʻihiʻai* or *Oxalis corniculata*), a very common small weed.

Table 1. Plant species observed at the Project sites.

Species listed by family	Common name	Status	Abundance	Notes
FLOWERING PLANTS				
MONOCOTS				
COMMELINACEAE				
Commelina benghalensis L.	hairy *honohono*	Nat	R	
MUSACEAE				
Musa x paradisiaca L	banana	**Pol**	--	<3>
POACEAE				
Bothriochloa pertusa (L.) A. Camus	pitted beardgrass	Nat	Oa	
Chloris barbata L.	swollen fingergrass	Nat	--	<2, 3>
Cynodon dactylon (L.) Pers.	Bermuda grass	Nat	A	<2, 3>
Digiteria insularis (L.) Mez ex Ekman	sourgrass	Nat	O	
Eleusine indica (L.) Gaertn.	wiregrass	Nat	O	<2, 3>
Eragrostis pectinacea (Michx.) Nees	Carolina lovegrass	Nat	C	<2>
Megathyrsus maximus (Jacq.) B.K. Simon & W.L. Jacobs	Guinea grass	Nat	AA	<2, 3>
Paspalum conjugatum Bergius	Hilo Grass	Nat	--	<2, 3>
Sporobolus indicus	rattail grass	Nat	C	
EUDICOTS				
ACANTHACEAE				
Justica betonica L.	white shrimp plant	Nat	--	<2,3>
Thunbergia fragrans Roxb.	sweet clock vine	Nat	U	
ANACARDIACEAE				
Mangifera indica L.	mango	Nat	U	
Schinus terebinthefolius Raddi	Christmas berry	Nat	Oc	<3>

Table 1 (continued).

Species listed by family	Common name	Status	Abundance	Notes
ASCLEPIADACEAE				
Asclepias physocarpa (E. Mey.) Schlechter	balloon plant	Nat	U	
ASTERACEAE (COMPOSITAE)				
Acanthospermum hispidum DC	---	Nat	R	
Ageratum conyzoides L.	*maile hohono*	Nat	O	<3>
Bidens pilosa L.	Spanish needle	Nat	--	<2, 3>
Conyza bonariensis Cronq.	hairy horseweed	Nat	--	<2, 3>
Pluchea carolinensis G.Don	sourbush	Nat	--	<3>
Senecio madagascariensis Poir.	fireweed	Nat	U	
AMARANTHACEAE				
Amaranthus spinosus L.	spiny amaranth	Nat	R	<2>
BRASSICACEAE				
Lepidium virginicum L.		Nat	--	<2>
CAPPARACEAE				
Cleome gynandra L.	wild spider flower	Nat	U	<2>
CARICACEAE				
Carica papaya L.	papaya	Nat	--	<3>
CHENOPODIACEAE				
Chenopodium murale L.	*‘aheahea*	Nat	R	
CONVOLVULACEAE				
Ipomoea obscura (L.) Ker-Gawl.	---	Nat	O	
Ipomea trilobata L.	little bell	Nat	U	<2, 3>
CUCURBITACEAE				
Momordica charantia L.	balsam pear	Nat	--	<2, 3>
EUPHORBIACEAE				
Euphorbia cyathophora J. A. Murray	wild poinsettia	Nat	--	<3>
Ricinus communis L.	castor bean	Nat	U	<3>
FABACEAE				
Clitoria ternatea L.	butterfly pea	Nat	--	<3>
Crotalaria incanum L.	fuzzy rattlepod	Nat	--	<2>
Chamaecrista nictitans L	partridge pea	Nat	R	<2, 3>
Desmodium incanum DC.	Spanish clover	Nat	O	<3>
Indigofera suffruticosa Mill.	indigo, *‘īnikō*	Nat	C	<3>
Leucaena leucocephala (Lam.) deWit	*koa haole*	Nat	C	<2,3>
Lotus subbiflorus Lag.	---	Nat	R	
Mimosa pudica L.	sensitive plant	Nat	R	

Table 1 (continued).

Species listed by family	Common name	Status	Abundance	Notes
FABACEAE (cont.)				
Neonotonia wightii (Wight & Arnott) Lackey	glycine vine	Nat	C	<3>
Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	*kiawe*	Nat	O	
Senna occidentalis (L.) Link	coffee senna	Nat	O	
Senna surattensis (N.L. Burm.) H. Irwin & Barneby	scrambled egg plant	Nat	O	
LAMIACEAE				
Hyptis pectinata (L.) Poit.	comb hyptis	Nat	O	<2, 3>
Leonotis nepetifolia (L.) R. Br.	lion's ear	Nat	O	<2>
MALVACEAE				
Abutilon grandifolium (Willd.) Sweet	hairy abutilon	Nat	O	<3>
Sida fallax Walp.	*‘ilima*	**Ind**	O	
Sida rhombifolia L.	---	Nat	O	<2>
Sida spinosa L.	prickly sida	Nat	R	
Urena lobata L.		Nat	R	
Waltheria indica L.	*‘uhaloa*	**Ind**	Oc	
MELIACEAE				
Melia azedarach L.	Chinabery	Nat	R	
MYRTACEAE				
Syzygium cumini (L.) Skeels	Java plum	Nat	U	
NYCTAGINACEAE				
Boerhavia coccinea Mill.		Nat	--	<3>
OXALIDACEAE				
Oxalis corniculata L.	yellow wood sorrel	**Pol**	R	
PLUMBAGINACEAE				
Plumbago zeylanica	*ilie‘e*	**Ind**	U	
POLYGONACEAE				
Antigonon leptopus Hook. & Arnott	Mexican creeper	Nat	--	<2>
PORTULACEAE				
Portulaca pilosa L.	---	Nat	R	<2, 3>
PROTEACEAE				
Grevillea robusta A. Cunn. ex R.Br.	silk oak	Nat	U	
RUTACEAE				
Murraya paniculata W. Jack	mock orange	Nat	--	<2>

Table 1 (continued).

Species listed by family	Common name	Status	Abundance	Notes
SOLANACEAE				
Solanum linnaeanum Hepper & P. Jaeger	Apple of Sodom	Nat	R	
TILIACEAE				
Triumfetta rhomboidea Jacq.	---	Nat	C	<3>
VERBENACEAE				
Lantana camara L.	lantana	Nat	A	<3>
Stachytarpheta urticifolia (Salisb.) Sims	---	Nat	O	
Verbena litoralis Kunth	*ōwi*	Nat	R	

Legend to Table 1

STATUS = distributional status for the Hawaiian Islands:
- **Ind** = indigenous; native to Hawaii, but not unique to the Hawaiian Islands.
- Nat = naturalized, exotic, plant introduced to the Hawaiian Islands since the arrival of Cook Expedition in 1778, and well-established outside of cultivation.
- Orn = A cultivated plant; a species not thought to be naturalized (spreading on its own) in Hawaiʻi.

ABUNDANCE = occurrence ratings for plant species:
- R – Rare: seen in only one or perhaps two locations.
- U - Uncommon: seen at most in several locations.
- O - Occasional: seen with some regularity.
- C - Common: observed numerous times during the survey.
- A - Abundant: found in large numbers; may be locally dominant.

NOTES:
- -- – Not observed in Area No. 1.
- <2> - Noted present in Area No. 2.
- <3> - Noted present in Area No. 3.
- <4> – Plant lacking key diagnostic characteristics (flower, fruit); identification, therefore, uncertain.

Avian Fauna

A total of 239 individual birds of 15 species, representing 10 separate families, were recorded during point counts. One species recorded, Pacific Golden-Plover (*Pluvialis fulva*), is an indigenous migratory shorebird species. The remaining 13 species recorded are all established alien or feral species (Table 2).

Table 2. Avian species detected at Nāʻālehu WWTP site On November 5, 2020.

Common Name	Scientific Name	ST	RA
	PHASIANIDAE - Pheasants & Partridges		
	Phasianinae - Pheasants & Allies		
Domestic Chicken	*Gallus gallus*	A	1.90
	COLUMBIFORMES		
	COLUMBIDAE - Pigeons & Doves		
Spotted Dove	*Streptopelia chinensis*	A	1.70
Zebra Dove	*Geopelia striata*	A	2.50
	CHARADRIIFORMES		
	CHARADRIIDAE - Lapwings & Plovers		
	Charadriinae - Plovers		
Pacific Golden-Plover	*Pluvialis fulva*	IM	0.30
	PASSERIFORMES		
	ALAUDIDAE - Larks		
Eurasian Skylark	*Alauda arvensis*	A	1.40
	ZOSTEROPIDAE - White-eyes		
Warbling White-eye	*Zosterops japonicus*	A	1.20
	STURNIDAE - Starlings		
Common Myna	*Acridotheres tristis*	A	5.20
	ESTRILDIDAE - Estrildid Finches		
Common Waxbill	*Estrilda astrild*	A	1.90
African Silverbill	*Euodice cantans*	A	0.60
Java Sparrow	*Lonchura oryzivora*	A	0.70
Scaly-breasted Munia	*Lonchura punctulata*	A	1.10
	PASSERIDAE - Old World Sparrows		
House Sparrow	*Passer domesticus*	A	0.60
	FRINGILLIDAE - Fringilline and Carduline Finches & Allies		
	Carduelinae - Carduline Finches and Hawaiian Honeycreepers		
House Finch	*Haemorhous mexicanus*	A	2.70
Yellow-fronted Canary	*Ceithagra mozambica*	A	1.60

Table 2 (continued).

Common Name	*Scientific Name*	*ST*	*RA*
	THRAUPIDAE - Tanagers		
	Thraupinae - Core Tanagers		
Saffron Finch	*Sicalis flaveola*	A	0.50

Key to Table 2

ST Status
- A Alien – Introduced to the Hawaiian Islands by humans
- IM Indigenous migratory– Native migratory shorebirds species which breeds in the high Arctic

RA Relative Abundance - Number of birds detected divided by the number of point counts (10)

Avian diversity and densities were in keeping with the location of the three sites and the vegetation present. Three introduced species—Common Myna (*Acridotheres tristis*), House Finch (*Haemorhous mexicanus*), and Zebra Dove (*Geopilia striata*)—accounted for 44% of the total number of birds recorded. Common Myna was the most commonly tallied species, which accounted for 23 percent of the birds recorded during point counts.

Mammals

Terrestrial mammalian species detected along with the methods of detection are presented in Table 3.

Table 3. Mammalian species detected at Nāʻālehu WWTP site in 2020.

Common Name	*Scientific Name*	*ST*	*Detection*
	CARNIVORA- FLESH EATERS		
	Canidae - Wolves, Jackals & Allies		
Domestic dog	*Canis lupus familiaris*	A	V, A, Sc
	Viverridae - Civets & Allies		
Small Indian mongoose	*Herpestes javanicus*	A	V, A
	Felidae- Cats		
House cat	*Felis catus*	A	V

Table 3 (continued).

Common Name	*Scientific Name*	*ST*	*Detection*
	ATRIODACTYLA - EVEN-TOED UNGULATES		
	Suicidae - Old World Swine		
Pig	*Sus scrofa*	A	V, Sc, Tr, Si
	Bovidae- Hollow-horned Ruminants		
Domestic cattle	*Bos taurus*	A	V, A, Tr, Sc

Key to Table 3

ST Status
- A Alien – Introduced to the Hawaiian Islands by humans
- V Visual – the animal was seen

***Detection** type*
- A Audio – the anima; was heard
- Sc Scat – feces of the anima; were observed
- Tr Tracks – tracks of the animals were seen
- Si Sign – browsing's signs, beds, rooting, dust baths etc. were observed

Discussion and Recommendations

Recommendations are partly based on U.S. Fish and Wildlife Service, Animal Avoidance and Minimization Measures (USFWS-PIFWO, nd). Implementation of the recommendations (provided below as bulleted items) by the Project contractor will minimize impacts to protected species to the maximum extent practicable.

Floral Resources

No plants of conservation concern or enjoying statutory protection (that is, listed as threatened or endangered; HDLNR, 1998; USFWS, 2020) were noted in the survey and given the highly disturbed nature of the site, would not be expected to be growing there. For comparative purposes, this survey revealed 66 species with 4 species as either indigenous or of early Polynesian introduction. The previous site—located on the *makai* side of Māmalahoa Highway 1 mi (1.6 km) east (also pastureland)—yielded 30 species of introduced plants and 1 species each of indigenous and early Polynesian introduction. A survey of the much smaller Waiʻōhinu Transfer Station (AECOS, 2020) in Waiʻōhinu, 2 mi (3.4 km) to the west produced a list of 59 taxa.

Although a much smaller area, the latter site is both highly disturbed (increasing the count of ruderal species) and subject to frequent introductions of species on vehicles and rubbish loads.

Faunal Resources

Insects

Several insects are now listed as endangered in the Hawaiian Islands: seven species of the yellow-faced bee (*Hylaeus anthracinus*, *H. assimulans*, *H. facilis*, *H. hilaris*, *H. kuakea*, *H. longiceps*, and *H. mana*; USFWS, 2016) and Blackburn's sphinx moth (*Manduca blackburnii*; USFWS, 2000, 2005).

No yellow-faced bee species was observed during the survey and no potential habitat or food sources were noted. The caterpillar of the sphinx moth feeds exclusively on plants in the Family Solanaceae. In particular, where the moth is found, caterpillars are most often associated with the widely distributed, non-native tree tobacco plant (*Nicotiana glauca*). The only plant observed representing the Family Solanaceae was a single wild cherry tomato plant (*Solanum lycopersicum* var. *cerasiforme*). This species is not known to be utilized by the caterpillar. We would deem any threat to these insect species due to Project activities as non-existent.

Terrestrial Birds

The findings of the avian survey are consistent with the vegetation present on the three sites. The WWTP site is mostly pasture that has been bulldozed in places. The other two smaller sites, located in town, have very limited plant species dominated by alien species. Fourteen of the recorded bird species are alien, naturalized bird species. The only native bird, the Pacific Golden-Plover, is an indigenous migratory shorebird commonly seen across the state between late September and the end of April each year. This species migrates to Arctic breeding grounds in late April or the first week of May.

It is possible that the endangered Hawaiian Petrel (*Puffinus sandwichesis*), Band-rumped Storm-Petrel (*Hydrobates castro*), and the threatened Newell's Shearwater (Puffinus newelli) over-fly the Project area between April and the middle of December each year in very small numbers. A primary cause of mortality in these listed seabirds in Hawaiʻi is thought to be predation by alien mammalian species at inland nesting colonies (USFWS, 1983; Simons and Hodges, 1998; Ainley et al., 2001). Collision with man-made structures is considered to be second-most as a cause of mortality; nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can

become disoriented by exterior lighting. Disoriented seabirds may collide with man-made structures and, if not killed outright, become easy targets of opportunity for feral mammals (Hadley, 1961; Telfer, 1979; Sincock, 1981; Reed et al., 1985; Telfer et al., 1987; Cooper and Day, 1998; Podolsky et al., 1998; Ainley et al., 2001; Hue et al., 2001; Day et al., 2003).

The potential impact that the Project poses to protected seabirds is the increased threat that birds will be downed during the seabird fledging season (from September 15 through December 15) after becoming disoriented by lights associated with the Project. The two main types of outdoor lighting posing a threat to nocturnally flying seabirds are: 1) night-time construction lights; and 2) exterior lighting around Project infrastructure.

- Fully shield all outdoor lights so the bulb can only be seen from below bulb height and only use when necessary; install automatic motion sensor switches and timer controls on all installed outdoor lights or turn off lights when human activity is not occurring in the lighted area. All external lighting structures should be fully "dark sky compliant" (HDLNR-DOFAW, 2016).

No habitats suitable for waterbird species are present on any of the three sites. Once the WWTP is constructed it is possible that one or more species will be attracted to ponds associated with the WWTP. No species currently listed or proposed for listing as threatened or endangered under federal or state endangered species statutes is associated with the project site (HDLNR, 2015; USFWS, nd-a).

Mammalian Resources

The five mammalian species recorded during these surveys are all common introduced species. Although no rodents were recorded, it is likely that one or more of the other four established alien Muridae found on Hawaiʻi—European house mouse (*Mus musculus*), roof rat (*Rattus rattus*), brown rat (*Rattus norvegicus*), and black rat (*Rattus exulans hawaiiensis*)—use various resources found within the general project area on a seasonal basis. It is also likely that small Indian mongoose (*Herpestes javanicus*) use resources in the general Project area. These human commensal species are drawn to areas of human habitation and activity. All of these introduced mammalian species are deleterious to native ecosystems and the native faunal species dependent on them.

No Hawaiian hoary bats or were detected during the course of our survey. It is within the realm of possibility that this species uses resources within the

Project area on a seasonal basis. The potential impact to bats would be during the clearing and grubbing phase of the construction. The trimming or removal of foliage and/or trees within the construction areas may temporarily displace an individual bat utilizing the vegetation as a roost. However, a bat will use multiple roosts within their home territory, so the potential disturbance resulting from the removal of the vegetation is likely to be minimal. During the pupping season, female carrying pups may be less able to rapidly vacate a roost site while vegetation is cleared. Additionally, adult female bats sometimes leave their pups in the roost tree while they themselves forage, and very small pups may be unable to flee a tree that is being felled.

- To avoid potential deleterious impacts to roosting bats with pups, it is recommended that no woody vegetation taller than 4.6 m (15 ft) be removed during the bat pupping season between June 1 and September 15 (USFWS, nd-c).

- The use of barbed wire to top fence lines may entangle flying bats and should be avoided (Zimpfer and Bonaccorso, 2010).

Other Resources of Potential Concern

Critical Habitat

Federally delineated Critical Habitat is not present in the Project area (USFWS, nd-b). No equivalent designation exists under state law. Conservation zoning in Hawaiʻi is promulgated at the state level by state Conservation Districts. No Conservation Districts occur near the Project.

Jurisdictional Waters

No streams or wetlands occur in the Project area, although the WWTP site itself is located within a shallow drainage swale and runoff flow will be directed around the WWTP infrastructure in a new channel. We observed no indications of water flow in the swale at the Project site. A concrete drainage channel crossed by the proposed force main on Melia Street is similar in directing runoff through town into shallow swale further downslope. Neither of these drainageways direct flows to streams or outlets on the ocean shore. Annual rainfall in the Nāʻālehu area is on the order of 40 in (1020 mm; Giambelluca et al., 2013) and the porous geology is not conducive to stream formation.

References Cited

AECOS Inc. (*AECOS*). 2020. A natural resources assessment for improvements to the Waiʻōhinu Transfer Station, Waiʻōhinu, Kaʻu, Hawaiʻi (TMK 9-5-005:001 por.). Prep. for Wilson Okamoto Corporation. *AECOS* No. 1618: 14 pp.

Ainley, D. G, R. Podolsky, L. Deforest, G. Spencer, and N. Nur. 2001. The Status and Population Trends of the Newell's Shearwater on Kaua'i: Insights from Modeling, in: Scott, J. M, S. Conant, and C. Van Riper III (editors) *Evolution, Ecology, Conservation, and Management of Hawaiian Birds: A Vanishing Avifauna. Studies in Avian Biology No. 22*. Cooper's Ornithological Society, Allen Press, Lawrence, Kansas. Pp. 108-123.

Chesser, R. T., S. M. Billerman, K. J. Burns, C. Cicero, J. L. Dunn, A. W. Fratter, I. J. Lovette, N. A. Mason, P. C. Rassmusen, and K. Winker. 2019. Sixtieth Supplement to the Check-list of North American Birds. *The Auk Ornithological Advances*, 136: 1-23.

______, ______, ______, ______, ______, ______, ______, ______, ______, J. V. Remsen Jr., D. F. Stotz, and K. Winker. 2020. Sixty-first Supplement to the Check-list of North American Birds. American Ornithological Society. Available online at URL: http://checklist.aou.org/taxa; last retrieved July 31, 2020.

David, R. E., and E. B. Guinther. 2012. Biological Surveys Conducted for the Nāʻālehu Wastewater Treatment Plant Project, Kaʻū District, Island of Hawaiʻi. Rana Biological Consulting, Inc. 18 pp.

Cooper, B. A. and R. H. Day. 1998. Summer Behavior and Mortality of Dark-rumped Petrels and Newells' Shearwaters at Power Lines on Kauai. *Colonial Waterbirds*, 21 (1): 11-19.

Day, R. H., B. Cooper, and T. C. Telfer. 2003. Decline of Townsend's (Newell's Shearwaters (*Puffinus auricularis newelli*) on Kauai, Hawaii. *The Auk,* 120: 669-679.

Giambelluca, T. W., Q. Chen, A.G. Frazier, J.P. Price, Y.-L. Chen, P.-S. Chu, J.K. Eischeid, and D.M. Delparte. 2013: Online Rainfall Atlas of Hawaiʻi. *Bull. Amer. Meteor. Soc.* 94: 313-316, doi: 10.1175/BAMS-D-11-00228.1. Online at URL: http://rainfall.geography.hawaii.edu/; last accessed on June 24, 2021.

Hadley, T. H. 1961. Shearwater calamity on Kauai. ʻ*Elepaio*, 21: 60.

Hawaii Department of Land and Natural Resources (HDLNR). 1998. Indigenous Wildlife, Endangered And Threatened Wildlife And Plants, And Introduced Wild Birds. Department of Land and Natural Resources. State of Hawaii. Administrative Rule §13-134-1 through §13-134-10, dated March 02, 1998.

_____. 2015. Hawaiʻi Administrative Rules, Title 13, Department of Land and Natural Resources, Subtitle 5 Forestry and Wildlife, Part 2 Wildlife, Chapter 124, Indigenous Wildlife, Endangered and Threatened Wildlife, Injurious Wildlife, Introduced Wild Birds, and Introduced Wildlife. February 27, 2015. 16 pp.

Hawaiʻi Department of Land and Natural Resources-Division of Forestry and Wildlife (HDLNR-DOFAW). 2016. Wildlife Lighting. PDF available at URL: http://dlnr.hawaii.gov/wildlife/files/2016/03/DOC439.pdf; last retrieved February 21, 2020.

Hue, D., C. Glidden, J. Lippert, L. Schnell, J. MacIvor and J. Meisler. 2001. Habitat Use and Limiting Factors in a Population of Hawaiian Dark-rumped Petrels on Mauna Loa, Hawaiʻi, *in:* : Scott, J. M, S. Conant, and C. Van Riper III (editors) *Evolution, Ecology, Conservation, and Management of Hawaiian Birds: A Vanishing Avifauna*. Studies in Avian Biology No. 22. Cooper's Ornithological Society, Allen Press, Lawrence, Kansas (Pg. 234-242).

Imada, C. T. 2019. Hawaiian Naturalized Vascular Plants Checklist (February 2019 update). *Bishop Museum Tech. Rept. 69*. 209 pp.

Podolsky, R., D. G. Ainley, G. Spencer, L. de Forest, and N. Nur. 1998. Mortality of Newell's Shearwaters Caused by Collisions with Urban Structures on Kauaʻi. *Colonial Waterbirds*, 21: 20-34.

Reed, J. R., J. L Sincock, and J. P. Hailman 1985. Light Attraction in Endangered Procellariform Birds: Reduction by Shielding Upward Radiation. *The Auk*, 102: 377-383.

Simons, T. R., and C. N. Hodges. 1998. Dark-rumped Petrel (*Pterodroma phaeopygia*). *In:* A. Poole and F. Gill (editors). The Birds of North America, No. 345. The Academy of Natural Sciences, Philadelphia, PA. and the American Ornithologists Union, Washington, D.C.

Sincock, J. L. 1981. Saving the Newell's Shearwater. Pages 76-78 in Proceedings of the Hawaii Forestry and Wildllife Conference, 2-4 October 1980. Department of Land and Natural Resources, State of Hawaii, Honolulu.

Staples, G. W. and D. R. Herbst. 2005. *A Tropical Garden Flora. Plants Cultivated in the Hawaiian Islands and other Tropical Places.* Bishop Museum, Honolulu. 908 pp.

Telfer, T. C. 1979. Successful Newell's Shearwater Salvage on Kauai. *ʻElepaio*, 39:71

_______, J. L. Sincock, G. V. Byrd, and J. R. Reed. 1987. Attraction of Hawaiian seabirds to lights: Conservation efforts and effects of moon phase. *Wildlife Soc. Bull.*, 15: 406-413.

U.S. Fish & Wildlife Service (USFWS). 1983. Hawaiian Dark-Rumped Petrel & Newell's Manx Shearwater Recovery Plan. USFWS, Portland, Oregon. February 1983.

______. 2000. Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for Blackburn's Sphinx Moth from the Hawaiian Islands, *Federal Register*, 65 (21; February 1, 2000): 4770-4779.

_______. 2005. Recovery Plan for Blackburn's Sphinx Moth (Manduca blackburni). August 26, 2005.

_______. 2016. 50 CFR 17. Final Rule: Endangered and Threatened Wildlife and Plants; Endangered Status for 49 Species from the Hawaiian Islands. *Federal Register*, 81 (190; Friday, September 30, 2016): 67786-67860.

_______. Undated (nd-a). USFWS Endangered Species. Available online at URL: https://www.fws.gov/endangered/; last retrieved October 30, 2020.

_____. Undated (nd-b). Critical Habitat Portal. Available online at URL: https://ecos.fws.gov/ecp/report/table/critical-habitat.html; last retrieved May 20, 2020.

U.S. Fish & Wildlife Service-Pacific Islands Fish and Wildlife Office (USFWS-PIFWO). No date (nd). Avoidance and Minimization Measures. Available online at URL: https://www.fws.gov/pacificislands/articles.cfm? id=149489720; last retrieved July 31, 2020.

Wagner, W. L., D. R. Herbst, and S. H. Sohmer. 1990. *Manual of the Flowering Plants of Hawaiʻi: Volume I and II*. Bishop Museum Special Publication 83. University of Hawaiʻi Press. 1853 pp.

______ and ______. 1999. *Supplement to the Manual of the flowering plants of Hawaiʻi*, pp. 1855-1918. *In:* Wagner, W. L., D. R. Herbst, and S. H. Sohmer, Manual of the flowering plants of Hawaiʻi. Revised edition. 2 vols. University of Hawaii Press and B.P. Bishop Museum.

Wilson, D. E. and D. M. Reeder (eds.). 2005. Wilson & Reeder's Mammal Species of the World (Third Edition). Available online at URL: http://www.departments.bucknell.edu/biology/resources/msw3/browse.asp; last retrieved December 9, 2019.

APPENDIX C:

Section 7 Consultation

Initiation Letter

JOSH GREEN, M.D.
GOVERNOR OF HAWAIʻI
KE KIAʻĀINA O KA MOKUʻĀINA ʻO HAWAIʻI

KENNETH S. FINK, MD, MGA, MPH
DIRECTOR OF HEALTH
KA LUNA HOʻOKELE

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

In reply, please refer to:
File:

90-04, 90-07 S7 ltr (initial).docx

May 31, 2024

Dr. Earl Campbell, Field Supervisor
U.S. Department of the Interior
U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, HI 96850
Email: pifwo_admin@fws.gov

Dear Dr. Campbell:

Subject: Initiate Informal Consultation and Request Concurrence of Proposed Determination Under Section 7 of the Endangered Species Act
Nāʻālehu Wastewater Collection System and Nāʻālehu Wastewater Treatment and Disposal System and Drainage Modifications
Clean Water State Revolving Fund Project No. C150090-04 and C150090-07
Information for Planning and Consultation (IPaC) Project Code: 2024-0078740

The U.S. Environmental Protection Agency (EPA) has designated the State of Hawaiʻi Department of Health (DOH) as its non-federal representative pursuant to 50 CFR Section 402.08 for purposes of initiating the consultation process and preparing a biological assessment, if necessary, under Section 7 of the federal Endangered Species Act (ESA) for certain projects funded under the Clean Water State Revolving Fund (CWSRF) program.

The County of Hawaiʻi Department of Environmental Management (COH-DEM) is planning to undertake the "Nāʻālehu Wastewater Collection System and Nāʻālehu Wastewater Treatment and Disposal System and Drainage Modifications" project. These projects plan to use CWSRF program funds and are contacting your office to initiate the informal consultation process under Section 7 of the ESA.

We are contacting your office to initiate the informal consultation process and request concurrence of the proposed determination under Section 7 of the ESA, request a list of threatened and endangered plant and animal species and critical habitats within the project and/or action area, and determine whether there are any other service trust resources, which may include, but not limited to the Migratory Bird Treaty Act (MBTA), beyond the species described and discussed in this letter.

Project Description

The COH-DEM is proposing to construct, wastewater system improvements to replace existing collection, treatment, and disposal systems that service the community of Nāʻālehu in the Kāʻu District on the Island of Hawaiʻi. The wastewater system improvements would allow the County to comply with the EPA regulations requiring the closure of the Large Capacity Cesspools (LLC)

currently in service and to construct a new system meeting the DOH and DEM design guidelines for collecting, treating, and disposing of community wastewater. The project would route the new collection and transmission systems primarily within existing rights-of-way, with easements where that isn't feasible or practical, and would provide a treatment and disposal system to allow closure of the three LCCs to meet EPA requirements.

The proposed improvements will occur on lands identified as TMK: 9-5-007-:016, 9-5-022:001, 9-5-021:015, and various other parcels within Nāʻālehu. The above-ground package wastewater treatment plant will be sited on the south side of Māmalahoa Highway (State Route 11) which runs east-west through the community. Collection and delivery systems will primarily be on the north (upslope) side of the highway within the developed community (*Attachment A*).

The Proposed Action includes four alternatives all using the above-ground package wastewater treatment plant but with different options for collection and delivery—these alternatives are discussed in detail in the attached DEM project package (*Attachment B*).

Consultation History

The project consultants sent a letter to the US Fish and Wildlife Service (USFWS) dated June 24, 2019, requesting a Technical Assistance (TA) review of the Draft Environmental Assessment for the Nāʻālehu LLC closure project. A response was received from USFWS in a letter dated July 15, 2019, assigning a TA consultation No. 01EPIF00-2019-TA-0388 for the project and including a list of species that could potentially be impacted by the project (*Attachment C*).

The official species list was obtained through the IPaC system on April 17, 2024 and identified 23 species that could potentially be present in the area and be affected by the proposed action. Of the species mentioned—one mammal, seven birds, one reptile, one insect, twelve flowering plants, and one fern—the only ones that could potentially be impacted by the action are the Hawaiian hoary bat (Lasiurus semotus), Band-rumped Storm Petrel (Hydrobatis castro), Hawaiian Petrel (Pterodroma sandwichensis), and Newell's Shearwater (Puffinus newelli) based on the biological surveys.

Biological Surveys

Two biological surveys were conducted on the sites: one in 2012 and one in 2021; both surveys were conducted by AECOS Inc. (*Attachment D*). During the botanical, avian, and mammalian resources surveys no listed or proposed-for-listing species under federal statutes were recorded. Also, a Natural Resources Assessment letter was prepared for the project in 2020 (*Attachment E*). To avoid and minimize the impacts, the following minimization measures will be incorporated into the project's plans and/or specifications.

Hawaiian Hoary Bat
To avoid or minimize effects to the Hawaiian hoary bat, the following conservation measures will be incorporated into the project where applicable:

- No barbed wire will be used for fencing.
- A provision will be included in the construction bid documents requiring the contractor to provide a qualified biologist to schedule surveys during the Hawaiian hoary bat birthing and pup rearing season between June 1 to September 15 should woody plants taller than 15 feet be trimmed, removed, or disturbed prior to the start of construction activities. If woody plants taller than 15 feet are removed outside of that time frame, the

surveys will not be necessary as work will fall outside of the peak birthing and pup rearing season.

Hawaiian Seabirds (Band-rumped Storm-petrel, Newell's shearwater, Hawaiian Petrel)
To avoid or minimize effects to Hawaiian seabirds, the following conservation measures will be incorporated into the project where applicable:

- Fully shield all outdoor lights so the bulb can only be seen from below bulb height and only use when necessary.
- Install automatic motion sensor switches and timer controls on all outdoor lights or turn off lights when human activity is not occurring in the lighted area.
- Avoid nighttime construction during the seabird fledging period, September 15 to December 15 on all islands.
- Install any required fencing extending above vegetation with three strands of polytape into the fence to increase visibility.

The project will **not affect** the remaining species identified in the official species list as biological surveys (*Attachment D*) concluded these species were neither present nor likely to be present in the project area.

Request for USFWS Assistance

Based on the project description along with the proposed avoidance and minimization measures that will be implemented, the project **may affect, not likely to adversely affect** these endangered or threatened species in the area as they will not be disturbed.

We are contacting your office to initiate the informal consultation process and request the concurrence of the proposed determination under Section 7 of the ESA and request a list of threatened and endangered plant and animal species and critical habitats within the project and/or action area that has not been mentioned above and/or in the natural resource assessment.

Your response within sixty (60) calendar days of receipt of this letter is greatly appreciated. Please address your written response to the following email or mailing addresses:
Chane.Hayashida@doh.hawaii.gov

Attn: Chane Hayashida
Department of Health, Wastewater Branch
2827 Waimano Home Road, Room 207
Pearl City, HI 96782

Should you have any questions, please contact Chane Hayashida at (808) 586-4294.

Sincerely,

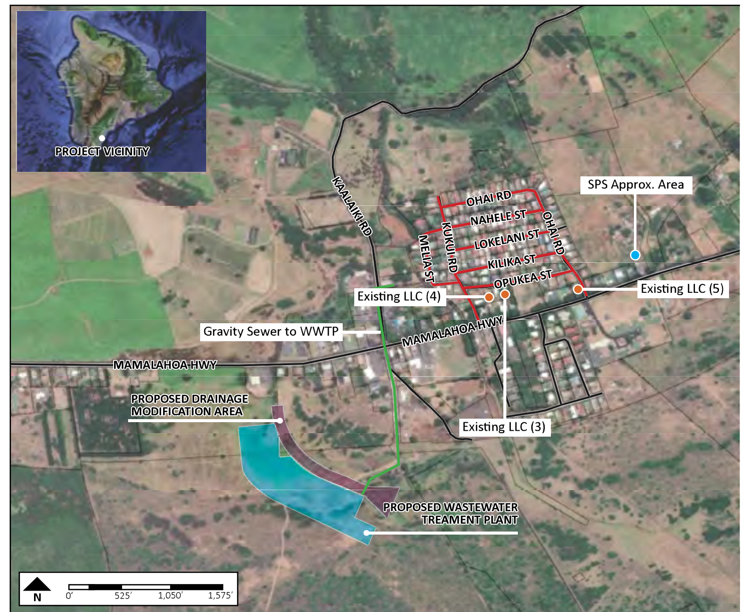
JONATHAN NAGATO, P.E., ACTING CHIEF
Wastewater Branch

Attachments

CH:jn

c: Ramzi Mansour (via email at Ramzi.Maansour@hawaiicounty.gov)
Chris Sparber (via email at Chris.Sparber@hawaiicounty.gov)
Mark Grant (via email at MarkJ.Grant@hawaiicounty.gov)

ATTACHMENT A



PROJECT LOCATION MAP

NA'ALEHU WASTEWATER TREATMENT PLANT

ATTACHMENT B

Environmental Information Document &
Draft Environmental Assessment
Consultation Package

NĀʻĀLEHU LARGE CAPACITY CESSPOOL CLOSURE

Nāʻālehu, Hawaiʻi Island, Hawaiʻi

March 2024

Prepared For:
County of Hawaiʻi Department of Environmental Management

Prepared By:
Wilson Okamoto Corporation

NĀʻĀLEHU LCC CLOSURE
ENVIRONMENTAL INFORMATION DOCUMENT & ENVIRONMENTAL ASSESSMENT
CONSULTATION PACKAGE

1. BACKGROUND

On behalf of the County of Hawaiʻi (County) Department of Environmental Management (DEM), Wilson Okamoto Corporation has prepared this Consultation Package to notify stakeholders of the preparation of a Draft Environmental Information Document (EID) / Environmental Assessment (EA) for the Nāʻālehu Large Capacity Cesspool (LCC) Closure (Proposed Action), as well as to solicit scoping input. The Proposed Action will be situated within the community of Nāʻālehu in the Kaʻū District, Island of Hawaiʻi (See Figure 1).

The Nāʻālehu community was established as the result of the sugar operations of the C. Brewer Company. A portion of the community is serviced by a sewer system that was privately built, owned, and operated by the C. Brewer Company, which merged with Hawaiian Agriculture Company (HAC) in 1972. The wastewater collected by the sewer system discharges into three large capacity "gang" cesspools (LCCs). Many years after its establishment, the private sewer system ownership was conveyed to the County of Hawaii Department of Environmental Management. In anticipation of C. Brewer's dissolution, C. Brewer proposed, and the County agreed, to enter into a formal agreement not only to construct and maintain a new and improved community sewer system but to assume ownership of the existing system including the LCC's by April 30, 2010.

Meanwhile, in 1998, the U.S. Environmental Protection Agency (EPA), promulgated regulations, 40 Code of Federal Regulations (CFR) 144.14, that require the elimination of LCCs. In 1999, EPA issued regulations under the Safe Drinking Water Act's (SDWA) Underground Injection Control (UIC) Program which prohibited the construction of new LCCs as of April 2000 and required the closure of all existing LCCs by April 5, 2005 (40 C.F.R. § 144.88). Under federal regulations, an LCC is a cesspool which serves multiple dwellings, or for non-residential facilities has the capacity to serve 20 or more persons per day.

In June 2017, the EPA and the County entered into an Administrative Order on Consent (AOC) to close the LCCs serving the Nāʻālehu community by June 2021. Options considered by the County to close the LCCs include construction of a new sewer collection system located within public right-of-way (ROW) and replacement of the existing LCCs with a wastewater treatment plant (WWTP) to address the wastewater treatment and disposal needs of the Nāʻālehu community. A recently Amended AOC was agreed upon between EPA and County, and took in effect August 22, 2022, which requires the LCCs to be closed no later than December 31, 2027.

As of August 22, 2022, the County of Hawaiʻi and the EPA voluntarily entered into an Amended AOC for the purpose of bringing the County into compliance with the requirements of the SDWA, 42 U.S.C. § 300f, et seq.

EPA has determined that the County, as the current owner and/or operator of two LCCs that serve approximately 109 private residences in the community of Pāhala and three (3) LCCs that

serve approximately 164 private residences in the community of Nāʻālehu, violated and continues to violate the SDWA and its Underground Injection Control program requirements for existing LCCs.

The Amended AOC (Docket No. SDWA-UIC-AOC-09-2017-0002) LCC closure requirements for the Nāʻālehu community mandates that an EID be prepared by the County of Hawaiʻi for the EPA approval to meet Federal Environmental Review Requirements.

The Amended AOC 31.a. requires evaluation of four feasible options:

1. A package plant and new collection system (Alternative 1)
2. A package plant connected to the existing collection system (Alternative 2)
3. A maintenance contract model Individual Wastewater System (IWS) program (Alternative 3)
4. An operating permit model IWS program (Alternative 4)

In addition, to meet the requirements of the EPA, this EID / EA will also evaluate:

5. A No Action alternative.

The subject EID / EA is intended to be consistent with requirements of the National Environmental Policy Act (NEPA) 42 U.S.C. § *et seq.* and will also provide documentation of necessary compliance with Section 7 of the Endangered Species Act and Section 106 of the National Historic Preservation Act. Further, the document shall be prepared pursuant to Hawaiʻi Revised Statutes (HRS) §343-5 (1) which outlines requirements for environmental disclosure for actions that propose the use of state or county lands or the use of state or county funds.

This project may also be funded by the DOH Clean Water State Revolving Fund (CWSRF) Program. Under the CWSRF program, the project consists of two parts: Nāʻālehu Large Capacity Cesspool Conversion and Nāʻālehu Wastewater Collection System. The CWSRF Program was created by the federal Water Quality Act of 1987 and authorizes low interest loans for the construction of publicly owned wastewater treatment works.

Supporting studies, to be included within the EID / EA, are anticipated to include Archaeological and Cultural documentation, including a Ka Paʻakai Analysis, as well as Botanical / Faunal Surveys and regulatory coordination. The County will seek to coordinate with the State of Hawaiʻi Department of Health (DOH) to ensure timely review and concurrence by the State of Hawaiʻi State Historic Preservation Division (SHPD) and the US Fish and Wildlife Service (FWS).

2. PROJECT DESCRIPTION AND ALTERNATIVES

The Proposed Action includes the construction of facilities which would allow the County to close the three LCCs in Nāʻālehu and thereby meet the compliance requirements of the Amended AOC and the applicable portions of the Clean Water Act. The Proposed Action would be achieved by any of the 4 alternatives set forth in the Revised AOC and described below.

Alternative 1 - Package Plant with New Collection System

Under Alternative 1, the County would construct a new sewer collection system in the Nāʻālehu community to replace the existing system of gravity lines that convey sewage to the three LCCs and connect it to the proposed wastewater treatment and disposal facility. The WWTP would serve the former Brewer lots as well as newly accessible parcels for future connection to the WWTP (See Figure 2). The potential connection of additional parcels may be further assessed by the County in the future.

During constructuon, the County shall ensure that residential units can maintain access to the sewer system at all times. Alternative 1 involves utilizing the existing collection system within the Brewer Company house lots and constructing new gravity sewers, wastewater pump station, and force main to transport sewage from the LCCs to the new WWTP (See Figure 3). Alternative 1 also involves the installation of gravity sewers to replace the existing collection system (See Figure 4).

Under this alternative, the County would perform the following actions:

1. Construct a new gravity sewer on Kaalaiki Road and Nāʻālehu Spur Road to the WWTP located on a portion of Tax Map Key (TMK) (3) 9-5-007:016.
2. Implement drainage improvements within the vicinity of the WWTP within TMKs (3) 9-5-007:016 and (3) 9-5-021:015.
3. Construct a new pump station located on a portion of TMK (3) 9-5-008:048, and construct a new force main, which crosses an existing storm drainage channel at Melia Street, to connect to the Kaalaiki Road gravity sewer.
4. Construct a new gravity sewer on Opukea Street and Ohai Road to intercept existing flows entering the LCCs and divert sewage to the wastewater pump station (WWPS) and transport flows to the gravity sewer along Kaalaiki Road.
5. Install gravity sewers within the streets to replace the existing collection system.
6. Close and abandon the three LCCs.
7. Accomodate future expansion of subsurface effluent disposal located within a portion of TMK (3) 9-5-022:001

Alternative 2 - Package Plant with Existing Collection System

Under Alternative 2, the County would perform the same actions as described under Alternative 1; however, gravity sewers would not be installed within the streets to replave the existing system. Instead, the new wastewater treatment and disposal facility and pump station would be connected to the existing 80-year old collection system.

Alternative 3 - Individual Wastewater System-Maintenance Contract Model

Hawai'i Revised Statutes, Title 14, Taxation, Chapter 235, Income Tax Law, § 235-16.5 defines a septic system as an individual wastewater system (IWS) that typically consists of a septic tank, piping, and a drainage field where there is natural biological decontamination as wastewater discharged into the system is filtered through soil.

The August 2023 PER, stated the State DOH Wastewater Branch is responsible for regulating IWS systems. The Revised AOC sets forth that the County Hawaiʽi must administer a more active management strategy than is typically found in Hawai'i IWS systems. The Revised AOC states either a Model 2 (Maintenance Contract) or a Model 3 (Operating Permit) must be used IWS systems at Pahala. Figure 4 shows the lots where the IWS systems shall be constructed.

The April 2023 PER indicates for a Model 2 Alternative, the County is to:

- Fund design and manage project construction of the IWS systems;
- Administer and manage a maintenance program for IWS;
    - The maintenance program would entail establishing rules and regulations, for monthly fees/penalties, County monitoring and reporting, and IWS educational information for homeowners
- Conduct routine maintenance and operate system, and respond to related trouble calls; and
- Prepare and submit related notices and reports.

Under Alternative 3, the County funds and manages project construction of the IWS which typically consist of a septic tank, disposal systems (leach field or seepage pit), and interconnecting piping between the IWS and the existing dwelling. The County will administer and manage a maintenance program for the IWS. The maintenance program will establish rules and regulations, monthly fees/ penalties, County monitoring and reporting, and IWS educational information for homeowners. Maintenance program includes County personnel being responsible for necessary maintenance to the IWS such as pumping the septic tanks.

Alternative 4 - Individual Wastewater System-Operating Permit to Homeowners

The April 2023 PER indicates for a Model 3 Alternative, the County is to:

- Fund design and construction of the IWS systems;
- Administer an operating permit program for the IWS system to the homeowners;
- Issues maintenance notice to the homeowner.

Under Alternative 4, the homeowners would be responsible for maintenance scheduling, contracting and paying for a service provider to conduct the necessary maintenance and/or responding to trouble calls, monitoring and record keeping of maintenance.

Under Alternative 4, County is evaluating the possibility of either completing the project as a conventional Design/ Bid/ Build process, or under a voucher program, which the County would administer a voucher program which will grant homeowners with funding to hire Professional Engineer to design new IWS and hire Contractor to construct IWS. Under the voucher program homeowners will be responsible to hire and coordinate with Professional engineer for placement of IWS and overall design of IWS.

2.1. PROJECT LOCATION & SETTING

The community of Nāʻālehu is located about 64 miles southwest of Hilo in the Kaʻū District. Māmalahoa Highway (State Route 11) runs through the community from East to West. The community of Nāʻālehu is about 2.06 miles from the shoreline. Most of the community lies between approximately 740 feet above mean sea level.

Even though Kaʻū was one of the originally settled areas in the Hawaiian Islands, it remains a vast remote area. Only a fraction of a percent of the Kaʻū District has been developed with residential properties, and the remainder is largely used for agricultural purposes or is undeveloped. The Kaʻū District covers about 922 square miles (approximately 590,000 acres), with over 80 miles of virtually undeveloped coastline. Nearly two-thirds of its total land area is in the Conservation District. The Kaʻū District consists of several communities, including the Nāʻālehu community, which has a population of approximately 810 persons according to the US Census Bureau American Community Survey, 2020. The distance to the communities of Hilo and Kailua-Kona means that the Kaʻū District is relatively isolated from the major infrastructure systems found in those communities, including wastewater treatment and disposal facilities.

2.2. PURPOSE AND NEED

DEM has outlined that the purpose and need for the Proposed Action is to comply with the requirements and mandates of the SDWA and AOC, and to ultimately close the three LCCs that serve Nāʻālehu in accordance with the Revised AOC. Thus, the core purpose of this exercise is to evaluate, gather community input, and make an informed decision in selecting an option or

alternative that will allow the County to close the LCCs, and provide a new, SDWA compliant solution for handling wastewater generated by the Nāʻālehu Community. Closure of the LCCs will eliminate the disposal of untreated sewage into the subsurface which will serve the County's mission to protect underground drinking water sources.

3. ENVIRONMENTAL CRITERIA TO BE ANALYZED

The EID / EA will evaluate and compare the anticipated environmental impacts of each alternative on the following environmental resource criteria:

- Climate
- Physiography
  - Topography
  - Geology
  - Soils
- Water Resources
- Natural Hazards
  - Sea Level Rise
  - Flood and Tsunami Threat
  - Hurricane and Wind Hazard
  - Seismic Hazard
  - Volcanic Hazard
  - Fire Hazard
- Flora & Fauna
- Cultural, Historical, and Archaeological Resources
- Air Quality & Odors
- Noise
- Energy and Natural Resources
  - Energy Sources
  - Water Resources
  - Land Use
- Roadways And Traffic
- Hazardous Materials
- Socioeconomics & Environmental Justice
- Sustainability
- Human Health and Safety

4. CONSULTATION

This Consultation Package has been circulated to the following parties:

Federal Agencies
US Army Corps of Engineers, Honolulu District
US Department of Agriculture Natural Resources Conservation Service

US Environmental Protection Agency
US Fish and Wildlife Service
National Oceanic and Atmospheric Administration
US Department of Transportation Federal Aviation Administration

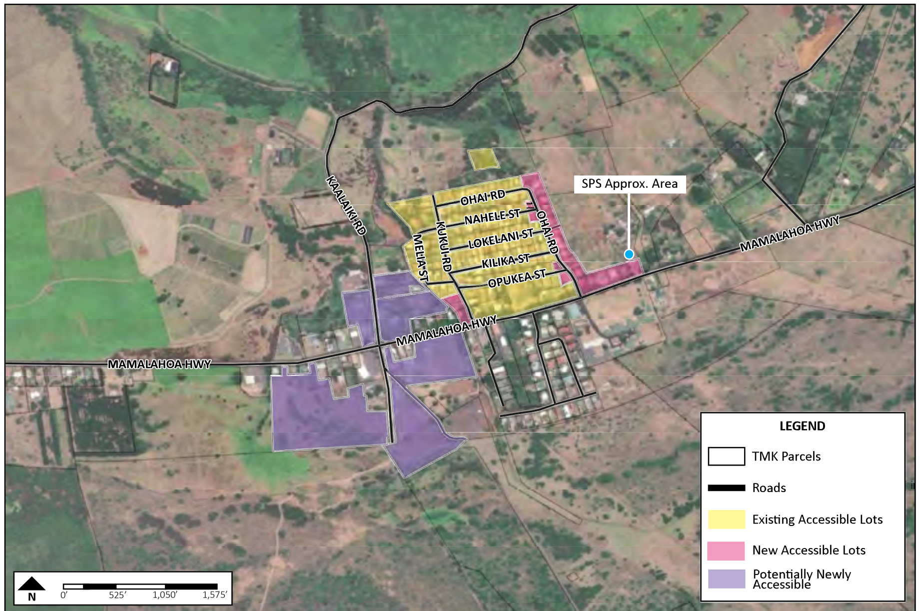
State Agencies
Department of Agriculture
Department of Accounting and General Services
Department of Business, Economic Development & Tourism (DBED&T)
  DBED&T Land Use Commission
  DBED&T Office of Planning and Sustainable Development
  DBED&T State Energy Office
Department of Hawaiian Home Lands (DHHL)
  DHHL – East Hawai'i District Office
Department of Health (DOH)
  DOH – Clean Water Branch
  DOH - Environmental Management Office
  DOH – Hazard Evaluation and Emergency Response
  DOH – Safe Drinking Water Branch
  DOH – Wastewater Branch
Department of Land and Natural Resources (DLNR)
  DLNR State Historic Preservation Division
  DLNR Land Division
Department of Transportation
Office of Hawaiian Affairs
University of Hawai'i

County of Hawai'i
Fire Department
Police Department
Planning Department
Research and Development
Department of Public Works
Department of Parks and Recreation
Department of Water Supply
Environmental Management Commission
Office of the Corporation Council
Office of Housing and Community Development

Elected Officials
State Senator Dru Mamo Kanuha, Senate District 3
Representative Jeanne Kapela, House District 5
Councilmember Michelle Galimba, Council District 6

Public Utilities
Hawaiian Electric Company
Hawaiian Telcom
Spectrum Hawai'i
Hawai'i Gas

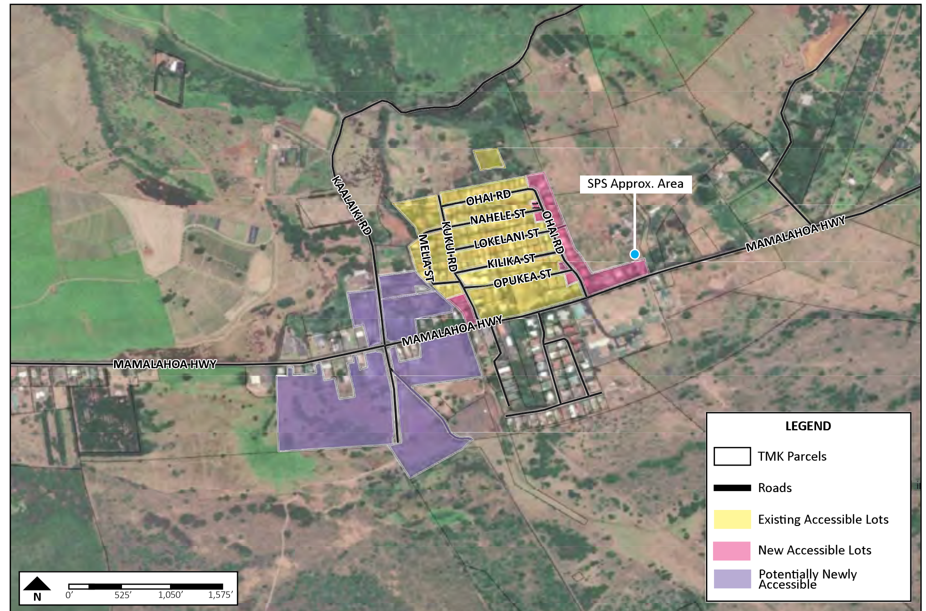
Other Parties
Hawai'i State Library
Nā'ālehu Public Library
Hawaiian Civic Club of Ka'ū
Ka'ū CDP Action Committee
Ka'ū Calendar
'O Ka'ū Kākou



WWTP SERVICE AREA

NA'ALEHU WASTEWATER TREATMENT PLANT

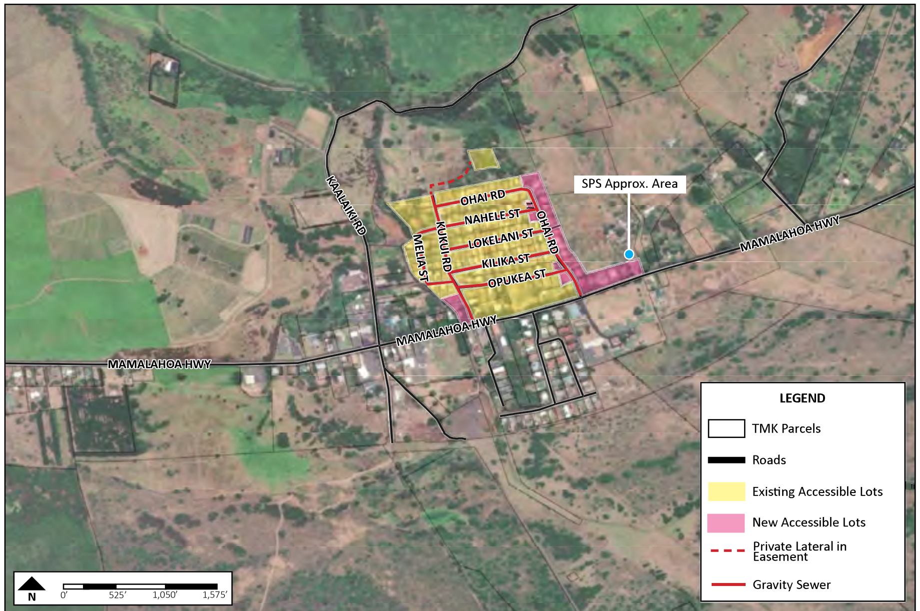
FIGURE 2


SPS Approx. Area
OHAI RD
NAHELE ST
LOKELANI ST
KILIKA ST
OPUKEA ST
KUKUI RD
MELIA ST
KAALAIKI RD
MAMALAHOA HWY
MAMALAHOA HWY
MAMALAHOA HWY
LEGEND
TMK Parcels
Roads
Existing Accessible Lots
New Accessible Lots
Potentially Newly Accessible
N
0'
525'
1,050'
1,575'

WWTP SERVICE AREA

NA'ALEHU WASTEWATER TREATMENT PLANT

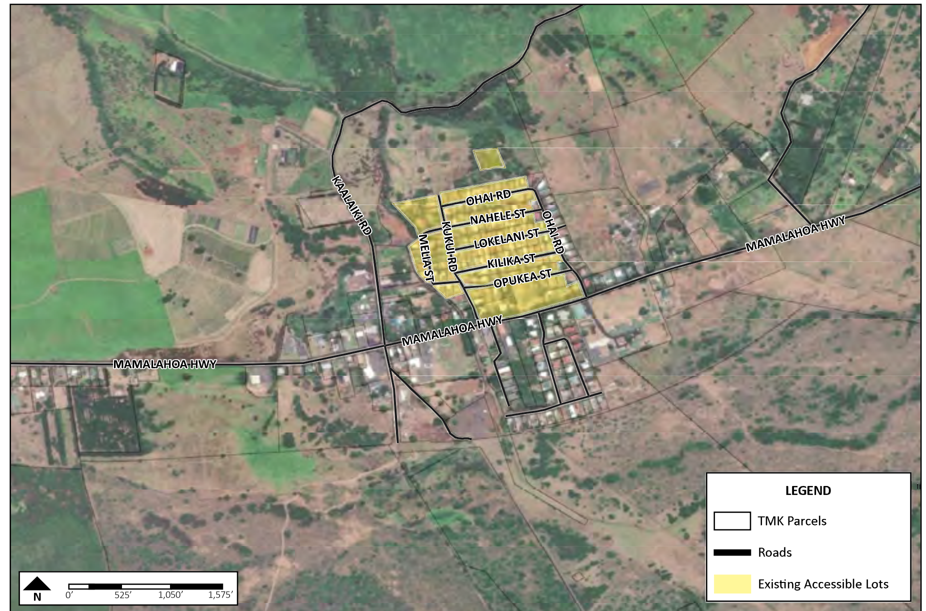
FIGURE 2



EXISTING COLLECTION SYSTEM REPLACEMENT

NA'ALEHU WASTEWATER TREATMENT PLANT

FIGURE 4



IWS ALTERNATIVE

NA'ALEHU WASTEWATER TREATMENT PLANT

FIGURE 5

PROJECT LOCATION MAP

NA'ALEHU WASTEWATER TREATMENT PLANT

FIGURE 1

Environmental Information Document &
Environmental Assessment
Nāʻālehu Large Cesspool Closure

ATTACHMENT C

10345-02
7/16/19

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard
Honolulu, Hawaii 96850

cc: BC
REG
2/28/2020

In Reply Refer To:
01EPIF00-2019-TA-0388

July 15, 2019

Earl Matsukawa, AICP
Project Manager
Wilson Okamoto Corporation
1907 South Beretania Street, Suite 400
Honolulu, HI 96826

Subject: Comments for the Draft Environmental Assessment, Pre-Assessment Consultation for the Naalehu Large Capacity Cesspools Closure Project, Kau, Island and County of Hawaii

Dear Mr. Matsukawa:

The U.S. Fish and Wildlife Service (Service) received your correspondence on June 24, 2019, requesting comments for the Draft Environmental Assessment for the Naalehu Large Capacity Cesspools (LCCs) Closure project in Kau (TMK: 9-5-007:016, 9-5-022:001, 9-5-021:015, and various parcels within the community).

The County of Hawaii Department of Environmental Management (DEM) is proposing to construct wastewater system improvements to replace the existing collection, treatment and disposal systems that service Naalehu. The wastewater system improvements would allow the County to comply with Environmental Protection Agency (EPA) regulations requiring closure of the LCCs and to construct a new system meeting current State of Hawaii Department of Health and DEM design guidelines for the collection, treatment and disposal of the community's wastewater. The projects would route the new collection and transmission systems primarily in the right-of-way, with easements where that isn't feasible or practical, and would provide a treatment and disposal system to allow closure the three LCCs to meet EPA requirements.

It is possible the Naalehu LCCs Closure project will be funded by the State of Hawaii Department of Health Clean Water State Revolving Fund (CWSRF) Program encompassing the following CWSRF projects: Naalehu Wastewater Collection System, Naalehu Sewage Pump Station and Force Main, Naalehu Wastewater Treatment and Disposal System and Drainage Modification.

The Service offers the following comments to assist you in your planning process so that impacts to trust resources can be avoided through site preparation, construction, and operation. Our comments are provided under the authorities of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C 1531 *et seq.*).

Based on information you provided and pertinent information in our files, including data compiled by the Hawaii Biodiversity and Mapping Project, there are eight (8) listed species that have the potential to either be in or fly through the vicinity of the project area: the federally endangered Hawaiian hoary bat *(Lasiurus cinereus semotus)*, Hawaiian hawk *(Buteo solitarius)*, Nene *Branta sandvicensis*, Hawaiian petrel (*Pterodroma sandwichensis*), band-rumped storm-petrel (*Oceanodroma castro*), Hawaiian stilt (*Himantopus mexicanus knudseni*), Hawaiian coot (*Fulica alai*), and the threatened Newell's shearwater (*Puffinus auricularis newelli*).

Avoidance and Minimization Measures

Hawaiian hoary bat
The Hawaiian hoary bat roosts in both exotic and native woody vegetation across all islands and will leave young unattended in trees and shrubs when they forage. If trees or shrubs 15 feet or taller are cleared during the pupping season, there is a risk that young bats could inadvertently be harmed or killed since they are too young to fly or may not move away. Additionally, Hawaiian hoary bats forage for insects from as low as three feet to higher than 500 feet above the ground and can become entangled in barbed wire used for fencing.

To avoid and minimize impacts to the endangered Hawaiian hoary bat we recommend incorporating the following applicable measures into your project description:

- Do not disturb, remove, or trim woody plants greater than 15 feet tall during the bat birthing and pup rearing season (June 1 through September 15).
- Do not use barbed wire for fencing.

Hawaiian hawk
The Hawaiian hawk is known to occur across a broad range of forest habitats throughout the Island of Hawaii. Loud, irregular and unpredictable activities, such as using heavy equipment or building a structure, near an endangered Hawaiian hawk nest may cause nest failure. Harassment of Hawaiian hawk nesting sites can alter feeding and breeding patterns or result in nest or chick abandonment. Nest disturbance can also increase exposure of chicks and juveniles to inclement weather or predators.

To avoid and minimize impacts to Hawaiian hawks we recommend you consider incorporating the following applicable measures into your project description:

- If work must be conducted during the March 1 through September 30 Hawaiian hawk breeding season, have a biologist familiar with the species conduct a nest search of the project footprint and surrounding areas immediately prior to the start of construction activities.
    - Pre-disturbance surveys for Hawaiian hawks are only valid for 14 days. If disturbance for the specific location does not occur within 14 days of the survey, conduct another survey.

- No clearing of vegetation or construction activities within 1,600 feet of any active Hawaiian hawk nest during the breeding season until the young have fledged.
- Regardless of the time of year, no trimming or cutting trees containing a hawk nest, as nests may be re-used during consecutive breeding seasons.

Nene
Nene are found on the islands of Hawaii, Maui, Molokai, and Kauai predominately, with a small population on Oahu. They are observed in a variety of habitats, but prefer open areas, such as pastures, golf courses, wetlands, natural grasslands and shrublands, and lava flows. Threats to the species include introduced mammalian and avian predators, wind facilities, and vehicle strikes.

To avoid and minimize potential project impacts to Nene we recommend incorporating the following applicable measures into your project description:

- Do not approach, feed, or disturb Nene.
- If Nene are observed loafing or foraging within the project area during the Nene breeding season (September through April), have a biologist familiar with the nesting behavior of Nene survey for nests in and around the project area prior to the resumption of any work. Repeat surveys after any subsequent delay of work of three or more days (during which the birds may attempt to nest).
    - Cease all work immediately and contact the Service for further guidance if a nest is discovered within a radius of 150 feet of proposed work, or a previously undiscovered nest is found within said radius after work begins.
- In areas where Nene are known to be present, post and implement reduced speed limits, and inform project personnel and contractors about the presence of endangered species on-site.

Hawaiian petrel, Band-rumped storm-petrel, and Newell's shearwater
Hawaiian seabirds may traverse the project area at night during the breeding, nesting and fledging seasons (March 1 to December 15). Outdoor lighting could result in seabird disorientation, fallout, and injury or mortality. Seabirds are attracted to lights and after circling the lights they may become exhausted and collide with nearby wires, buildings, or other structures or they may land on the ground. Downed seabirds are subject to increased mortality due to collision with automobiles, starvation, and predation by dogs, cats, and other predators. Young birds (fledglings) traversing the project area between September 15 and December 15, in their first flights from their mountain nests to the sea, are particularly vulnerable.

To avoid and minimize potential project impacts to seabirds we recommend you incorporate the following applicable measures into your project description:

- Fully shield all outdoor lights so the bulb can only be seen from below bulb height and only use when necessary.
- Install automatic motion sensor switches and controls on all outdoor lights or turn off lights when human activity is not occurring in the lighted area.
- Avoid nighttime construction during the seabird fledging period, September 15 through December 15.

Hawaiian stilt and Hawaiian coot
Listed Hawaiian waterbirds are found in fresh and brackish-water marshes and natural or man-made ponds. Hawaiian stilts may also be found wherever ephemeral or persistent standing water may occur. Threats to these species include non-native predators, habitat loss, and habitat degradation. Hawaiian ducks are also subject to threats from hybridization with introduced mallards.

Based on the project details provided, our information suggests that your project may result in standing water or the creation of open water, thus attracting Hawaiian waterbirds to the site. In particular, the Hawaiian stilt is known to nest in sub-optimal locations (e.g. any ponding water), if water is present. Hawaiian waterbirds attracted to sub-optimal habitat may suffer adverse impacts, such as predation and reduced reproductive success, and thus the project may create an attractive nuisance. Therefore, we recommend you work with our office during project planning so that we may assist you in developing measures to avoid impacts to listed species (e.g., fencing, vegetation control, predator management).

To avoid and minimize potential project impacts to Hawaiian waterbirds we recommend you incorporate the following applicable measures into your project description:

- In areas where waterbirds are known to be present, post and implement reduced speed limits, and inform project personnel and contractors about the presence of endangered species on-site.
- If water resources are located within or adjacent to the project site, incorporate applicable best management practices regarding work in aquatic environments into the project design.
- Have a biological monitor that is familiar with the species' biology conduct Hawaiian waterbird nest surveys where appropriate habitat occurs within the vicinity of the proposed project site prior to project initiation. Repeat surveys again within 3 days of project initiation and after any subsequent delay of work of 3 or more days (during which the birds may attempt to nest). If a nest or active brood is found:
    - Contact the Service within 48 hours for further guidance.
    - Establish and maintain a 100-foot buffer around all active nests and/or broods until the chicks/ducklings have fledged. Do not conduct potentially disruptive activities or habitat alteration within this buffer.

Have a biological monitor that is familiar with the species' biology present on the project site during all construction or earth moving activities until the chicks/ducklings fledge to ensure that Hawaiian waterbirds and nests are not adversely impacted.

Native plants

Where disturbed areas do not need to be maintained as an open area, the Service recommends restoring disturbed areas using native plants as appropriate for the location.

The following websites are good resources to use when choosing landscaping plants:

Pacific Island Ecosystems at Risk (www.hear.org/Pier/), Hawaii-Pacific Weed Risk Assessment (www.botany.hawaii.edu/faculty/daehler/wra/full_table.asp.html) and Global Compendium of Weeds (www.hear.org/gcw).

Compliance with the Endangered Species Act

If this project will receive any federal funding, federal permits, or any federal authorization, it is that Federal agency's responsibility to consult with the Service pursuant to section 7 of the ESA on the listed species and designated critical habitat. The Service only conducts Section 7 consultations with the federal action agency or their designated representative. If there is no federal action agency involved, but the take of listed species cannot be fully avoided, the project proponent should apply for an incidental take permit from the Service by developing a Habitat Conservation Plan.

Thank you for participating with us in the protection of our endangered species. If you have any further questions or concerns regarding this consultation, please contact Eldridge Naboa, Fish and Wildlife Biologist, 808-284-0037, e-mail: eldridge_naboa@fws.gov. When referring to this project, please include this reference number: ***01EPIF00-2019-TA-0388***.

Sincerely,

MICHELLE BOGARDUS Digitally signed by MICHELLE BOGARDUS Date: 2019.07.15 10:31:05 -10'00'

Michelle Bogardus
Island Team Leader
Maui Nui and Hawaii Island

BIOSECURTY PROTOCOL – HAWAII ISLAND (JULY 2018)

The following biosecurity protocol (based on National Park Service, State of Hawaii, U.S. Fish and Wildlife, U.S. Geological Survey, and the DOI Office of Native Hawaiian Relations guidance) should be followed when operating on Hawaii Island to prevent the introduction of harmful invasive species including frogs, ants, weeds, and fungi into local natural areas (e.g., Hawaii Volcanoes National Park, Hakalau Forest National Wildlife Refuge, State of Hawaii "Natural Areas") and areas with native habitat (habitat that is primarily composed of native vegetation), other islands in Hawaiian archipelago, or the U.S. mainland. The protocol also includes suggestions for keeping field staff safe from certain invasive species.

1. All work vehicles, machinery, and equipment should be cleaned, inspected by its user, and found free of mud, dirt, debris and invasive species prior to entry into the natural areas or native habitat.
a. Vehicles, machinery, and equipment must be thoroughly pressure washed in a designated cleaning area and visibly free of mud, dirt, plant debris, insects, frogs (including frog eggs) and other vertebrate species such as rats, mice and non-vegetative debris. A hot water wash is preferred. Areas of particular concern include bumpers, grills, hood compartments, areas under the battery, wheel wells, undercarriage, cabs, and truck beds (truck beds with accumulated material (intentionally placed or fallen from trees) are prime sites for hitchhikers).

b. The interior and exterior of vehicles, machinery, and equipment must be free of rubbish and food. The interiors of vehicles and the cabs of machinery must be vacuumed clean. Floor mats shall be sanitized with a solution of >70% isopropyl alcohol or a freshly mixed 10% bleach solution.

c. Any machinery, vehicles, equipment, or other supplies found to be infested with ants (or other invasive species) must not enter natural areas or native habitat. Treatment is the responsibility of the equipment or vehicle owner and operator.

2. Little Fire Ants – All work vehicles, machinery, and equipment should be inspected for invasive ants prior to entering the natural areas or native habitat.
a. A visual inspection for little fire ants should be conducted prior to entry into natural areas or native habitat.

b. Hygiene is paramount but even the cleanest vehicle can pick up a little fire ant. Place MaxForce Complete Brand Granular Insect Bait (1.0% Hydramethylnon; http://littlefireants.com/Maxforce%20Complete.pdf) into refillable tamper resistant bait stations. An example of a commercially available refillable tamper resistant bait station is the Ant Café Pro (https://www.antcafe.com/). Place a bait station (or stations) in vehicle. Note larger vehicles, such as trucks, may require multiple stations. Monitor bait stations frequently (every week at a minimum) and replace bait as needed. If the station does not have a sticker to identify the contents, apply a sticker listing contents to the station.

c. Any machinery, vehicles, equipment, or other supplies found to be infested with ants (or other invasive species) must not enter natural areas or native habitat until it is sanitized and re-tested following a resting period. Infested vehicles must be sanitized following recommendations by the Hawaii Ant Lab (http://www.littlefireants.com/) or other ant control expert and in accordance

with all State and Federal laws. Treatment is the responsibility of the equipment or vehicle owner.

d. Gravel, building materials, or other equipment such as portable buildings should be baited using MaxForce Complete Brand Granular Insect Bait (1.0% Hydramethylnon; http://littlefireants.com/Maxforce%20Complete.pdf) or AmdroPro (0.73% Hydramethylnon; http://littlefireants.com/Amdro%20Pro.pdf) following label guidance.

e. Storage areas that hold field tools, especially tents, tarps, and clothing should be baited using MaxForce Complete Brand Granular Insect Bait (1.0% Hydramethylnon; http://littlefireants.com/Maxforce%20Complete.pdf) or AmdroPro (0.73% Hydramethylnon; http://littlefireants.com/Amdro%20Pro.pdf) following label guidance.

3. Base yards and staging areas inside and outside areas must be kept free of invasive species.
a. Base yards and staging areas should be inspected at least weekly for invasive species and any found invasive removed immediately. Pay particular attention to where vehicles are parked overnight, keeping areas within 10-meters of vehicles free of debris. Parking on pavement and not under trees, while not always practical is best.

b. Project vehicles or equipment stored outside of a base yard or staging area, such as a private residence, should be kept in a pest free area.

4. All cutting tools must be sanitized to prevent the Rapid Ohia Death (ROD) fungus.
a. Avoid wounding ohia trees and roots with mowers, chainsaws, weed eaters, and other tools. Cut only the minimum amount of trees and branches as approved for the project.

b. All cutting tools, including machetes, chainsaws, and loppers must be sanitized to remove visible dirt and other contaminants prior to entry into natural areas or areas with native habitat, and when moving to a new project area within the native habitat area. Tools may be sanitized using a solution of >70% isopropyl alcohol or a freshly mixed 10% bleach solution. One minute after sanitizing, you may apply an oil based lubricant to chainsaw chains or other metallic parts to prevent corrosion.

c. Only dedicated tools and chainsaws should be used to sample known or suspected ROD infected trees.

d. Vehicles, machinery, and equipment must be cleaned as described in (1) above.

5. Imported firewood, logs, and ohia parts:
a. Ohia firewood, ohia logs, and ohia parts should not be transported.

6. For individuals working in the field:
a. **Before going into the field**, visually inspect and clean your clothes, boots, pack, radio harness, tools and other personal gear and equipment, for seeds, soil, plant parts, insects, and other debris. A small brush is handy for cleaning boots, equipment and gear. Soles of shoes should be sanitized using a solution of >70% isopropyl alcohol or a freshly mixed 10% bleach solution.

b. **Immediately before leaving the field,** visually inspect and clean your clothes, boots, pack, radio harness, tools, and other personnel gear and equipment, for seeds, soil, plant parts, insects, and other debris. Soles of shoes should be sanitized using a solution of >70% isopropyl alcohol or a freshly mixed 10% bleach solution.

c. **Little fire ants nest in trees.** If you are under a tree and that tree is bumped or somehow stressed, the threat response of the ants is to fall from the leaves and sting the person under the tree. If you are subject to an ant attack, do not panic. The ants are extremely small but their stings are painful so make sure you remove all ants from your body and clothing. The stings cause inch long welts that are itchy and painful, and can last for weeks. Treat stings as you would other insect stings. In some persons stings can produce life threatening reactions. Stocking antihistamine in the first aid kit is a reasonable precaution.

d. **Rat Lungworm disease** is caused by a parasite that can infect humans who consume raw or undercooked infected snails or slugs or consume raw produce that contains a small infected snail or slug. Infection is rare but can be serious. Symptoms can include severe headache, neck stiffness, low grade fever, nausea, and vomiting anywhere from 1-6 weeks after exposure. The disease is not spread person to person. Anyone who handles snails or slugs should wear gloves and/or wash hands. Eating unwashed produce is discouraged.

ATTACHMENT D

A natural resources assessment for the Nāʻālehu WWTP, Nāʻālehu, Kaʻu District Island of Hawaiʻi (TMK 9-5-005:001 por.)

AECOS Inc.
45-939 Kamehameha Highway
Suite 104
Kāneʻohe, Hawai'i 96744

June 24, 2021

A natural resources assessment for the Nāʻālehu WWTP, Nāʻālehu, Kaʻu District Island of Hawaiʻi (TMK 9-5-005:001 por.)

June 24, 2021 **DRAFT** *AECOS* No. 1613

E. Guinther, D. Miranda, and R. David
AECOS Inc.
45-939 Kamehameha Highway Suite 104
Kāneʻohe, Hawai'i 96744
Phone: (808) 234-7770 ~ Email: guinther@aecos.com

Introduction

The Hawaiʻi County Department of Environmental Management, Wastewater Division is proposing to construct a wastewater treatment and disposal system to treat sewage collected in Nāʻālehu, Kaʻu District, Island of Hawaiʻi (the "Project"; Figure 1). Construction of the treatment and disposal system will allow the closure of three large capacity cesspools currently used to dispose of untreated sewage. The treatment and disposal facility will be located on an approximately 28-ac (11.3-ha) portion of State Department of Land and Natural Resources (DLNR) land to the southwest of town (*makai* and downslope; see Figure 2). Site work includes grading of a drainage diversion swale to realign the existing site drainage, beginning from a vegetated diversion channel at a point some 350 ft (100 m) downslope of Māmalahoa Highway to a point downslope and east of the Project site. Road access and a utility corridor would follow from off the existing Nāʻālehu Spur Road.

A collector system will initially service residences on the north (*mauka*) side of the main street, the Hawaii Belt Road (Mamalahoa Highway). The Project also includes a force main pump station (SPS) and a force main connecting to the WWTP. The latter was surveyed specifically where the force main would cross a drainage channel. Otherwise, the force main route follows existing roads.

AECOS Inc. was contracted by Wilson Okamoto Corporation to conduct a natural resources survey and assessment of the subject property (TMK 9-5-005:001

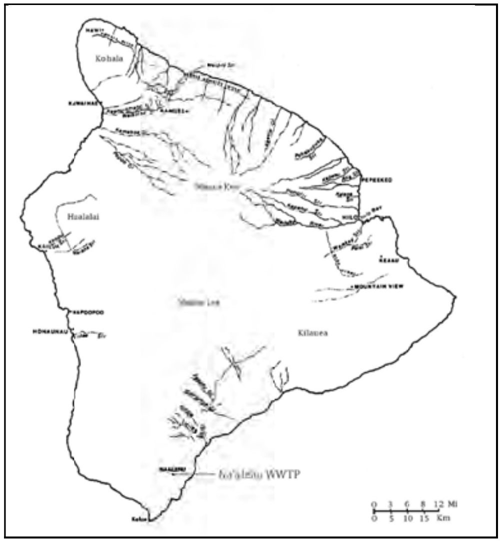


Figure 1. Project location on the Island of Hawaiʻi.

por.) and prepare this report of findings.[1] We make reference herein to a previous survey of a nearby location proposed for the WWTP nearly a decade ago (David & Guinther, 2012). As in 2012, our survey included the sewerage collector system as presently proposed, the latter covered by driving all of the streets to be impacted to establish that no environmental resources of conservation interest occur in those areas.

Site Description

The Project site is low sloping ground covered by pasture, in places mostly of cropped grasses (Figure 3), in other places a mixture of grasses and low growing shrubs (Figure 4); along the southern boundary, the vegetation merges

[1] This document is produced for inclusion in an EA for the subject Project and will become part of the public record.

Figure 4. Survey areas

Figure 3. Grassland pasture area of cropped Guinea grass.

Figure 4. Pasture area of cropped grass and low shrubs.

into scrub growth (cover photo). Much of the grassland is dominated by Guinea grass (*Megathyrsus maximus*), Low shrub growth areas are dominated by lantana (*Lantana camara*). Taller shrub/scrub growth is entirely *koa haole* (*Leucaena leucocephala*). The proposed pump station site ("Area No. 3") is on the *mauka* side of Māmalahoa Highway in an overgrown pasture off ʻŌhai Road east of the intersection with Opukea Street. The force main runs west on Opukea Street to Melia Street then south on Kaʻaiʻāiki Rd and Nāʻālehu Spur Road to the proposed WWTP site. The pipe crosses a drainage channel on Melia Street ("Area No. 2").

Methods

Botanical Survey

The natural resources survey was undertaken by the botany team on February 18, 2020 and again on November 5, 2020. A survey area map (corresponding to the red outline on Fig. 2) was loaded on a Trimble 6000 Series GNSS unit (Trimble GeoXH and GeoXT for use during the surveys). The GNSS units recorded the progress tracks of the botanists, providing real time feedback on location and adequacy of coverage during a wandering (pedestrian) transect. The November survey encompassed the site for a sewerage pump station east of ʻŌhai Road, the force main crossing of a drainage channel off Melia Street, and an additional look along the southwest side of the WWTP site (Figure 2) that may not have been completely covered by the February visit owing to later adjustments in Project footprint.

Plant species were identified as they were encountered. Species names follow *Manual of the Flowering Plants of Hawaiʻi* (Wagner, Herbst, & Sohmer, 1990; Wagner & Herbst, 1999) for native and naturalized flowering plants, *Hawaiʻi's Ferns and Fern Allies* (Palmer, 2003) for ferns, and *A Tropical Garden Flora* (Staples & Herbst, 2005) for ornamental plants. More recent name changes for naturalized plant species follow Imada (2019).

Terrestrial Vertebrates Survey

A survey of extant birds and mammals was conducted on the morning of February 18, 2020 and the morning of November 5, 2020. Only the results from the November 5 survey are reported herein. Ten avian point-count stations were established covering the Project areas and a single eight-minute avian point-count made at each station. The avian counts were conducted in the morning hours between 0730 and 1030 am with the aid of Leica 8 X 42 binoculars and by listening for vocalizations. Weather conditions were ideal, with unlimited visibility, light winds, and no rainfall. The avian phylogenetic order and nomenclature used in this report follow the AOU *Check-List of North and Middle American Birds* 2019 and the Sixtieth first Supplement to the Check-list of North American Birds (Chesser et al., 2019, 2020)

The survey of mammals was limited to visual and auditory detection, coupled with visual observation of scat, tracks, and other animal sign. We did not conduct a survey for Hawaiian hoary bat or *'ōpe'ape'a* (*Lasiurus cinereus semotus*), the only native land mammal in the Islands. Bats are solitary and potentially widespread throughout Hawai'i, and detection requires night surveys and deployment of special detection equipment recording over a long period of time. Negative results cannot confirm the absence of this mammal. At a location. Mammal scientific names follow *Mammal species of the world: a taxonomic and geographic reference* (Wilson and Reeder, 2005).

Figure 5. "Area 3" proposed pump station site overgrown with Guinea grass.

Results

Vegetation

Vegetation across the site consists entirely of grass pasture (predominantly Guinea grass or *Megathyrsus maximus*) and areas of mostly low scrub growth, dominated by lantana. Trees are scattered around the site, especially along a shallow swale feature that transects the area from north to southeast.

The site ("Area No. 3" in Figure 2) of the proposed SPS is a former pasture dominated by tall Guinea grass (Figure 5, above). "Area No. 2" is an open area on Melia Street with a foot bridge crossing a concrete-lined drainage channel and surrounded by private houses (Figure 6).

Figure 6. "Area 2" in our survey is a section of concrete-lined drainage channel at Melia Street.

Flora

Table 1 is a listing of all the species of flowering plants (angiosperms) observed during the surveys with a total of 66 taxa identified from the three survey areas. The vast majority (91%) are naturalized or non-native) species. Three native indigenous plants (4.5%) and one early Polynesian species (3%). The native species are *ʻilima* (*Sida fallax*), *ʻilieʻe* (*Plumbago zeylanica*), and *ʻuhaloa* (*Waltheria indica*); all common plants. The early Polynesian introduction (so-called "canoe plant") is yellow wood sorrel (*ʻihiʻai* or *Oxalis corniculata*), a very common small weed.

Table 1. Plant species observed at the Project sites.

Species listed by family	Common name	Status	Abundance	Notes
FLOWERING PLANTS				
MONOCOTS				
COMMELINACEAE				
Commelina benghalensis L.	hairy *honohono*	Nat	R	
MUSACEAE				
Musa x paradisiaca L	banana	**Pol**	--	<3>
POACEAE				
Bothriochloa pertusa (L.) A. Camus	pitted beardgrass	Nat	Oa	
Chloris barbata L.	swollen fingergrass	Nat	--	<2, 3>
Cynodon dactylon (L.) Pers.	Bermuda grass	Nat	A	<2, 3>
Digiteria insularis (L.) Mez ex Ekman	sourgrass	Nat	O	
Eleusine indica (L.) Gaertn.	wiregrass	Nat	O	<2, 3>
Eragrostis pectinacea (Michx.) Nees	Carolina lovegrass	Nat	C	<2>
Megathyrsus maximus (Jacq.) B.K. Simon & W.L. Jacobs	Guinea grass	Nat	AA	<2, 3>
Paspalum conjugatum Bergius	Hilo Grass	Nat	--	<2, 3>
Sporobolus indicus	rattail grass	Nat	C	
EUDICOTS				
ACANTHACEAE				
Justica betonica L.	white shrimp plant	Nat	--	<2,3>
Thunbergia fragrans Roxb.	sweet clock vine	Nat	U	
ANACARDIACEAE				
Mangifera indica L.	mango	Nat	U	
Schinus terebinthefolius Raddi	Christmas berry	Nat	Oc	<3>

Table 1 (continued).

Species listed by family	Common name	Status	Abundance	Notes
ASCLEPIADACEAE				
Asclepias physocarpa (E. Mey.) Schlechter	balloon plant	Nat	U	
ASTERACEAE (COMPOSITAE)				
Acanthospermum hispidum DC	---	Nat	R	
Ageratum conyzoides L.	*maile hohono*	Nat	O	<3>
Bidens pilosa L.	Spanish needle	Nat	--	<2, 3>
Conyza bonariensis Cronq.	hairy horseweed	Nat	--	<2, 3>
Pluchea carolinensis G.Don	sourbush	Nat	--	<3>
Senecio madagascariensis Poir.	fireweed	Nat	U	
AMARANTHACEAE				
Amaranthus spinosus L.	spiny amaranth	Nat	R	<2>
BRASSICACEAE				
Lepidium virginicum L.		Nat	--	<2>
CAPPARACEAE				
Cleome gynandra L.	wild spider flower	Nat	U	<2>
CARICACEAE				
Carica papaya L.	papaya	Nat	--	<3>
CHENOPODIACEAE				
Chenopodium murale L.	*ʻaheahea*	Nat	R	
CONVOLVULACEAE				
Ipomoea obscura (L.) Ker-Gawl.	---	Nat	O	
Ipomea trilobata L.	little bell	Nat	U	<2, 3>
CUCURBITACEAE				
Momordica charantia L.	balsam pear	Nat	--	<2, 3>
EUPHORBIACEAE				
Euphorbia cyathophora J. A. Murray	wild poinsettia	Nat	--	<3>
Ricinus communis L.	castor bean	Nat	U	<3>
FABACEAE				
Clitoria ternatea L.	butterfly pea	Nat	--	<3>
Crotalaria incanum L.	fuzzy rattlepod	Nat	--	<2>
Chamaecrista nictitans L	partridge pea	Nat	R	<2, 3>
Desmodium incanum DC.	Spanish clover	Nat	O	<3>
Indigofera suffruticosa Mill.	indigo, *ʻīnikō*	Nat	C	<3>
Leucaena leucocephala (Lam.) deWit	*koa haole*	Nat	C	<2,3>
Lotus subbiflorus Lag.	---	Nat	R	
Mimosa pudica L.	sensitive plant	Nat	R	

Table 1 (continued).

Species listed by family	Common name	Status	Abundance	Notes
FABACEAE (cont.)				
Neonotonia wightii (Wight & Arnott) Lackey	glycine vine	Nat	C	<3>
Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	*kiawe*	Nat	O	
Senna occidentalis (L.) Link	coffee senna	Nat	O	
Senna surattensis (N.L. Burm.) H. Irwin & Barneby	scrambled egg plant	Nat	O	
LAMIACEAE				
Hyptis pectinata (L.) Poit.	comb hyptis	Nat	O	<2, 3>
Leonotis nepetifolia (L.) R. Br.	lion's ear	Nat	O	<2>
MALVACEAE				
Abutilon grandifolium (Willd.) Sweet	hairy abutilon	Nat	O	<3>
Sida fallax Walp.	*ʻilima*	**Ind**	O	
Sida rhombifolia L.	---	Nat	O	<2>
Sida spinosa L.	prickly sida	Nat	R	
Urena lobata L.		Nat	R	
Waltheria indica L.	*ʻuhaloa*	**Ind**	Oc	
MELIACEAE				
Melia azedarach L.	Chinabery	Nat	R	
MYRTACEAE				
Syzygium cumini (L.) Skeels	Java plum	Nat	U	
NYCTAGINACEAE				
Boerhavia coccinea Mill.		Nat	--	<3>
OXALIDACEAE				
Oxalis corniculata L.	yellow wood sorrel	**Pol**	R	
PLUMBAGINACEAE				
Plumbago zeylanica	*ilieʻe*	**Ind**	U	
POLYGONACEAE				
Antigonon leptopus Hook. & Arnott	Mexican creeper	Nat	--	<2>
PORTULACEAE				
Portulaca pilosa L.	---	Nat	R	<2, 3>
PROTEACEAE				
Grevillea robusta A. Cunn. ex R.Br.	silk oak	Nat	U	
RUTACEAE				
Murraya paniculata W. Jack	mock orange	Nat	--	<2>

Table 1 (continued).

Species listed by family	Common name	Status	Abundance	Notes
SOLANACEAE				
Solanum linnaeanum Hepper & P. Jaeger	Apple of Sodom	Nat	R	
TILIACEAE				
Triumfetta rhomboidea Jacq.	---	Nat	C	<3>
VERBENACEAE				
Lantana camara L.	lantana	Nat	A	<3>
Stachytarpheta urticifolia (Salisb.) Sims	---	Nat	O	
Verbena litoralis Kunth	*ōwi*	Nat	R	

Legend to Table 1

STATUS = distributional status for the Hawaiian Islands:
- **Ind** = indigenous; native to Hawaii, but not unique to the Hawaiian Islands.
- Nat = naturalized, exotic, plant introduced to the Hawaiian Islands since the arrival of Cook Expedition in 1778, and well-established outside of cultivation.
- Orn = A cultivated plant; a species not thought to be naturalized (spreading on its own) in Hawaiʻi.

ABUNDANCE = occurrence ratings for plant species:
- R – Rare: seen in only one or perhaps two locations.
- U - Uncommon: seen at most in several locations.
- O - Occasional: seen with some regularity.
- C - Common: observed numerous times during the survey.
- A - Abundant: found in large numbers; may be locally dominant.

NOTES:
- -- – Not observed in Area No. 1.
- <2> - Noted present in Area No. 2.
- <3> - Noted present in Area No. 3.
- <4> – Plant lacking key diagnostic characteristics (flower, fruit); identification, therefore, uncertain.

Avian Fauna

A total of 239 individual birds of 15 species, representing 10 separate families, were recorded during point counts. One species recorded, Pacific Golden-Plover (*Pluvialis fulva*), is an indigenous migratory shorebird species. The remaining 13 species recorded are all established alien or feral species (Table 2).

Table 2. Avian species detected at Nāʻālehu WWTP site On November 5, 2020.

Common Name	Scientific Name	ST	RA
	PHASIANIDAE - Pheasants & Partridges		
	Phasianinae - Pheasants & Allies		
Domestic Chicken	*Gallus gallus*	A	1.90
	COLUMBIFORMES		
	COLUMBIDAE - Pigeons & Doves		
Spotted Dove	*Streptopelia chinensis*	A	1.70
Zebra Dove	*Geopelia striata*	A	2.50
	CHARADRIIFORMES		
	CHARADRIIDAE - Lapwings & Plovers		
	Charadriinae - Plovers		
Pacific Golden-Plover	*Pluvialis fulva*	IM	0.30
	PASSERIFORMES		
	ALAUDIDAE - Larks		
Eurasian Skylark	*Alauda arvensis*	A	1.40
	ZOSTEROPIDAE - White-eyes		
Warbling White-eye	*Zosterops japonicus*	A	1.20
	STURNIDAE - Starlings		
Common Myna	*Acridotheres tristis*	A	5.20
	ESTRILDIDAE - Estrildid Finches		
Common Waxbill	*Estrilda astrild*	A	1.90
African Silverbill	*Euodice cantans*	A	0.60
Java Sparrow	*Lonchura oryzivora*	A	0.70
Scaly-breasted Munia	*Lonchura punctulata*	A	1.10
	PASSERIDAE - Old World Sparrows		
House Sparrow	*Passer domesticus*	A	0.60
	FRINGILLIDAE - Fringilline and Carduline Finches & Allies		
	Carduelinae - Carduline Finches and Hawaiian Honeycreepers		
House Finch	*Haemorhous mexicanus*	A	2.70
Yellow-fronted Canary	*Ceithagra mozambica*	A	1.60

Table 2 (continued).

Common Name	Scientific Name	ST	RA
	THRAUPIDAE - Tanagers		
	Thraupinae - Core Tanagers		
Saffron Finch	*Sicalis flaveola*	A	0.50

Key to Table 2

ST Status

A Alien – Introduced to the Hawaiian Islands by humans

IM Indigenous migratory– Native migratory shorebirds species which breeds in the high Arctic

RA Relative Abundance - Number of birds detected divided by the number of point counts (10)

Avian diversity and densities were in keeping with the location of the three sites and the vegetation present. Three introduced species—Common Myna (*Acridotheres tristis*), House Finch (*Haemorhous mexicanus*), and Zebra Dove (*Geopilia striata*)—accounted for 44% of the total number of birds recorded. Common Myna was the most commonly tallied species, which accounted for 23 percent of the birds recorded during point counts.

Mammals

Terrestrial mammalian species detected along with the methods of detection are presented in Table 3.

Table 3. Mammalian species detected at Nāʻālehu WWTP site in 2020.

Common Name	Scientific Name	ST	Detection
	CARNIVORA- FLESH EATERS		
	Canidae - Wolves, Jackals & Allies		
Domestic dog	*Canis lupus familiaris*	A	V, A, Sc
	Viverridae - Civets & Allies		
Small Indian mongoose	*Herpestes javanicus*	A	V, A
	Felidae- Cats		
House cat	*Felis catus*	A	V

Table 3 (continued).

Common Name	*Scientific Name*	*ST*	*Detection*
	ATRIODACTYLA - EVEN-TOED UNGULATES		
	Suicidae - Old World Swine		
Pig	*Sus scrofa*	A	V, Sc, Tr, Si
	Bovidae- Hollow-horned Ruminants		
Domestic cattle	*Bos taurus*	A	V, A, Tr, Sc

Key to Table 3

ST Status

A Alien – Introduced to the Hawaiian Islands by humans

V Visual – the animal was seen

Detection *type*

A Audio – the anima; was heard

Sc Scat – feces of the anima; were observed

Tr Tracks – tracks of the animals were seen

Si Sign – browsing's signs, beds, rooting, dust baths etc. were observed

Discussion and Recommendations

Recommendations are partly based on U.S. Fish and Wildlife Service, Animal Avoidance and Minimization Measures (USFWS-PIFWO, nd). Implementation of the recommendations (provided below as bulleted items) by the Project contractor will minimize impacts to protected species to the maximum extent practicable.

Floral Resources

No plants of conservation concern or enjoying statutory protection (that is, listed as threatened or endangered; HDLNR, 1998; USFWS, 2020) were noted in the survey and given the highly disturbed nature of the site, would not be expected to be growing there. For comparative purposes, this survey revealed 66 species with 4 species as either indigenous or of early Polynesian introduction. The previous site—located on the *makai* side of Māmalahoa Highway 1 mi (1.6 km) east (also pastureland)—yielded 30 species of introduced plants and 1 species each of indigenous and early Polynesian introduction. A survey of the much smaller Waiʻōhinu Transfer Station (AECOS, 2020) in Waiʻōhinu, 2 mi (3.4 km) to the west produced a list of 59 taxa.

Although a much smaller area, the latter site is both highly disturbed (increasing the count of ruderal species) and subject to frequent introductions of species on vehicles and rubbish loads.

Faunal Resources

Insects

Several insects are now listed as endangered in the Hawaiian Islands: seven species of the yellow-faced bee (*Hylaeus anthracinus*, *H. assimulans*, *H. facilis*, *H. hilaris*, *H. kuakea*, *H. longiceps*, and *H. mana*; USFWS, 2016) and Blackburn's sphinx moth (*Manduca blackburnii*; USFWS, 2000, 2005).

No yellow-faced bee species was observed during the survey and no potential habitat or food sources were noted. The caterpillar of the sphinx moth feeds exclusively on plants in the Family Solanaceae. In particular, where the moth is found, caterpillars are most often associated with the widely distributed, non-native tree tobacco plant (*Nicotiana glauca*). The only plant observed representing the Family Solanaceae was a single wild cherry tomato plant (*Solanum lycopersicum* var. *cerasiforme*). This species is not known to be utilized by the caterpillar. We would deem any threat to these insect species due to Project activities as non-existent.

Terrestrial Birds

The findings of the avian survey are consistent with the vegetation present on the three sites. The WWTP site is mostly pasture that has been bulldozed in places. The other two smaller sites, located in town, have very limited plant species dominated by alien species. Fourteen of the recorded bird species are alien, naturalized bird species. The only native bird, the Pacific Golden-Plover, is an indigenous migratory shorebird commonly seen across the state between late September and the end of April each year. This species migrates to Arctic breeding grounds in late April or the first week of May.

It is possible that the endangered Hawaiian Petrel (*Puffinus sandwichesis*), Band-rumped Storm-Petrel (*Hydrobates castro*), and the threatened Newell's Shearwater (Puffinus newelli) over-fly the Project area between April and the middle of December each year in very small numbers. A primary cause of mortality in these listed seabirds in Hawaiʻi is thought to be predation by alien mammalian species at inland nesting colonies (USFWS, 1983; Simons and Hodges, 1998; Ainley et al., 2001). Collision with man-made structures is considered to be second-most as a cause of mortality; nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. Disoriented seabirds may collide with man-made structures and, if not killed outright, become easy targets of opportunity for feral mammals (Hadley, 1961; Telfer, 1979; Sincock, 1981; Reed et al., 1985; Telfer et al., 1987; Cooper and Day, 1998; Podolsky et al., 1998; Ainley et al., 2001; Hue et al., 2001; Day et al., 2003).

The potential impact that the Project poses to protected seabirds is the increased threat that birds will be downed during the seabird fledging season (from September 15 through December 15) after becoming disoriented by lights associated with the Project. The two main types of outdoor lighting posing a threat to nocturnally flying seabirds are: 1) night-time construction lights; and 2) exterior lighting around Project infrastructure.

- Fully shield all outdoor lights so the bulb can only be seen from below bulb height and only use when necessary; install automatic motion sensor switches and timer controls on all installed outdoor lights or turn off lights when human activity is not occurring in the lighted area. All external lighting structures should be fully "dark sky compliant" (HDLNR-DOFAW, 2016).

No habitats suitable for waterbird species are present on any of the three sites. Once the WWTP is constructed it is possible that one or more species will be attracted to ponds associated with the WWTP. No species currently listed or proposed for listing as threatened or endangered under federal or state endangered species statutes is associated with the project site (HDLNR, 2015; USFWS, nd-a).

Mammalian Resources

The five mammalian species recorded during these surveys are all common introduced species. Although no rodents were recorded, it is likely that one or more of the other four established alien Muridae found on Hawaiʻi—European house mouse (*Mus musculus*), roof rat (*Rattus rattus*), brown rat (*Rattus norvegicus*), and black rat (*Rattus exulans hawaiiensis*)—use various resources found within the general project area on a seasonal basis. It is also likely that small Indian mongoose (*Herpestes javanicus*) use resources in the general Project area. These human commensal species are drawn to areas of human habitation and activity. All of these introduced mammalian species are deleterious to native ecosystems and the native faunal species dependent on them.

No Hawaiian hoary bats or were detected during the course of our survey. It is within the realm of possibility that this species uses resources within the

Project area on a seasonal basis. The potential impact to bats would be during the clearing and grubbing phase of the construction. The trimming or removal of foliage and/or trees within the construction areas may temporarily displace an individual bat utilizing the vegetation as a roost. However, a bat will use multiple roosts within their home territory, so the potential disturbance resulting from the removal of the vegetation is likely to be minimal. During the pupping season, female carrying pups may be less able to rapidly vacate a roost site while vegetation is cleared. Additionally, adult female bats sometimes leave their pups in the roost tree while they themselves forage, and very small pups may be unable to flee a tree that is being felled.

- To avoid potential deleterious impacts to roosting bats with pups, it is recommended that no woody vegetation taller than 4.6 m (15 ft) be removed during the bat pupping season between June 1 and September 15 (USFWS, nd-c).

- The use of barbed wire to top fence lines may entangle flying bats and should be avoided (Zimpfer and Bonaccorso, 2010).

Other Resources of Potential Concern

Critical Habitat

Federally delineated Critical Habitat is not present in the Project area (USFWS, nd-b). No equivalent designation exists under state law. Conservation zoning in Hawaiʻi is promulgated at the state level by state Conservation Districts. No Conservation Districts occur near the Project.

Jurisdictional Waters

No streams or wetlands occur in the Project area, although the WWTP site itself is located within a shallow drainage swale and runoff flow will be directed around the WWTP infrastructure in a new channel. We observed no indications of water flow in the swale at the Project site. A concrete drainage channel crossed by the proposed force main on Melia Street is similar in directing runoff through town into shallow swale further downslope. Neither of these drainageways direct flows to streams or outlets on the ocean shore. Annual rainfall in the Nāʻālehu area is on the order of 40 in (1020 mm; Giambelluca et al., 2013) and the porous geology is not conducive to stream formation.

References Cited

AECOS Inc. (*AECOS*). 2020. A natural resources assessment for improvements to the Waiʻōhinu Transfer Station, Waiʻōhinu, Kaʻu, Hawaiʻi (TMK 9-5-005:001 por.). Prep. for Wilson Okamoto Corporation. *AECOS* No. 1618: 14 pp.

Ainley, D. G, R. Podolsky, L. Deforest, G. Spencer, and N. Nur. 2001. The Status and Population Trends of the Newell's Shearwater on Kaua'i: Insights from Modeling, in: Scott, J. M, S. Conant, and C. Van Riper III (editors) *Evolution, Ecology, Conservation, and Management of Hawaiian Birds: A Vanishing Avifauna. Studies in Avian Biology No. 22*. Cooper's Ornithological Society, Allen Press, Lawrence, Kansas. Pp. 108-123.

Chesser, R. T., S. M. Billerman, K. J. Burns, C. Cicero, J. L. Dunn, A. W. Fratter, I. J. Lovette, N. A. Mason, P. C. Rassmusen, and K. Winker. 2019. Sixtieth Supplement to the Check-list of North American Birds. *The Auk Ornithological Advances*, 136: 1-23.

______, ______, ______, ______, ______, ______, ______, ______, ______, J. V. Remsen Jr., D. F. Stotz, and K. Winker. 2020. Sixty-first Supplement to the Check-list of North American Birds. American Ornithological Society. Available online at URL: http://checklist.aou.org/taxa; last retrieved July 31, 2020.

David, R. E., and E. B. Guinther. 2012. Biological Surveys Conducted for the Nāʻālehu Wastewater Treatment Plant Project, Kaʻū District, Island of Hawaiʻi. Rana Biological Consulting, Inc. 18 pp.

Cooper, B. A. and R. H. Day. 1998. Summer Behavior and Mortality of Dark-rumped Petrels and Newells' Shearwaters at Power Lines on Kauai. *Colonial Waterbirds*, 21 (1): 11-19.

Day, R. H., B. Cooper, and T. C. Telfer. 2003. Decline of Townsend's (Newell's Shearwaters (*Puffinus auricularis newelli*) on Kauai, Hawaii. *The Auk,* 120: 669-679.

Giambelluca, T. W., Q. Chen, A.G. Frazier, J.P. Price, Y.-L. Chen, P.-S. Chu, J.K. Eischeid, and D.M. Delparte. 2013: Online Rainfall Atlas of Hawaiʻi. *Bull. Amer. Meteor. Soc.* 94: 313-316, doi: 10.1175/BAMS-D-11-00228.1. Online at URL: http://rainfall.geography.hawaii.edu/; last accessed on June 24, 2021.

Hadley, T. H. 1961. Shearwater calamity on Kauai. *ʻElepaio*, 21: 60.

Hawaii Department of Land and Natural Resources (HDLNR). 1998. Indigenous Wildlife, Endangered And Threatened Wildlife And Plants, And Introduced Wild Birds. Department of Land and Natural Resources. State of Hawaii. Administrative Rule §13-134-1 through §13-134-10, dated March 02, 1998.

_____. 2015. Hawaiʻi Administrative Rules, Title 13, Department of Land and Natural Resources, Subtitle 5 Forestry and Wildlife, Part 2 Wildlife, Chapter 124, Indigenous Wildlife, Endangered and Threatened Wildlife, Injurious Wildlife, Introduced Wild Birds, and Introduced Wildlife. February 27, 2015. 16 pp.

Hawaiʻi Department of Land and Natural Resources-Division of Forestry and Wildlife (HDLNR-DOFAW). 2016. Wildlife Lighting. PDF available at URL: http://dlnr.hawaii.gov/wildlife/files/2016/03/DOC439.pdf; last retrieved February 21, 2020.

Hue, D., C. Glidden, J. Lippert, L. Schnell, J. MacIvor and J. Meisler. 2001. Habitat Use and Limiting Factors in a Population of Hawaiian Dark-rumped Petrels on Mauna Loa, Hawaiʻi, *in:* : Scott, J. M, S. Conant, and C. Van Riper III (editors) *Evolution, Ecology, Conservation, and Management of Hawaiian Birds: A Vanishing Avifauna*. Studies in Avian Biology No. 22. Cooper's Ornithological Society, Allen Press, Lawrence, Kansas (Pg. 234-242).

Imada, C. T. 2019. Hawaiian Naturalized Vascular Plants Checklist (February 2019 update). *Bishop Museum Tech. Rept. 69*. 209 pp.

Podolsky, R., D. G. Ainley, G. Spencer, L. de Forest, and N. Nur. 1998. Mortality of Newell's Shearwaters Caused by Collisions with Urban Structures on Kauaʻi. *Colonial Waterbirds*, 21: 20-34.

Reed, J. R., J. L Sincock, and J. P. Hailman 1985. Light Attraction in Endangered Procellariform Birds: Reduction by Shielding Upward Radiation. *The Auk*, 102: 377-383.

Simons, T. R., and C. N. Hodges. 1998. Dark-rumped Petrel (*Pterodroma phaeopygia*). *In:* A. Poole and F. Gill (editors). The Birds of North America, No. 345. The Academy of Natural Sciences, Philadelphia, PA. and the American Ornithologists Union, Washington, D.C.

Sincock, J. L. 1981. Saving the Newell's Shearwater. Pages 76-78 in Proceedings of the Hawaii Forestry and Wildllife Conference, 2-4 October 1980. Department of Land and Natural Resources, State of Hawaii, Honolulu.

Staples, G. W. and D. R. Herbst. 2005. *A Tropical Garden Flora. Plants Cultivated in the Hawaiian Islands and other Tropical Places.* Bishop Museum, Honolulu. 908 pp.

Telfer, T. C. 1979. Successful Newell's Shearwater Salvage on Kauai. *'Elepaio*, 39:71

_______, J. L. Sincock, G. V. Byrd, and J. R. Reed. 1987. Attraction of Hawaiian seabirds to lights: Conservation efforts and effects of moon phase. *Wildlife Soc. Bull.*, 15: 406-413.

U.S. Fish & Wildlife Service (USFWS). 1983. Hawaiian Dark-Rumped Petrel & Newell's Manx Shearwater Recovery Plan. USFWS, Portland, Oregon. February 1983.

______. 2000. Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for Blackburn's Sphinx Moth from the Hawaiian Islands, *Federal Register*, 65 (21; February 1, 2000): 4770-4779.

_______. 2005. Recovery Plan for Blackburn's Sphinx Moth (Manduca blackburni). August 26, 2005.

_______. 2016. 50 CFR 17. Final Rule: Endangered and Threatened Wildlife and Plants; Endangered Status for 49 Species from the Hawaiian Islands. *Federal Register*, 81 (190; Friday, September 30, 2016): 67786-67860.

_______. Undated (nd-a). USFWS Endangered Species. Available online at URL: https://www.fws.gov/endangered/; last retrieved October 30, 2020.

_____. Undated (nd-b). Critical Habitat Portal. Available online at URL: https://ecos.fws.gov/ecp/report/table/critical-habitat.html; last retrieved May 20, 2020.

U.S. Fish & Wildlife Service-Pacific Islands Fish and Wildlife Office (USFWS-PIFWO). No date (nd). Avoidance and Minimization Measures. Available online at URL: https://www.fws.gov/pacificislands/articles.cfm? id=149489720; last retrieved July 31, 2020.

Wagner, W. L., D. R. Herbst, and S. H. Sohmer. 1990. *Manual of the Flowering Plants of Hawaiʻi: Volume I and II.* Bishop Museum Special Publication 83. University of Hawaiʻi Press. 1853 pp.

______ and ______. 1999. *Supplement to the Manual of the flowering plants of Hawaiʻi*, pp. 1855-1918. *In:* Wagner, W. L., D. R. Herbst, and S. H. Sohmer, Manual of the flowering plants of Hawaiʻi. Revised edition. 2 vols. University of Hawaii Press and B.P. Bishop Museum.

Wilson, D. E. and D. M. Reeder (eds.). 2005. Wilson & Reeder's Mammal Species of the World (Third Edition). Available online at URL: http://www.departments.bucknell.edu/biology/resources/msw3/browse.asp; last retrieved December 9, 2019.

ATTACHMENT E

AECOS, Inc.
45-939 Kamehameha Highway, Suite 104♦Kaneohe HI 96744
♦Telephone: (808)234-7770♦ ♦Email: guinther@aecos.com♦

December 2, 2020

John Sakaguchi
Wilson Okamoto Corp.
1907 So. Beretania Street, Suite 400
Honolulu, HI 96826

RE: Natural Resources Assessment for the Na'alehu Large Capacity Cesspools Replacement Project

Mr. Sakaguchi,

AECOS, Inc. biologists, Eric Guinther, David Miranda, and Reginald David conducted an initial assessment survey of the proposed site for the Na'alehu WWTP on February 18, 2020. We prepared an internal draft report. However, changes to the project layout of the site and additional offsite appurtenances (a sewer pump station and force main) required that we undertake additional surveys for the project. These were completed by Reginald David and David Miranda on November 5, 2020. Our surveys (sxee Figure 1, attached) covered the proposed WWTP site (Area No. 1), including the proposed drainage feature adjacent, the SPS site off the east end of Opukea Street (Arera No. 3), the service area neighborhood (outlined partly in red), and the location where the force main will cross a concrete-lined channel at the west end of Melia Street over to Kaalaiki Road (Area No. 2).

The vegetation is dominated almost to the exclusion of native species on all three sites. Avian resources were sparse on the WWTP site as the habitat is very disturbed. All of the proposed WWTP site is pasture land, in various states of use, covered by grasses and scrub growth. Scattered trees are present, mostly along the shallow drainage swale. The proposed location for the SPS is a pasture with tall Guinea grass and minimal other weedy species. No resources are present at any of the sites with respect to the endangered Blackburn's Sphinx moth. All but one avian species detected during the surveys are introduced, established alien species. The sole native species—Pacific-golden Plover (*Pluvialis fulva*)—is an indigenous migratory shorebird species regularly seen across the state in the winter months between each year. The survey sites have no aquatic resources/environments present—with the exception of the crossing of the concrete drainage channel (Area No. 2)—and are not within federal Critical Habitat or a State of Hawaiʻi Conservation Zone.

Eric Guinther
AECOS Inc.

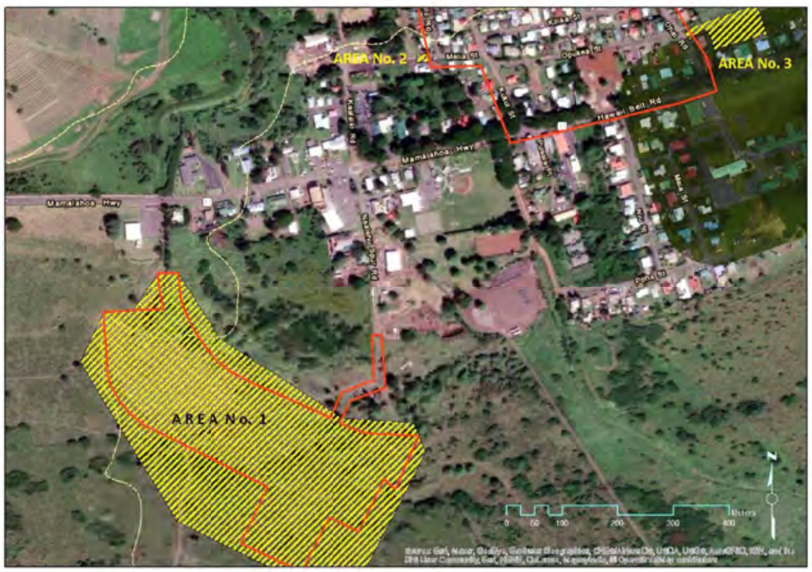


Figure 1. Specific areas surveyed in two visits to Naʻalehu.

APPENDIX D:

Section 7 Consultation

U.S. Fish and Wildlife Service Response

In Reply Refer To:
2024-0078740-S7-001

June 21, 2024

Chane Hayashida
State of Hawaiʻi
Department of Health, Wastewater Branch
2827 Waimano Home Road, Room 207
Pearl City, Hawaiʻi 96782

Subject: 2024-0078740-S7-001 Nāʻālehu Wastewater Collection, Treatment, Disposal, and Drainage System Modifications, Nāʻālehu, Hawaiʻi

Dear Chane Hayashida,

This letter is in response to your May 31, 2024, request for our concurrence with your determination that the proposed wastewater system modification actions in Nāʻālehu, Hawaiʻi, "may affect, but is not likely to adversely affect" federally listed species. Specifically, you requested informal consultation pursuant to section 7(a)(2) of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (ESA) for the following federally listed species:

- ʻŌpeʻapeʻa or Hawaiian hoary bat (*Lasiurus cinereus semotus*)
- Hawaiian seabirds, including Hawaiʻi Distinct Population Segment of the ʻakēʻakē or band-rumped storm-petrel (*Hydrobates castro*), ʻaʻo or Newell's shearwater (*Puffinus newelli*), ʻuaʻu or Hawaiian petrel (*Pterodroma sandwichensis*)

The U.S. Environmental Protection Agency (EPA) has designated the State of Hawaiʻi Department of Health (HDOH) as its non-federal representative for certain projects funded under the Clean Water State Revolving Fund (CWSRF) program. The County of Hawaiʻi Department of Environmental Management is planning to undertake the Nāʻālehu Wastewater Collection, Treatment, Disposal, and Drainage System Modifications Project. There is no designated critical habitat within the project area.

The determination of “no effect” to other species, rests with the action agency. The U.S. Fish and Wildlife Service (Service) has no regulatory or statutory authority for concurring with “no effect” determinations, and no consultation with the Service is required. We recommend that the action agency document their analysis on effects to listed species and maintain that documentation as part of the project file.

The Service requests HDOH also consider impacts to avian species protected under the Migratory Bird Treaty Act (MBTA) of 1918, as amended (16 U.S.C. § 703–712) and implement avoidance and minimization measures. A list of birds protected under the MBTA implementing regulations is provided at 50 CFR § 10.13.

The Service also requests the HDOH continue to coordinate with us prior to construction activities that may create temporary water sources and/or, any exposed wastewater and water containment, settling, or drainage facilities, such as ponds, pools or other capture structures. Endangered Hawaiian waterbirds (ae‘o, Hawaiian stilt, *Himantopus mexicanus knudseni*; ‘alae ke‘oke‘o, Hawaiian coot, *Fulica alai*; and koloa maoli, Hawaiian duck, *Anas wyvilliana*) can be attracted to such reservoirs or open sources of water during construction, operation, and maintenance of the new facility.

The proposed action area and project activities may also attract nēnē or Hawaiian goose (*Branta sandvicensis*). Nēnē may be observed in a variety of habitats, but prefer open areas, such as pastures, golf courses, wetlands, natural grasslands and shrublands, and lava flows. Nēnē are vulnerable to vehicular strikes, human presence, and activities as they can result in injury or mortality associated with crushing nests hidden in vegetation, vehicular strikes, and human-caused disturbance, such as keeping adults from provisioning young in nests. We recommend HDOH survey the action area prior to beginning proposed Project activities and coordinate with us for future construction activities to avoid and minimize impacts to nēnē.

The action area of the Project is not limited to the footprint of the construction activities; rather, the action area includes the surrounding area impacted by the project activities. The creation of drainage channels related to Project construction of the wastewater treatment plant (WWTP) and supporting infrastructure should be included within the Project description and considered in all consultations.

The concurrence provided in this letter is confined to the species and avoidance and minimization actions incorporated into the project activities specifically described in your letter dated May 31, 2024, and does not relieve the EPA and its designee, HDOH, of the responsibility under the ESA for take of listed species for the proposed project.

Project Description

The EPA is cooperating with HDOH, to make wastewater system improvements that will replace existing collection, treatment, and disposal systems servicing the community of Nā‘ālehu in the Ka‘ū District on the island of Hawai‘i. (Figure 1). The Hawai‘i County Department of Environmental Management, Wastewater Division is proposing to construct a wastewater treatment and disposal system to treat sewage to allow the closure of three large capacity cesspools currently used to dispose of untreated sewage. Collection and delivery systems will be within the developed community of Nāʻālehu. A force main pump station (SPS) east of the developed community will connect to the WWTP, cross a drainage channel, and, otherwise, follow existing roads. The WWTP will be located on approximately 28-acres (11.3-hectares) of State lands to the southwest of the town on the south side of Māmalahoa Highway (Figure 1, light blue area). Site work proposed includes grading of a drainage diversion swale, beginning from a vegetated diversion channel, and heading east within the Project area (Figure 1). No streams or wetlands occur in the Project area; however, the WWTP site itself is located within a shallow drainage swale and runoff flow will be directed around the WWTP infrastructure in a new channel.

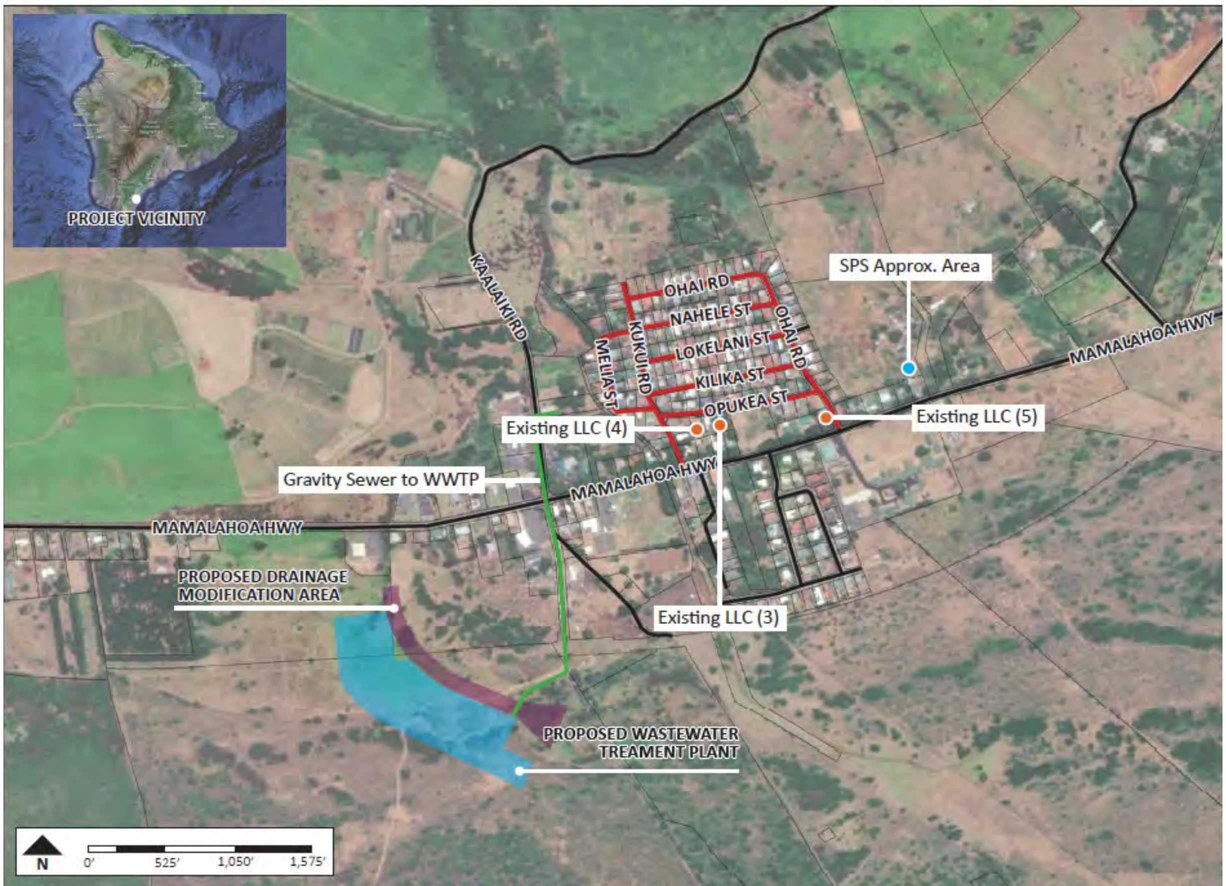


Figure 1. Nāʻālehu Wastewater Collection, Treatment, Disposal, and Drainage System Modifications Project in Nāʻālehu, Hawaiʻi. (LLC = existing large capacity cesspool; SPS = proposed sewage pumping Station; light blue = proposed wastewater treatment plant)

Conservation Measures

There are no streams or wetlands within the proposed project footprint described in the May 31, 2024 letter. The Project will incorporate the Service recommended Avoidance and Minimization Measures (Attachment A) for federally listed Hawaiian seabird species and the ʻōpeʻapeʻa. To avoid and minimize impacts to ʻōpeʻapeʻa, the Project will not use barbed wire in fencing. A provision will be included in the construction bid requiring the contractor to provide a qualified biologist to survey for ʻōpeʻapeʻa during the bat birthing and pupping season from June 1 through September 15 prior to the start of any construction activities. Woody plants taller than 15 feet (ft) will only be removed outside of the June 1 to September 15 time period.

Effects to Listed Species

Hawaiian seabirds

Hawaiian seabirds may traverse the project area at night during the breeding, nesting, and fledging seasons (March 1 to December 15). Outdoor night lighting can cause seabird disorientation, fallout, and injury or mortality when seabirds are attracted to lights and after circling the lights, they become exhausted and collide with nearby wires, buildings, fences, or other structures or they may land on the ground. Fledglings are particularly vulnerable to light attraction when they are traversing the project area between September 15 and December 15, as they are making their first flights from their mountain nests to the sea. Downed seabirds are subject to increased mortality due to collision with automobiles, starvation, and depredation by dogs, cats, and other predators.

No nighttime construction activities during the seabird fledging period, September 15 to December 15, is planned for this project. Any seabirds traversing the area at night are extremely unlikely to be exposed to construction-related activities because no work will occur at night. All outdoor lights associated with the Project structures and infrastructure will be fully shielded and only used when human activity is occurring in the lighted area. Motion detectors or timers will be deployed on all outdoor lighting. All required fencing installed at the Project that extends above vegetation will integrate three strands of polytape to increase visibility and reduce collision risk. We do not expect injury, mortality, or measurable disruptions to the normal behaviors of Hawaiian seabirds. Therefore, effects to Hawaiian seabirds are considered discountable.

ʻŌpeʻapeʻa

Woody vegetation may be used by ʻōpeʻapeʻa for roosting, potentially year around. The ʻōpeʻapeʻa roosts in woody vegetation across all islands and will leave their young unattended in trees and shrubs when they forage. If trees or shrubs 15 ft or taller are cleared during the pupping season, June 1 through September 15, there is a risk that young bats could inadvertently be harmed or killed, since they are too young to fly or move away from disturbance.

Human presence and project activities may cause temporary disruptions to the normal behaviors of ʻōpeʻapeʻa near the Project area. If bats are present during the construction, we expect the disturbance may cause them to leave the site. We expect that these disturbances will be short term and intermittent and will not result in measurable disruptions of their normal behaviors, nor will there be reductions in the reproductive success or fitness of the bats. The high mobility of adult bats enables them to relocate to suitable vegetation nearby. No nonvolant young would be injured or killed because trees and vegetation taller than 15 ft will not be removed during the pupping season when the young cannot fly.

Avoidance and minimization measures will be implemented to avoid adverse effects to ‘ōpe‘ape‘a. ‘Ōpe‘ape‘a are not expected to be injured, killed, or to experience measurable disruptions to their normal behaviors. Therefore, effects to the ‘ōpe‘ape‘a are discountable.

Summary

Based on the project description, conservation measures incorporated (Attachment A) and supporting biological rationale provided above, we expect effects to the four federally listed species to be discountable (extremely unlikely to occur). Therefore, the Service concurs with the determination that the proposed Project may affect but is not likely to adversely affect federally listed species.

This concludes section 7 consultation for the proposed Project. Reinitiation of this consultation is required by the Service, where discretionary Federal involvement or control over the proposed actions has been retained or is authorized by law and:

1) If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered;
2) If the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered herein; or
3) If a new species is listed or critical habitat designated that may be affected by the proposed actions.

The concurrence provided in this letter under our ESA section 7 authority is only applicable to the activities of the aforementioned Project. Please continue to coordinate with us as the Project enters new construction and permitting phases.

Thank you for participating with us in the protection of our endangered species. If you have any questions, please contact Diane Sether, Ph.D., at diane_sether@fws.gov or by telephone at 808-210-4919, or pifwo_admin@fws.gov. When referring to this project, please include this reference number: 2024-0078740-S7-001.

Sincerely,

Chelsie Javar-Salas
Acting Island Team Manager for Maui Nui and Hawai‘i
Pacific Islands Fish and Wildlife Office

Attachment: A: Service Avoidance and Minimization Measures (Animals)

Attachment A: Animals – U.S. Fish and Wildlife Service Avoidance and Minimization Measures

FINAL Avoidance and Minimization Measures (AMMs)
Final revised May 2023

ESA Listed Species

Endangered ʻōpeʻapeʻa (Hawaiian hoary bat, *Lasiurus cinereus semotus*): The Hawaiian hoary bat roosts in woody vegetation across all islands and will leave their young unattended in trees and shrubs when they forage. If trees or shrubs 15 feet or taller are cleared during the pupping season, June 1 through September 15, there is a risk that young bats could inadvertently be harmed or killed, since they are too young to fly or move away from disturbance. Hawaiian hoary bats forage for insects from as low as 3 feet to higher than 500 feet above the ground and can become entangled in barbed wire used for fencing.

To avoid and minimize impacts to the endangered Hawaiian hoary bat we recommend you incorporate the following applicable measures into your project description:

- Do not disturb, remove, or trim woody plants greater than 15 feet tall during the bat birthing and pup rearing season (June 1 through September 15).
- Do not use barbed wire for fencing.

Endangered ʻuaʻu (Hawaiian petrel, *Pterodroma sandwichensis*), Threatened ʻaʻo, (Newell's shearwater, *Puffinus newelli*), and Endangered Hawaiʻi Distinct Population Segment of the ʻakēʻakē (band-rumped storm-petrel, *Hydrobates castro*):
Hawaiian seabirds may traverse the project area at night during the breeding, nesting and fledging seasons (March 1 to December 15). Outdoor lighting could result in seabird disorientation, fallout, and injury or mortality. Seabirds are attracted to lights and after circling the lights they may become exhausted and collide with nearby wires, buildings, or other structures or they may land on the ground. Downed seabirds are subject to increased mortality due to collision with automobiles, starvation, and predation by dogs, cats, and other predators. Young birds (fledglings) traversing the project area between September 15 and December 15, in their first flights from their mountain nests to the sea, are particularly vulnerable to light attraction.

To avoid and minimize potential project impacts to seabirds we recommend you incorporate the following measures into your project description:

- Fully shield all outdoor lights so the bulb can only be seen from below.
- Install automatic motion sensor switches and controls on all outdoor lights or turn off lights when human activity is not occurring in the lighted area.
- Avoid nighttime construction during the seabird fledging period, September 15 through December 15.

Seabirds have been known to collide with fences, powerlines, and other structures near nesting colonies. To avoid and minimize the likelihood of collision we recommend you incorporate the following measures into your project description:

- Where fences extend above vegetation, integrate three strands of polytape into the fence to increase visibility.
- For powerlines, guy-wires and other cables, minimize exposure above vegetation height and vertical profile.

We recommend further coordination with our office to address specific project details and potential seabird interactions.

APPENDIX E:

Draft Archaeological Inventory Survey

Cultural Surveys Hawaii

Draft

Archaeological Inventory Survey Report for the Nāʻālehu Large Capacity Cesspool Closure Project, Kāhilipalinui and Kāwala Ahupuaʻa, Kaʻū District, Hawaiʻi Island, TMKs: (3) 9-5-007:016; 9-5-008:033, 045, 048; 9-5-010:001, 030; 9-5-021:015, 020, 999; 9-5-022:001; 9-5-024:001, 009, 010, 011, 069, 076, 077, 999; 9-5-025:002, 039, 999; 9-5-026:999

Prepared for
County of Hawaiʻi Department of Environmental Management, Wastewater Division

Prepared by
Olivier M. Bautista, B.A.,
Samantha Purdy, B.A.,
Sarah Wilkinson, B.A.,
and
Hallett H. Hammatt, Ph.D.

Cultural Surveys Hawaiʻi, Inc.
Kailua, Hawaiʻi
(Job Code: KAHILIPALINUI 6)

July 2024

Oʻahu Office
P.O. Box 1114
Kailua, Hawaiʻi 96734
Ph.: (808) 262-9972
Fax: (808) 262-4950

www.culturalsurveys.com

Hawaiʻi Office
Hualani St. #124
Hilo, Hawaiʻi 96720
Ph.: (808) 965-6478
Fax: (808) 965-6582

Management Summary

Reference	Archaeological Inventory Survey Report for the Nāʻālehu Large Capacity Cesspool Closure Project, Kāhilipalinui and Kāwala Ahupuaʻa, Kaʻū District, Hawaiʻi Island, TMKs: (3) 9-5-007:016; 9-5-008:033, 045, 048; 9-5-010:001, 030; 9-5-021:015, 020, 999; 9-5-022:001; 9-5-024:001, 009, 010, 011, 069, 076, 077, 999; 9-5-025:002, 039, 999; 9-5-026:999 (Bautista et al. 2024)
Date	July 2024
Project Number(s)	Cultural Surveys Hawaiʻi, Inc. (CSH) Job Code: KAHILIPALINUI 3 HICRIS Project Number: 2019PR30811 CWSRF Project Numbers: C150090-06 (Nāʻālehu Sewage Pump Station and Force Main); C150090-07 (Nāʻālehu Wastewater Treatment and Disposal System and Drainage Modifications)
Investigation Permit Number	CSH completed the archaeological inventory survey (AIS) fieldwork under archaeological fieldwork permit numbers 20-07 and 21-10 for calendar years 2020 and 2021, respectively, issued by the Hawaiʻi State Historic Preservation Division (SHPD) per Hawaiʻi Administrative Rules (HAR) §13-13-282
Agencies	Hawaiʻi State Department of Health (DOH); SHPD; County of Hawaiʻi Department of Environmental Management (COH-DEM)
Land Jurisdiction	State of Hawaiʻi/County of Hawaiʻi/Private
Project Proponent	COH-DEM Ramzi Mansour, Director 345 Kekuanaoa Street, Suite 41 Hilo, HI 96720 Attention: Mark Grant Email: cohdem@hawaiicounty.gov
Project Funding	State of Hawaiʻi (revolving fund); County of Hawaiʻi
Project Location	This project is in the town of Nāʻālehu in the Kaʻū District of Hawaiʻi Island. The project area straddles the Māmalahoa Highway (State Route 11, also called Hawaiʻi Belt Road) in the traditional land divisions or *ahupuaʻa* of Kāhilipalinui to the west and Kāwala to the east.
Project Description	In June 2017 the United States Environmental Protection Agency (EPA) and the COH-DEM voluntarily entered an Administrative Order on Consent (AOC) to close three County owned large capacity cesspools (LCCs) in the town of Nāʻālehu. The original proposed project to close the LCCs included construction of a new wastewater collection and transmission system to convey wastewater to a new wastewater treatment facility for processing and disposal to a land application system planted with native trees, to be established on the project site for that purpose. The construction of the wastewater treatment plant also

	included a 1,500-foot (ft) extension of an existing drainage channel. Under this proposed action the environmental and historic preservation review under Hawaiʻi Revised Statues (HRS) §343 and §6E-8, respectively, was initiated. Effective as of 22 August 2022, the EPA and COH-DEM voluntarily entered a Revised AOC, which identified four project alternatives for evaluation: • Alternative #1: Package Wastewater Treatment Plant and new collection system • Alternative #2: Package Wastewater Treatment Plant Plants connected to the existing collection system • Alternative #3: Individual Wastewater System (IWS) – Maintenance program model • Alternative #4: Individual Wastewater System IWS – Operating program model. COH-DEM Wastewater Division (WWD) has evaluated the four treatment alternative options, considering the technical, environmental impact, public input, legal challenges, cost, and assorted factors for a selection of a treatment option. As a result, COH-DEM and WWD have selected option No. 1 as the preferred alternative option. Under Alternative 1, the County would construct a new sewer collection system in the Nāʻālehu community to replace the existing system of gravity lines that convey sewage to the three LCCs and connect it to the proposed wastewater treatment and disposal facility. The WWTP would serve the former Brewer lots as well as newly accessible parcels for future connection to the WWTP. The potential connection of additional parcels may be further assessed by the County in the future. During construction, the County shall ensure that residential units can maintain access to the sewer system at all times. Alternative 1 involves utilizing the existing collection system within the Brewer Company house lots and constructing new gravity sewers, wastewater pump station (WWPS), and force main to transport sewage from the LCCs to the new WWTP. Alternative 1 also involves the installation of gravity sewers to replace the existing collection. Under this alternative, the County would perform the following actions: 1. Construct a new gravity sewer on Kaʻalaʻiki Road and Nāʻālehu Spur Road to the WWTP located on a portion of Tax Map Key (TMK) (3) 9-5-007:016. 2. Implement drainage improvements within the vicinity of the WWTP within TMKs (3) 9-5-007:016 and (3) 9-5-021:015. 3. Construct a new pump station located on a portion of TMK: (3) 9-5-008:048, and construct a new force main, which crosses an

<table>
<tr><td></td><td>existing storm drainage channel at Melia Street, to connect to the Ka‘ala‘iki Road gravity sewer.
4. Construct a new gravity sewer on Opukea Street and Ohai Road to intercept existing flow entering the LCCs and divert sewage to the WWPS and transport flows to the gravity sewer along Ka‘ala‘iki Road.
5. Install gravity sewers within the streets to replace the existing collection system.
6. Close and abandon the three LCCs.
7. Accommodate future expansion of subsurface effluent disposal located within a portion of TMK: (3) 9-5-022:001.

A geotechnical survey will be conducted during the design phase to inform a soil investigation report for understanding the subsurface conditions. Grass cutting and mulching equipment will be utilized to cut down the tall grass so that a topographic survey can be conducted of the terrain at parcels TMKs: (3) 9-5-007:016, (3) 9-5-021:015, and (3) 9-5-022:001 prior to the geotechnical boring. The grass cutting and geotechnical survey work will be monitored by CSH and the results appended to this AIS report upon completion.</td></tr>
<tr><td>Area of Potential Effect (APE) and AIS Project Area</td><td>The APE for the Nā‘ālehu Large Capacity Cesspool Closure Project is approximately 80.4 acres (32.5 hectares). The APE includes:
• The proposed treatment plant and disposal facility, which will be located makai (seaward) of the Māmalahoa Highway at TMKs: (3) 9-5-007:016 and (3) 9-5-022:001. An associated drainage channel may be located on a portion of TMK: (3) 9-5-021:015;
• The location(s) of proposed pump station at TMK: (3) 9-5-008:048;
• The proposed collection system primarily in the County streets of Nā‘ālehu;
• The locations of three LCCs which will be decommissioned; and
• Community parcels currently connected to the existing County system.

The AIS project area comprises a 49.62-acre (20.08-hectare) portion of the overall APE. The project area comprises numerous tax parcels (in whole or part) and public roadway rights-of-way; a full list of project TMKs and applicable information is provided in Appendix A. The AIS project area includes all the components of the APE listed above except for the currently connected community parcels. All project staging will be confined within the AIS project area limits at the proposed treatment plant and sewer pump station site.</td></tr>
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The Nā‘ālehu Large Capacity Cesspool Closure Project (comprising the Nā‘ālehu Sewage Pump Station and Force Main Project and Nā‘ālehu Wastewater Treatment and Disposal System and Drainage Modifications Project) involves CWSRF funding and is therefore an undertaking subject to the NHPA and its implementing regulations. The EPA is the lead federal agency for this undertaking. The EPA administers the CWSRF Program, which authorizes capitalization grants to state agencies in Region 9, including the Hawai‘i State DOH. In turn, the DOH provides assistance to public and private community water systems as well as nonprofit noncommunity water systems for CWSRF projects. In October 2015 the EPA authorized the DOH to undertake consultation with the State Historic Preservation Officer (SHPO) and Native Hawaiian organizations (NHOs) for projects funded under the CWSRF (Appendix B).

In consultation with the SHPD, this AIS investigation fulfills the requirements of HAR §13-13-276 and the Secretary of the Interior's Standards for Archaeology and Historic Preservation. It was conducted to assess any historic properties for integrity and site significance in accordance with HAR §13-275-6. This report is also intended to support any project-related historic preservation consultation with consulting parties, such as state and county agencies and interested Native Hawaiian Organizations (NHOs) and community groups, if applicable.

In 2020 CSH prepared an archaeological literature review for the project's Environmental Assessment (Purdy et al. 2020). This investigation was designed—through detailed historical, cultural, and archaeological background research—to determine the likelihood that historic properties may be affected by the project and, based on findings, consider cultural resource management recommendations. It was also intended to support the COH-DEM's consultation with the SHPD regarding the project's necessary historic preservation review steps pursuant to HAR §13-275.

On 22 October 2020 the County submitted a packet of materials (including a cover letter dated 16 October 2020) to SHPD initiating consultation under HRS §6E-8/HAR §13-275-5(b) and requesting concurrence with the need for an AIS for the project. SHPD replied in</td></tr>
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	correspondence dated 1 December 2020 (Log No.: 2020.02555; Doc. No.: 2012NM01; Appendix C) concurring with the DEM's recommendation that an AIS be conducted. The SHPD letter also stated that proposed AIS testing strategy attached to the County's 22 October 2020 submittal "appears sufficient in identifying historic properties within the current project area and determining the potential impacts to those sites should the AIS identify any." The DOH initiated Section 106 consultation with the State Historic Preservation Office and other parties in June 2024.
Fieldwork Effort	Fieldwork was conducted intermittently between 26 October 2020 and 29 January 2021 by CSH Archaeologist Samantha Purdy, B.A., and Project Director Olivier M. Bautista, B.A., under the general supervision of Principal Investigator Hallett H. Hammatt, Ph.D. This work required approximately 19 person-days to complete.
Consultation	NHPA Section 106 consultation with community members, agencies, and NHOs is being undertaken by the project proponents.
Historic Properties Identified	This AIS identified four previously documented and seven newly documented historic properties in the project area. The four previously documented sites include the following: • SIHP # 50-10-74-29507 is a historic ranching complex. Pursuant to HAR §13-275-6 it is assessed as significant under Criterion d for the information it has yielded about historic ranching activity in the project area. It is evaluated as not eligible for listing on the National Register of Historic Places ("National Register"). • SIHP # 50-10-47-30187 comprises the former and present alignments of the Māmalahoa Highway, also known as the Belt Road (variably State Routes 11, 19, 180, and 190). Pursuant to HAR §13-275-6 it is assessed as significant under Criterion a for its association with events that have made an important contribution to the development of transportation routes on Hawaii Island, and under Criterion d for having yielded information about historic transportation in the project area. Pursuant to 36 CFR 60.4 is evaluated as eligible for listing on the National Register under Criterion A (for its association with events that have made a significant contribution to the broad patterns of our history) and Criterion D (for having yielded, or being likely to yield, information important in history). • SIHP # 50-0-74-30929 is a pre-Contact activity area and historic ranching complex. It is assessed as significant under Criterion d for the information it has yielded about traditional and historic

	land use in the project area. It is evaluated as not eligible for listing on the National Register. • SIHP # 50-10-74-30930 is a historic ranch wall. It is assessed as significant under Criterion d for the information it has yielded about historic ranching activity in the project area. It is evaluated as not eligible for listing on the National Register. The seven newly documented historic properties in the project area include the following: • SIHP# 50-10-74-31268 is a historic earthen drainage ditch used to channel storm water. It is assessed as significant under Criterion d for the information it has provided about historic water control activity in the project area. It is evaluated as not eligible for listing on the National Register. • SIHP # 50-10-74-31269 is a historic ranching complex. It is assessed as significant under Criterion d for the information it has yielded about historic ranching activity in the project area. It is evaluated as not eligible for listing on the National Register. • SIHP # 50-10-74-31270 is a historic jeep road. It is assessed as significant under Criterion d for the information it has yielded about historic transportation in the project area. It is evaluated as not eligible for listing on the National Register. • SIHP # 50-10-74-31271 is the historic Nāʻālehu Spur Road. It is assessed as significant under Criterion d for the information it has yielded about historic transportation in the project area. It is evaluated as not eligible for listing on the National Register. • SIHP # 50-10-74-31272 is the historic Kaʻalaiki Road. It is assessed as significant under Criterion d for the information it has yielded about historic transportation in the project area. It is evaluated as not eligible for listing on the National Register. • SIHP # 50-10-74-31273 is a historic complex comprising a concrete drainage channel and associated footbridge. It is assessed as significant under Criterion d for the information it has yielded about historic water control activity in the project area. It is evaluated as not eligible for listing on the National Register. • SIHP # 50-10-74-31274 is a historic boundary wall. It is assessed as significant under Criterion d for the information it has yielded about historic land use in the project area. It is evaluated as not eligible for listing on the National Register.

Effect Recommendation	In accordance with federal regulations (36 CFR 800.5), the AIS results support the determination made by the Hawaiʻi State DOH on behalf of the EPA of "no adverse effect." In accordance with HAR §13-275-7, the Hawaiʻi State DOH and COH-DEM have determined the project effect is "effect, with proposed mitigation commitments." The project proponents request SHPD concurrence with these determinations. One historic property on the project area has been evaluated as eligible for inclusion on the National Register: SIHP # 50-10-47-30187 (Māmalahoa Highway). The 15-m (50-ft) portion of this historic property within the project area retains integrity of location only, as all the constructed elements of the original Māmalahoa Highway are no longer evident today. While the project will affect the modern roadway elements, these elements will be replaced following construction, and the integrity and significance of the highway will not be diminished. Therefore, the project will have no adverse effect on SIHP # -30187. This site is assessed as significant under Criterion a of the State of Hawaiʻi significance criteria for its association with events that have made an important contribution to the development of transportation routes on Hawaii Island, and under Criterion d for having yielded information about historic transportation in the project area. Documentation of SIHP # -30187 in this AIS has included historical research, GPS data collection, photographs, and written description. This AIS has adequately documented the location, extent, function, age, and construction methods of the portion of SIHP # -30187 in the project area, mitigating project-related impacts pursuant to HAR §13-275-8. The remaining ten historic properties in the project area (SIHP #s 50-10-74-29507, -30929, -30930, -31268, -31269, -31270, -31271, -31272, -31273, and -31274) may also be impacted by project development. These historic properties have been evaluated as not eligible for inclusion on the National Register. These sites are assessed as significant under Criterion d of the State of Hawaiʻi significance criteria because they have yielded information important for research on history. Documentation of these historic properties in this AIS has included historical research, GPS data collection, photographs, plan view maps, and written descriptions. This AIS has adequately documented the location, extent, function, age, and construction methods of these ten historic properties, mitigating project-related impacts pursuant to HAR §13-284-8.
Mitigation Recommendations	The single historic property evaluated as eligible for listing on the National Register (SIHP # 50-10-47-30187, Māmalahoa Highway), will not be adversely impacted by the project as its integrity and significance will not be diminished. This AIS has adequately documented the location, extent, function, age, and construction methods of the 11 historic properties within the project area, mitigating any project-related

	impacts pursuant to HAR §13-284-8. No further work is recommended for these 11 historic properties. Archaeological monitoring is recommended during all project ground-disturbing activities to facilitate historic property identification for information purposes, especially of any subsurface lava tubes that may contain historic properties. Archaeological monitoring will proceed under an archaeological monitoring plan that meets the requirements of HAR §13-279-4, which will be submitted to the SHPD for review and acceptance prior to project initiation.

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Section 1 Introduction

1.1 Project Background

At the request of County of Hawaiʻi Department of Environmental Management (DEM), Cultural Surveys Hawaiʻi, Inc. (CSH) has prepared this archaeological inventory survey (AIS) for the Nāʻālehu Large Capacity Cesspool Closure Project, Kāhilipalinui and Kāwala Ahupuaʻa, Kaʻū District, Hawaiʻi Island. The project area, which comprises numerous tax parcels and public roadways in the town of Nāʻālehu, is depicted on a portion of the 1995 U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle (Figure 1), tax map plats (Figure 2 through Figure 7), and a 2017-2018 aerial photograph (Figure 8). The project area comprises numerous tax parcels (in whole or part) and public roadway rights-of-way; a full list of project TMKs and applicable information is provided in Appendix A.

In June 2017 the United States Environmental Protection Agency (EPA) and the COH-DEM voluntarily entered an Administrative Order on Consent (AOC) to close three County owned large capacity cesspools (LCCs) in the town of Nāʻālehu. The original proposed project to close the LCCs included construction of a new wastewater collection and transmission system to convey wastewater to a new wastewater treatment facility for processing and disposal to a land application system planted with native trees, to be established on the project site for that purpose. The construction of the wastewater treatment plant also included a 1,500-foot (ft) extension of an existing drainage channel. Under this proposed action the environmental and historic preservation review under Hawaiʻi Revised Statues (HRS) §343 and §6E-8, respectively, was initiated.

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- Alternative #4: Individual Wastewater System IWS – Operating program model.

COH-DEM Wastewater Division (WWD) has evaluated the four treatment alternative options, considering the technical, environmental impact, public input, legal challenges, cost, and assorted factors for a selection of a treatment option. As a result, COH-DEM and WWD have selected option No. 1 as the preferred alternative option.

Under Alternative 1, the County would construct a new sewer collection system in the Nāʻālehu community to replace the existing system of gravity lines that convey sewage to the three LCCs and connect it to the proposed wastewater treatment and disposal facility. The WWTP would serve the former Brewer lots as well as newly accessible parcels for future connection to the WWTP. The potential connection of additional parcels may be further assessed by the County in the future.

During construction, the County shall ensure that residential units can maintain access to the sewer system at all times. Alternative 1 involves utilizing the existing collection system within the Brewer Company house lots and constructing new gravity sewers, wastewater pump station

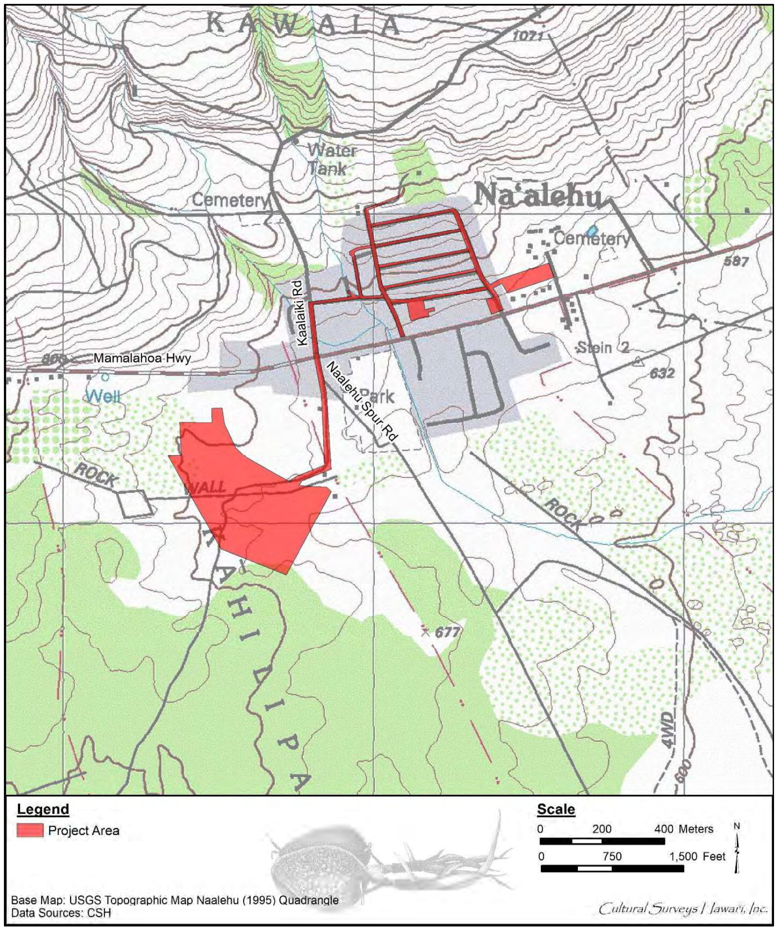

Figure 1. Portion of the 1995 Naalehu USGS 7.5-minute topographic quadrangle showing the location of the project area

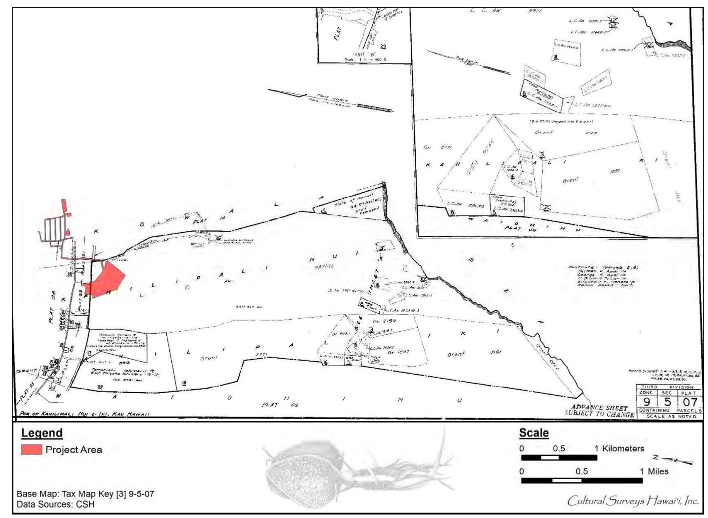

Figure 2. Tax Map Key (TMK) (3) 9-5-07 showing the project area; the proposed treatment facility would be located within a portion of parcel 016 (Hawai‘i TMK 2014)

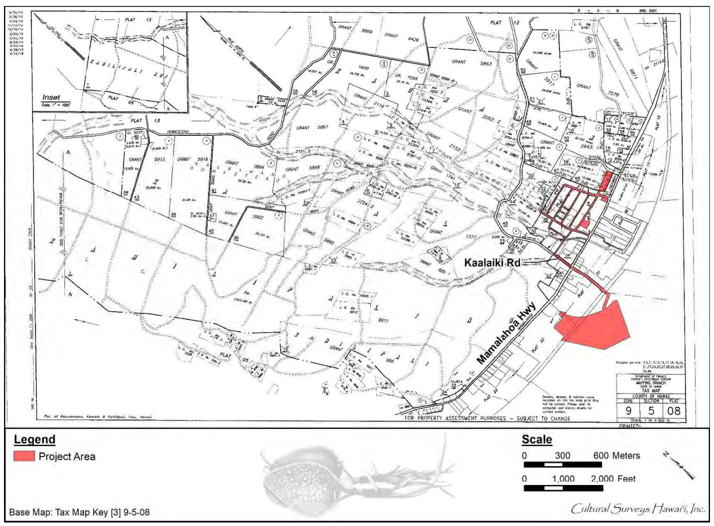

Figure 3. TMK: (3) 9-5-008 showing portions of the project area within parcels 033, 045, and 048 (proposed pump station site) (Hawai‘i TMK Service 2014)

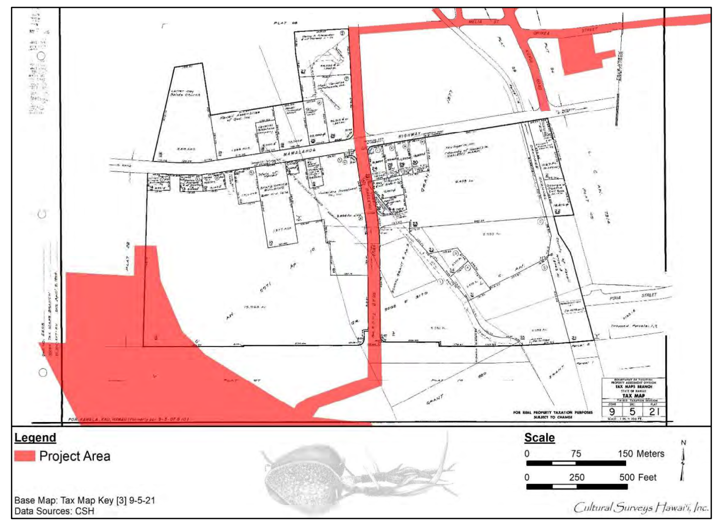

Figure 4. TMK: (3) 9-5-021 showing the project area crossing the State-owned Māmalahoa Highway (Hawai‘i TMK Service 2014)

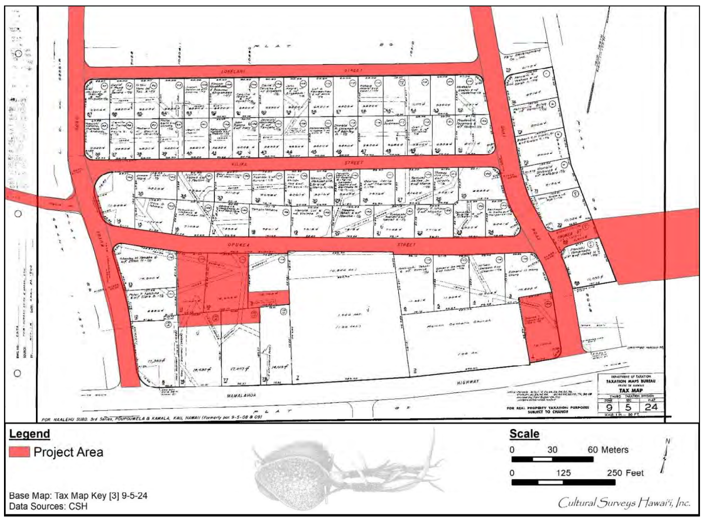

Figure 5. TMK: (3) 9-5-024 showing portions of the project area within parcels 001, 009, 010, 011, 069, 076, 077, and various county roadways (Lokelani Street, Kilika Street, Opukea Street, ʻŌhai Road, Kukui Road) (Hawaiʻi TMK Service 2014)

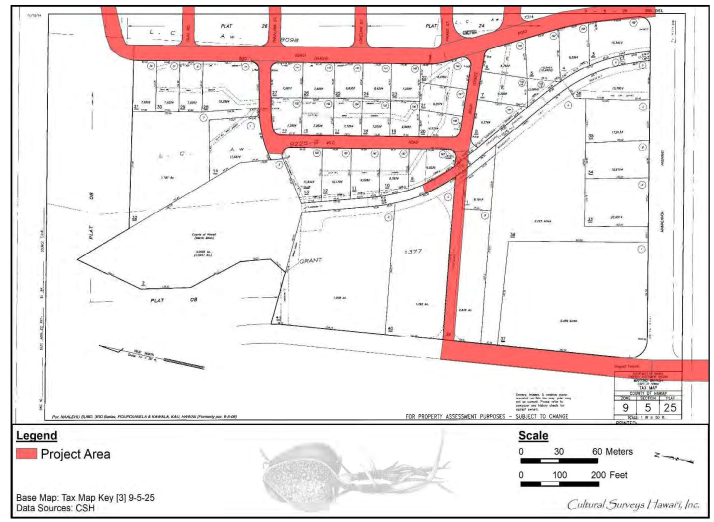

Figure 6. TMK: (3) 9-5-025 showing portions of the project area within parcels 002, 039, and county roadways (Milo Road, Melia Street) (Hawaiʻi TMK Service 2014)

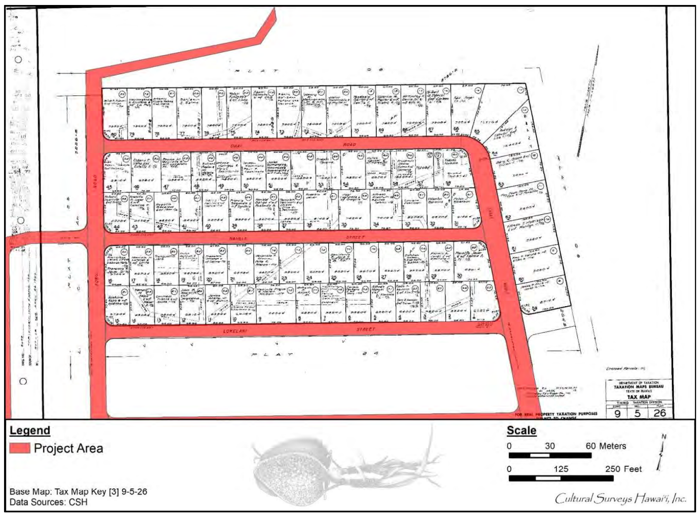

Figure 7. TMK: (3) 9-5-026 showing portion of the project area within various County roadways (Ohai Road, Nahele Road, Lokelani Road, Kukui Road) (Hawai‘i TMK Service 2014)

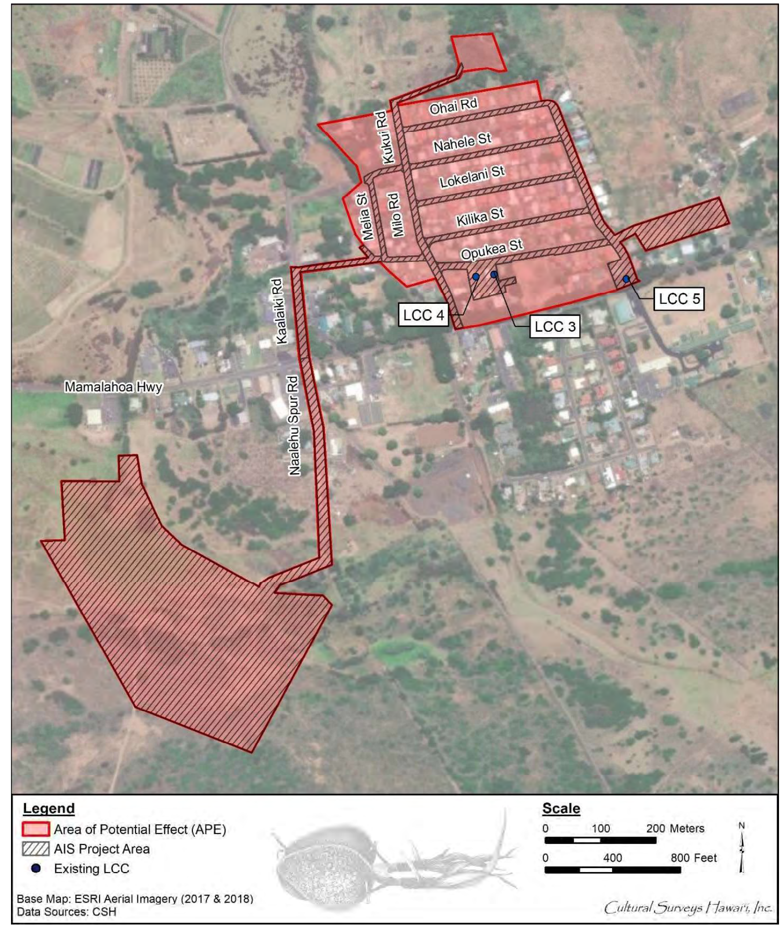

Figure 8. Aerial photograph of the project area (ESRI 2017-2018) showing the AIS project area within the larger APE

(WWPS), and force main to transport sewage from the LCCs to the new WWTP. Alternative 1 also involves the installation of gravity sewers to replace the existing collection.

Under this alternative, the County would perform the following actions:

1. Construct a new gravity sewer on Kaʻalaʻiki Road and Nāʻālehu Spur Road to the WWTP located on a portion of Tax Map Key (TMK) (3) 9-5-007:016.
2. Implement drainage improvements within the vicinity of the WWTP within TMKs (3) 9-5-007:016 and (3) 9-5-021:015.
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The federal Area of Potential Effect (APE) for the Nāʻālehu Large Capacity Cesspool Closure Project is approximately 80.4 acres (32.5 hectares). The APE is shown in Figure 8 and includes:

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The DOH initiated Section 106 consultation with the State Historic Preservation Office and other parties in June 2024.

1.3 Environmental Setting

1.3.1 Natural Environment

This project area is situated on the southeastern slope of Mauna Loa, within the traditional land divisions of Kāhilipalinui and Kāwala. The project area ranges in elevation from approximately 195–247 m (640–810 ft) above mean sea level (AMSL). The town of Nā'ālehu receives an annual average rainfall of 1,062 mm (42 inches) (Giambelluca et al. 2013). The terrain in this area is characterized by 15–20% slopes to the southeast. The project area lands have been used extensively for residential and commercial development, ranching, and agriculture which have significantly altered the natural environment.

According to the U.S. Department of Agriculture (USDA) Soil Survey Geographic (SSURGO) database (2001) and soil survey data gathered by Sato et al. (1973), the project area overlies soils from the Naalehu, Punaluu and Kaimu Series (Figure 9). The northern portion of the project area is situated on soils from the Naalehu series including Naalehu silty clay loam, 0%–10% slopes (NaC); Naalehu silty clay loam, 10%–20% slopes (NaD); Naalehu silty clay loam, 20%–35% slopes (NaE); and Naalehu very rocky silty clay loam, 6%–20% slopes (see Figure 9). Naalehu series soils are described as well-drained silty clay loams that formed in volcanic ash; these soils are used mostly for sugarcane or pasture (Sato et al. 1973:40).

The southwestern portion of the project area consists primarily of Punaluu extremely rocky peat, 6%–20% slopes (rPYD), with smaller small portions overlapping areas of Kaimu extremely rocky peat 7%–25% (rKED) and the miscellaneous land types pahoehoe (rLW), and Rock land (rRO) (see Figure 9). Punaluu and Kaimu series soils are described as well-drained, thin organic soils over lava bedrock (Sato et al. 1973:22, 48). Punaluu soils are used for pasture, and Kaimu soils are used for pasture, macadamia nuts, papaya, and citrus fruits (Sato et al. 1973:22, 48). *Pāhoehoe* lava flow is described as having "billowy, glass surface that is relatively smooth […] Pahoehoe lava has no soil covering and is typically bare of vegetation except for mosses and lichens" (Sato et al. 1973:34). Rock land is a miscellaneous land type that consists of *pāhoehoe* lava bedrock covered by a thin layer of soil material. "The vegetation is confined mainly to the soil cover areas and cracks in the lava […] Rock land is used for pasture, wildlife habitat, and watershed" (Sato et al. 1973:51).

Vegetation within the undeveloped portions of the project area consist primarily of guinea grass (*Megathyrsus maximus*), invasive vines, and lantana (*Lantana camara*) associated with use of these areas for pasture. A depression caused by a collapsed lava tube system bisects the proposed treatment facility portion of the project area in TMK: (3) 9-5-007:016. This depression trends east–west and contains several tree species including native *kukui* or candlenut (*Aleurites moluccanus*).

1.3.2 Built Environment

The collection system portion of the project area located *mauka* (upslope) of the Māmalahoa Highway comprises various active county residential roadways including 'Ōhai Road, Kukui Road, Milo Road, Melia Street, Opukea Street, Nahele Street, Lokelani Street, and Kilika Street (see Figure 7). It also includes two forcemain alignments across a concrete drainage channel west of the residential area, and associated infrastructure connecting to and along Ka'alaiki Road. The concrete drainage channel is fenced along its length and accessed from a gravel road off Ka'alaiki Road or from the western terminus of Melia Street. The three existing LCCs are located at TMKs:

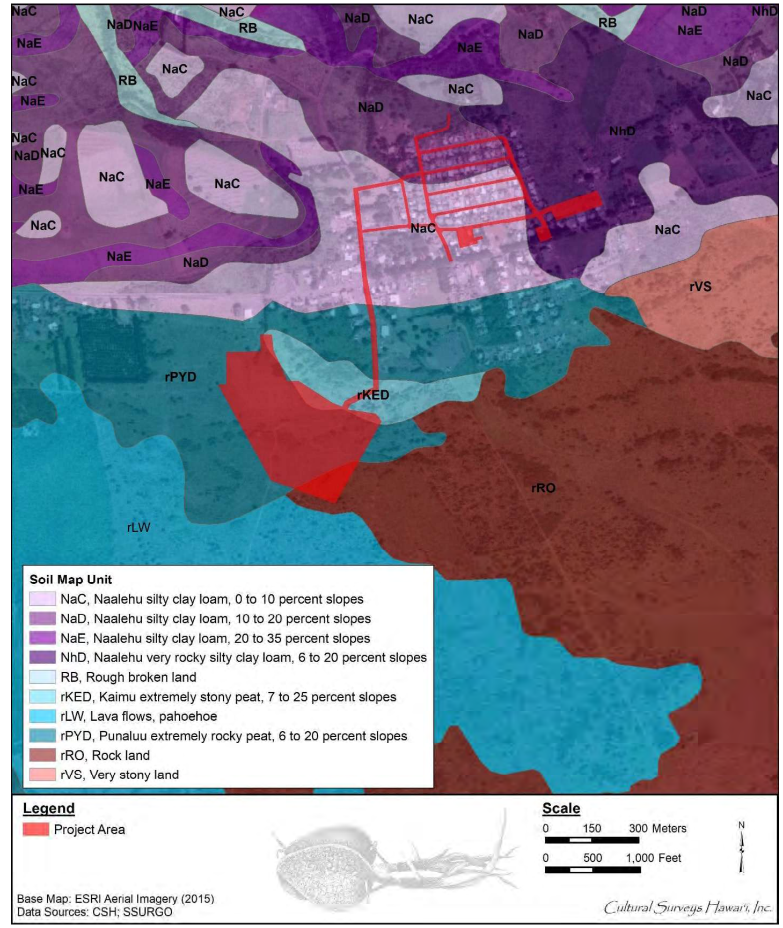

Figure 9. Overlay of *Soil Survey of the Island of Hawaii* (Sato et al. 1973) indicating soil types within and surrounding the project area (USDA SSURGO 2014)

(3) 9-5-024:011 (LCC 1), 9-5-024:010 (LCC 2), and 9-5-024:001 (LCC 3). These three parcels have been previously disturbed and the latter two parcels contain private residences. The proposed collection system may also include development of a sewer pump station (SPS) within a portion of TMK: (3) 9-5-008:048, which is bound to the south by residences and the Igelsia Ni Cristo Church and has been used for pasture.

The project area crosses the Māmalahoa Highway at the Ka'alaiki Road intersection and extends *makai* along Nā'ālehu Spur Road where it passes several commercial establishments including but not limited to the Nā'ālehu Shopping Center. The portion of Nā'ālehu Spur Road within the project area is paved. A dirt road extending south from Nā'ālehu Spur Road accesses Onipa'a Ranch and pasture lands in which the proposed wastewater treatment facility will be located at TMK: (3) 9-5-007:016 (see Figure 2). These pasture lands contain fenced paddocks and other remnants of ranching activity.

Section 2 Methods

2.1 Field Methods

CSH completed the fieldwork component of this AIS under archaeological permit numbers 20-07 and 21-10, issued by the SHPD pursuant to HAR §13-13-282. Fieldwork was conducted intermittently between 26 October 2020 and 29 January 2021 by CSH Archaeologist Samantha Purdy, B.A., and Project Director Olivier M. Bautista, B.A., under the general supervision of Principal Investigator Hallett H. Hammatt, Ph.D. This work required approximately 19 person-days to complete.

In general, fieldwork included 100% pedestrian inspection of the project area, GPS data collection, site documentation, and a program of subsurface testing.

2.1.1 Pedestrian Survey

A 100%-coverage pedestrian inspection of the project area was undertaken for the purpose of historic property identification and documentation. The pedestrian survey was accomplished through systematic sweeps spaced 5-10 m apart depending on the density of the vegetation and ground visibility.

Where a new historic property was encountered, the determination of its boundary was based on factors including apparent age, architectural style, and the spatial and functional interrelationships of both natural and man-made features.

At each historic property archaeologists recorded site locations using a Trimble Geo 7X unit (sub-meter accuracy), took digital photographs, and prepared a written description and plan view maps of each site, or updated existing site descriptions and maps as applicable. Generally, plan view maps were not drawn for roads (SIHP #s -30187, -31271, -31272, -31273 or walls (-31275, -31276); instead, GPS points were taken at key locations along these sites and their routes were mapped in GIS for inclusion on an aerial image. A plan view map was also not prepared for the SIHP # -31274 drainage channel, as a copy of the original design plans was obtained for inclusion in this report.

2.1.2 Subsurface Testing

A program of subsurface testing was undertaken for the AIS in accordance with a testing strategy submitted to SHPD in October 2020 alongside materials initiating the project's historic preservation review (see Section 1.2). This testing program comprised both mechanical and manual excavation undertaken for two distinct purposes. Exploratory mechanical (i.e., "backhoe") testing was conducted to assess the potential for subsurface archaeological features throughout the undeveloped portions of the project area, including but not limited to buried cultural deposits and/or culturally modified lava tubes. Hand excavation was completed at select historic property features in an attempt to yield data to support assessments of site age and function.

2.1.2.1 Mechanical Excavation Methods

Mechanical excavation was conducted as proposed using a "mini" excavator to complete 14 exploratory test trenches (TTs). A total of 11 trenches were excavated within the major components of the treatment facility site (disposal groves, treatment lagoons, finishing wetland, stream channel diversion; Figure 10) and three trenches were excavated within the sewer pump station site (at the below grade pump station and force main corridor; Figure 11).

The center point of each test trench was recorded using Trimble sub-meter accurate GPS prior to excavation. In general, trenches measured approximately 5 m (16.5 ft) long and 1.0 m (3.3 ft) in width. All trenches were excavated to bedrock or the physical limitations of the backhoe, whichever was reached first.

The archaeologist carefully watched all machine excavations and inspected the soil sediments as they were removed from the trench and placed into an adjacent backfill pile. Mechanical excavations occurred one stratum or level at a time. If subsurface features or cultural layers were encountered, the machine was to cease excavation and excavation would proceed manually, expanding outward from the trench as necessary to expose the limits of the feature or cultural layer. However, no subsurface features or cultural layers were encountered.

A stratigraphic profile of each test excavation was drawn and photographed. The observed sediments were described using standard USDA soil description observations/terminology. Soil sediment descriptions included Munsell color; texture; consistence; structure; plasticity; cementation; origin of sediments; descriptions of any inclusions, such as cultural material and/or roots; lower boundary distinctiveness and topography; and other general observations. Stratigraphic anomalies or potential cultural deposits were to be carefully represented on test excavation profile maps if encountered. If subsurface features or cultural deposits were encountered, plan view maps were to be completed at the top and/or base of each cultural layer, and at the top and base of each feature, and maps of the completed test units would include plotted locations of all points in each unit where GPS readings were taken. No such features were encountered.

Had any been encountered, all identified cultural materials and/or charcoal or soil samples would have been appropriately documented and described, and all collected materials catalogued, labeled, and delivered to the CSH laboratory for analysis.

Following documentation, the excavated materials were returned to their original provenience and the ground surface was restored as best as possible to its original condition.

2.1.2.2 Manual Excavation Methods

Manual or hand excavation was undertaken as applicable based on the findings of the pedestrian survey. Two 1.0-m-sq test units (TUs) were hand excavated at architectural features of -31270. The center point of each test unit was recorded using Trimble sub-meter accurate GPS prior to excavation. Both units were excavated to bedrock. Had subsurface features or cultural layers been encountered, the unit was to be expanded outward as necessary to expose the limits of the feature or cultural layer; however, this was not necessary as no distinct subsurface features or cultural layers were encountered.

Soil-sedimentary deposits were removed by shovel, trowel, and whisk and dustpan. Excavations proceeded one stratum at a time, with internal levels added as needed (no internal level crossed a stratum boundary). All excavated soil-sediment was passed through a 1/8-inch mesh screen. All excavated architectural rock material and screened sediment was deposited in a backdirt pile adjacent to the unit for replacement/backfilling following completion of excavation and documentation. All identified cultural materials and/or charcoal or soil samples were

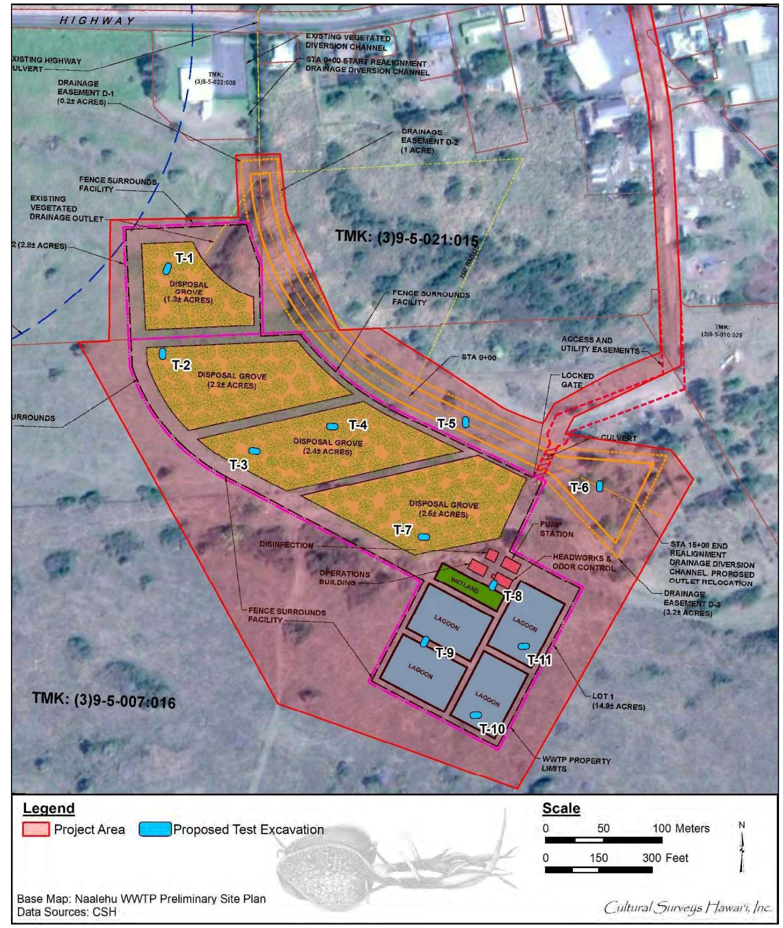

Figure 10. Client provided map showing approximate proposed locations for 11 test excavation trenches at the proposed wastewater treatment facility site at TMK: (3) 9-5-007:016

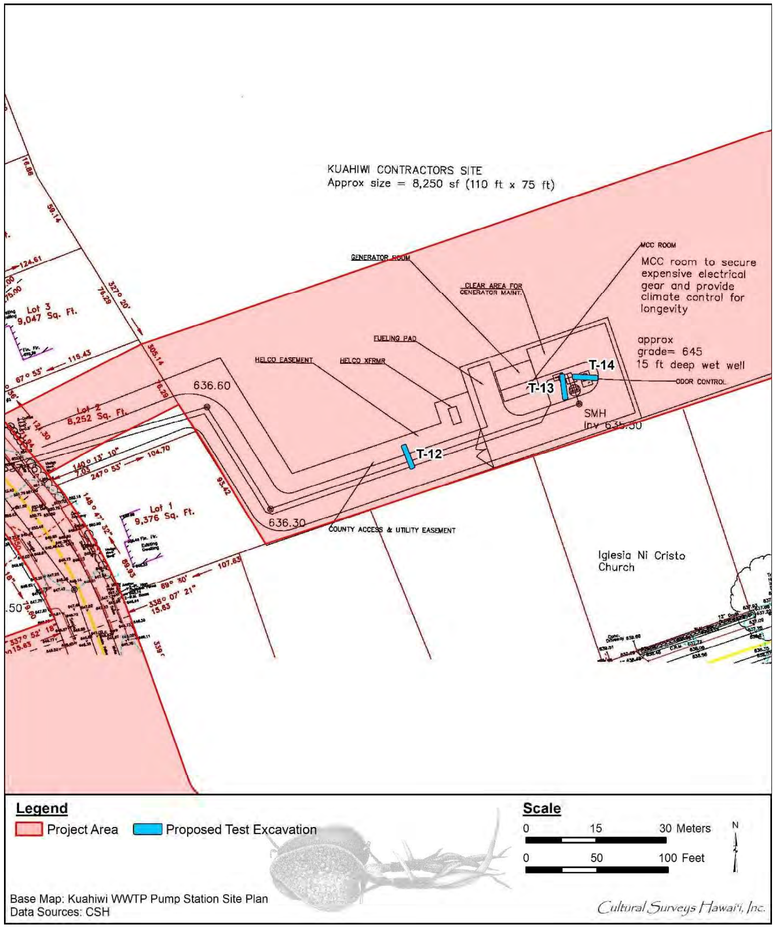

Figure 11. Client provided map showing approximate proposed locations for three test excavation trenches at the proposed at the proposed sewer pump station site at TMK: (3) 9-5-008:048

appropriately documented and described, and collected materials were catalogued, labeled, and delivered to the CSH laboratory for analysis. All materials collected for analysis were collected during screening of excavated material and were not part of a distinct cultural feature or layer such as a hearth or trash pit. These materials were analyzed following the applicable methods described in Section 2.2.

The test units were documented following the methods described in Section 2.1.2.1. Following documentation, the excavated architectural materials and sediments were returned to their original provenience and the ground surface was restored as best as possible to its original condition.

Some cultural materials were collected from the screen during excavation of one of the two test units and returned to the laboratory for analysis.

2.2 Laboratory Methods

Materials collected during AIS fieldwork were identified and catalogued at CSH's laboratory facilities on Hawai'i Island. Analysis of collected materials was undertaken using standard archaeological laboratory techniques. Materials were washed, sorted, measured, weighed, described, and/or photographed (see Section 5). The analyzed materials included diagnostic (identifiable or datable) artifacts, and charcoal.

2.2.1 Artifact Analysis

In general, artifact analysis focused on establishing, to the greatest extent possible, material type, function, cultural affiliation, and age of manufacture. As applicable, artifacts were washed, sorted, measured, weighed, described, photographed, and catalogued. Diagnostic (dateable or identifiable) attributes of artifacts were researched.

The artifacts collected during excavation were types generally interpreted as traditional Hawaiian artifacts (an adze and a coral abrader). No historic-era artifactual material was encountered in the project area. The traditional Hawaiian artifactual material was identified, and forms and functions determined, using standard reference materials (e.g., Barrera and Kirch 1973; Brigham 1974; Buck 2003; Emory et al. 1968; and Graves and McElroy 2004). Analyzed materials were tabulated and are presented in Section 5.1.

2.2.2 Energy-Dispersive X-ray Fluorescence (EDXRF) Analysis

The use of energy-dispersive X-ray fluorescence (EDXRF) may make it possible to determine if lithic artifacts from within the project area are from similar sources, different sources, or from sources consistent with another island. Using an EDXRF spectrometer, Dr. Peter Mills of the University of Hawai'i at Hilo is working to establish geochemical "fingerprints" of stone tools that Native Hawaiians quarried from various sites and track the extent to which that material was circulated on each island or throughout the island chain. The EDXRF analyzer allows archaeologists to conduct rapid and non-destructive analyses of stone artifacts to determine the extent and distance stone tools moved from the quarries. Attempts are made to match the lithic artifact samples with geochemical data collected on known prehistoric quarry areas, such as on Mauna Kea, and sources of volcanic glass, such as Pu'u Wa'awa'a located on the north slope of Hualālai volcano on Hawai'i Island (McCoy et al. 2011). Samples that do not match known quarry sites may lead to the discovery of currently unknown quarry sites, or possibly to the identification of stone tools derived from other island groups such as Tahiti and the Marquesas. By examining the extent to which stone tools in various *ahupua‘a* were derived from non-local sources, archaeologists will be able to quantify Native Hawaiian movement of lithic artifacts through time and space, and possibly identify some tools that were carried over long distances of open ocean.

As the UHH EDXRF database has expanded over time, more information has become known about specific sources for stone and volcanic glass across the Hawaiian Islands. In support of furthering this research, and to gather potential source information about artifacts found within a given project, CSH submits lithic samples for this inexpensive and non-destructive analysis whenever possible.

The single lithic artifact collected during the current AIS was sent to the UHH Geoarchaeology Lab for EDXRF analysis. The EDXRF focuses a high energy beam of X-rays onto the sample and uses atomic excitation to create X-ray emissions that are then measured by an energy-dispersive spectrometer. The spectrometer converts the X-ray energy into voltage signals that are digitally analyzed and plotted. The trace elements strontium (Sr), zirconium (zr), rubidium (Rb), and niobium (Nb) were used as main discriminators for this study. The signals were plotted on Sr to Zr and Rb to Nb bivariate plots in comparison to data from samples in the database. The results were summarized in personal communication to CSH from Dr Peter Mills. Following analysis, the artifact was returned to the CSH laboratory.

2.2.3 Wood Taxa Analysis

Select samples of charcoal material from test unit excavations within the context of a historic property were analyzed for species identification. Samples were sent to the Wood Identification Laboratory (WIDL) at the International Archaeological Research Institute, Inc. (IARII) for taxa identification. The samples are intended to be viewed under magnification of a dissecting microscope and then compared with anatomical characteristics of known woods in the Pacific Islands Wood Collection at the Department of Botany, University of Hawai‘i, as well as in published descriptions. Taxa identification of wood samples provides useful information for interpreting the environmental and cultural history of the project area and helps determine a general time frame of land use. The identification can also be useful in the selection of short-lived plant material suitable for radiocarbon dating. In the case of this study, CSH submitted charcoal samples to the WIDL for analysis and selection for radiocarbon analysis but was subsequently informed that no one was available to process the samples. In lieu of a full analysis, CSH was provided a brief, informal evaluation of which samples were likely best suited for radiocarbon dating, and the samples were returned to the CSH laboratory.

2.2.4 Radiocarbon Analysis

Charcoal samples informally identified as short-lived plant species during wood taxa analysis (see Section 2.2.3) were sent to Beta Analytic, Inc. of Miami, Florida for radiocarbon dating analysis using the Accelerator Mass Spectrometer (AMS) method. The conventional radiocarbon age determined by Beta Analytic, Inc. was calibrated to calendar ages using the INTCAL13 High Probability Density Range Method (HPD) and OxCal calibration program, Version 4.3, developed by the University of Oxford Radiocarbon Accelerator Unit (ORAU).

2.2.5 Disposition of Materials

Materials collected during the current AIS (which do not include human remains or grave goods) will remain temporarily curated at the CSH office in Hilo Hawai‘i. CSH will make

arrangements with the landowner regarding the disposition of this material. Should the landowner request different archiving of material, an archive location will be determined in consultation with the SHPD. All data generated during the course of the AIS are stored at the CSH offices.

2.3 Research Methods

Background research included a review of previous archaeological studies on file at the SHPD; review of documents at Hamilton Library of the University of Hawai‘i, the Hawai‘i State Archives, the Mission Houses Museum Library, the Hawai‘i Public Library, and the Bishop Museum Archives; study of historic photographs at the Hawai‘i State Archives and the Bishop Museum Archives; and study of historic maps at the Survey Office of the Department of Land and Natural Resources. Historic maps and photographs from the CSH library were also consulted. In addition, Māhele records were examined from the Waihona ‘Aina database (Waihona ‘Aina 2021).

This research provided the environmental, cultural, historic, and archaeological background for the project area. The sources studied were used to formulate a predictive model regarding the expected types and locations of cultural resources in the project area.

2.4 Consultation Methods

NHPA Section 106 consultation with community members, agencies, and NHOs is being undertaken by the project proponents.

Section 3 Background Research

3.1 Traditional and Historical Background

3.1.1 Traditional Background and Land Use

Ka'ū is the southernmost and largest district of Hawai'i Island, known for its dynamic natural environment and fierce people. The project area is situated within the boundaries of two *ahupua'a*, Kāhilipalinui and Kāwala, located on the southern slopes of Mauna Loa and northeast of the southern tip of the island known as Ka Lae or South Point. Pukui et al. (1974:65, 99) note Kāhilipali literally translates as "[wind-] swept cliff," while Kāwala translates as "to strike back."

There is general agreement that Ka Lae is one of the earliest settled areas in the Hawaiian Islands, though there is less consensus regarding the timeframe of its initial settlement. Kirsch (1985:81–87) proposes settlement by the fourth or fifth century AD, and notes that Ka Lae would have been an attractive locale given its direct proximity to abundant deep-sea fishing grounds. Archaeological studies in the general region clearly indicate pre-Contact permanent habitation settlement along the coast as well as within inland portions of Ka Lae. Archaeological research conducted in the upland Ka Lae region (Cordy 1986; Cordy 1987; Spear and Rosendahl 1987; Tomonari-Tuggle and Tuggle 1991) signify a distinct inland settlement typically focusing on agricultural subsistence. An organized upland field system is known to have been present in Ka'ū but has not been investigated in any systemic way.

Given the proximity of Wai'ōhinu and Nā'ālehu to the inland Ka Lae region, and their relatively sheltered setting from lava flows, it is unsurprising that agriculture and associated settlement were firmly established in these places prior to European Contact. Radiocarbon dates from a lava tube site located in the upslope Wai'ōhinu area indicate occupation between AD 1420 and 1655 (Robins et al. 1992). Handy and Handy (1972) describe pre-Contact Nā'ālehu as follows:

> Na'alehu was a place of some importance in ancient times. There were two sayings that had reference to it. *Na'alehu i ka pala pa'a* ('Na'alehu of the thick-walled calabashes') means that folk of this locality were proudly thick skulled and stubborn even more so than the run of Ka'u folk. Another saying shows that they regarded themselves, or were regarded as, merciless fighters. *Na'alehu haehae poko* means 'Na'alehu tears to bits.' This saying comes down from the memory of a warrior who was so strong and so fierce that he tore his victims to bits with his bare hands.
>
> This was an area of sweet potatoes and gourds. There was a notable heiau, a *luakini* or war temple, the remains of which are in the rear of the present public-school site. About half a mile beyond this to seaward is a caved-in section of lava tube forming a sort of cave, on the wall of which are lightly drawn petroglyphs in the form of human figures. [Handy and Handy 1972:595–596]

Handy and Handy (1972:595) note that Kāwala was considered "an *ahupua'a* of importance because to it belonged to Na'alehu with its large population; rich planting areas; planting, healing and war *heiau*; sports arena; a pavilion of the *ali'i* in a grove of *kou* trees; and other distinctions."

In contrast, Kahilipalinui contained "no settlements of prime importance," (Handy and Handy 1972:595).

In the pre-Contact period, inter-district competition resulted in the shifting dominance of the *ali'i* (chiefly class) of Ka'ū with the rulers of Puna and Kohala. The chief Kalani'opu'u ruled Ka'ū (and the entire island) during the eighteenth century just before the first European visitors began to record their early impressions of the land and its people.

3.1.2 Early Historic Period

Lt. James King of Captain Cook's expedition in 1779 recorded his impressions of this portion of the rocky Ka'ū coast as "a prospect of the most horrid and dreary kind" (King 1784:104). Regardless of his first impression, the rich fishing grounds on the coast and the inland plantations provided Hawaiians with an abundance of resources, which supported a substantial population.

Archibald Menzies (1920), a surgeon and naturalist on the 1794 voyage of Captain George Vancouver, and the Rev. William Ellis (1963), who traveled through Ka'ū in 1823, encountered productive and populous villages at nearby Honu'apo, east of the project area, and Wai'ōhinu, west of the project area. Rev. Ellis may have been the first missionary to visit Ka'ū. During the 1830s Protestant missionaries based in Kona and Hilo made occasional tours into Ka'ū, but a permanent missionary presence was not installed until the early 1840s when Catholic and Protestant missions were established in the district. In 1842, the Protestant minister John Paris reached Ka'alu'alu (located approximately 7.0 miles southwest at the coast) by schooner where he found,

> The shore was lined with hundreds of natives as our little boat neared the shore. I was taken up by a great strong native Samson, whose entire dress was a malo [male's loincloth] and who was tattooed from head to foot. He looked fierce but set me gently down on the pahoehoe amid a crowd of natives . . . Then came greetings from the multitude, some kissing my hands and some taking hold of my feet. A joyful 'Aloha ino!' with a low wail, rose from the aged ones. [Paris 1926:89]

Paris' account of the profusion offered in welcome by the Ka'ū natives illustrates the abundant resources available in the district:

> . . . two strong men, tattooed from head to foot, came in bearing a huge whole hog, baked entire minus hair and entrails. These bearers were followed by others, dressed in the same style bringing calabashes of various sizes filled with fish, poi, potatoes, then came melons, bananas, and sugar cane, and little gourds filled with goat's milk. All was spread out in royal Hawaiian style, a dozen kukuis [nuts from the Candlenut tree, *Aleutris moluccana*] burning and kahilis [feather standards] waving to and fro. [Paris 1926:90]

Paris settled in Wai'ōhinu where he founded a church and school. Later, in 1843, a stone church was also built at Punalu'u to the northeast. Cordy (1986:21) postulates that around this time a settlement shift was occurring from coastal to inland regions, the result of depopulation and of efforts to gain access to the government road and to populate the economic center of Wai'ōhinu.

Mission station reports and censuses and accounts by visitors to Ka'ū during the mid-nineteenth century document the changes to the district brought about by natural forces and by the pressures of an increasing western presence. A visitor to Wai'ōhinu and its environs in 1849 anonymously published an account describing the devastating effects of a drought and fire that had occurred three years earlier:

> [W]e noticed many a tall, stately trunk, branchless and lifeless standing monument-like, all over the country. On enquiry we ascertained that they were the remains of a noble forest, which, with the whole surrounding country, were burnt in 1846. In that year a severe drought visited the Island, the streams dried up, the grass withered, and fire swept over the whole district. [Sailor in Kelly 1980:89]

The author also describes an area above the settlement at Wai'ōhinu that, apparently undamaged by the 1846 fire, probably represents the idyllic setting that had drawn the Ka'ū *ali'i* to the *ahupua'a*:

> [W]e ascended the hills back of the mission, and when we had reached an elevation of about 5,000 feet were repaid with one of the richest scenes it was our privilege to look upon. Below us lay, fashioned by the hand of nature, within a range of ten miles, six lovely terraces, on which one thousand dwellings might be placed, each of which should have a prospect of the sea, the rocky shore, the lava and the verdant upland. To each of these farms might be attached, of from 100 to 1500 acres of land, now lying utterly waste, that would repay bountifully the labor of the husbandman. The grass, with which most of the land was covered, grows luxuriantly and attains the height of two or three feet. On this land we saw some noble upland kalo, and a number of very large banana trees. Several crystal springs take their rise on the summit, and might send, if rightly directed, a portion of their treasures through every man's fields. Behind this noble series of hills, timber abounds. So that there is to be found every thing desirable to make a rich farming country, and in a circuit of some fifteen miles, might be abundantly grown the best products of the temperate, with the rich and varied fruits of the tropic zones. But alas the farmers are wanting, the land lies in all the wild luxuriance of nature desolate, there are no passable roads, except foot paths, to it, and no harbor at which vessels could lie in safety, is found within many miles. [Sailor in Kelly 1980:89]

Noticeably missing from this account is mention of any Hawaiians occupying and utilizing this verdant land "now lying utterly waste." Early census data provide insights into the dramatic shift in population between the 1830s and 1850s. An 1831-1832 census of Ka'ū, the first taken within the district, records a total population of 5,800. In 1835 the total population is counted as 4,766. The first official government census, taken in 1847, records the population as having dropped to 3,010. Reverend John Paris would write in an 1848 mission station report (Paris 1848:3), "Since the year 1845 the work of depopulation of Kau has gone on with fearful rapidity." He notes, during the years 1845 and 1846 (Paris 1848:3), a "distressing famine and fire which overran the country," the same disasters the anonymous visitor of 1849 mentioned. By the time of the 1853 government census only 2,210 people are recorded in Ka'ū. Figure 12 depicts the population of Ka'ū at this time and indicates a population of only about 100–150 people in the Nā'ālehu vicinity. Despite a relatively low population density indicated in the vicinity of the project area, documents associated with the Māhele and subsequent Kuleana Act illustrate continued patterns of settlement and subsistence agriculture in the Nā'ālehu area by Native Hawaiians.

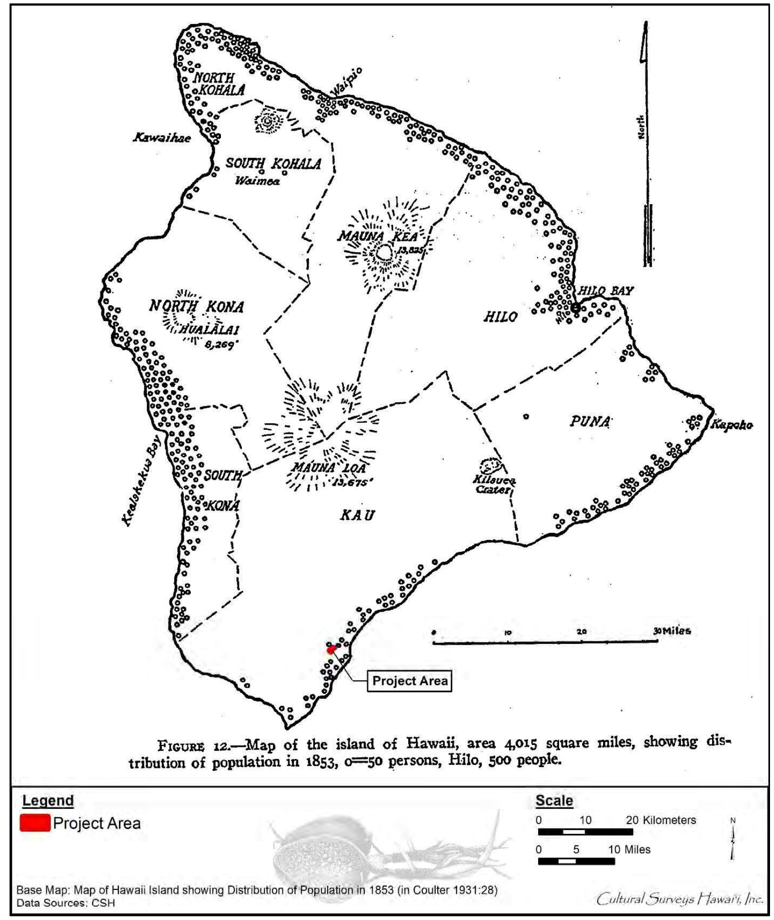

Figure 12. Map of Hawai'i Island showing population as of 1853 (Coulter 1931:28)

3.1.3 The Māhele and the Kuleana Act

In the mid-nineteenth century, during the time of Kamehameha III, a series of legal and legislative changes were brought about in the name of land reform (see the works of Jon Chinen 1958, 1971 for a thorough and well-written explanation). Before the Māhele, all land belonged to the *akua* (gods), held in trust for them by the paramount chief, and managed by subordinate chiefs.

Following the enactment of a series of new laws from the mid-1840s to mid-1850s, Kamehameha III divided the land into four categories: Crown Lands reserved for himself and the royal house; Government Lands; Konohiki Lands claimed by *ali'i* and their *konohiki* (supervisors); and *kuleana*, small plots claimed by the *maka'āinana* (commoners) (Chinen 1958:8–15). These claims are described in Land Commission Award (LCA) testimony from the claimant and witnesses. A Royal Patent (RP), which quitclaimed the government's interest in the land, was issued on most Land Commission Awards (Chinen 1958:14). In some cases, more than one RP number was issued for an LCA, especially in cases where there were several widely separated *'āpana* (lots), such as an award with agricultural land in one *ahupua'a* and a house lot in another.

Ali'i were required to pay a commutation fee to the government for their confirmed Konohiki Land titles; this payment could be in cash or in the return of land to the government or crown. Many *ali'i* elected to return substantial portions of their awarded lands to avoid the one-third commutation cash fee. The Kuleana Act of 1850 allowed *maka'āinana*, in principle, to own land parcels where they were currently and actively cultivating and/or residing. In 1851, certain Government Lands became available for purchase in lots of 1 to 50 acres in fee simple; this new category of land ownership became known as Royal Patent Grants or Land Grants.

LCA records provide insight into former land use within the project area and vicinity. The *ali'i* William Pitt Lelei'ohoku during the Māhele of 1848 retained the *ahupua'a* of Kahilipalinui as part of LCA 9971. Under the subsequent Kuleana Act a number of *kuleana* or commoner claims were also made within Kahilipalinui, but none were awarded in the vicinity of the project area. At the time of the Māhele, Kāwala Ahupua'a was not delineated as it is today. Rechtman (2011) notes

> […] there were at least four smaller *ahupua'a* (Aemalo, Poupouwela, Papaikou, and Paukui; from west to east) surrounded by the larger Kāwala and Kaunāmano ahupua'a [Kaunāmano is to the east of Kāwala]. The names of these smaller *ahupua'a* do not appear on later maps, and it appears as though they were subsumed by the larger Kaunāmano and Kāwala ahupua'a. [Rechtman 2011:19]

Over two dozen *kuleana* were awarded within Aemalo, Poupouwela, Papaikou, Paukui, and Kāwala (which typically appears in the records using the alternative spelling "Kowala"). Of these awards, ten are indicated in direct proximity to the project area; these awards along with LCA 9971 to Lelei'ohoku are depicted in Figure 13 and summarized in Table 1 (which provides separate entries for multiple *'apana* or lots belonging to the same award). Seven of the 12 proximate *kuleana* overlap the project area; these are listed in Table 2 along with the forms of land use expressed for each in the associated claim records. Land use within the project area as expressed in the Māhele data consisted of subsistence agriculture; indicated crops include *kalo* (taro, *Colocasia esculenta*), *wauke* (paper mulberry, *Broussonetia papyrifera*), and banana (*Maia* sp.).

Subsequent to the Māhele many Land Grants were made throughout Nā'ālehu; unfortunately, Land Grant records rarely contain specific land use information.

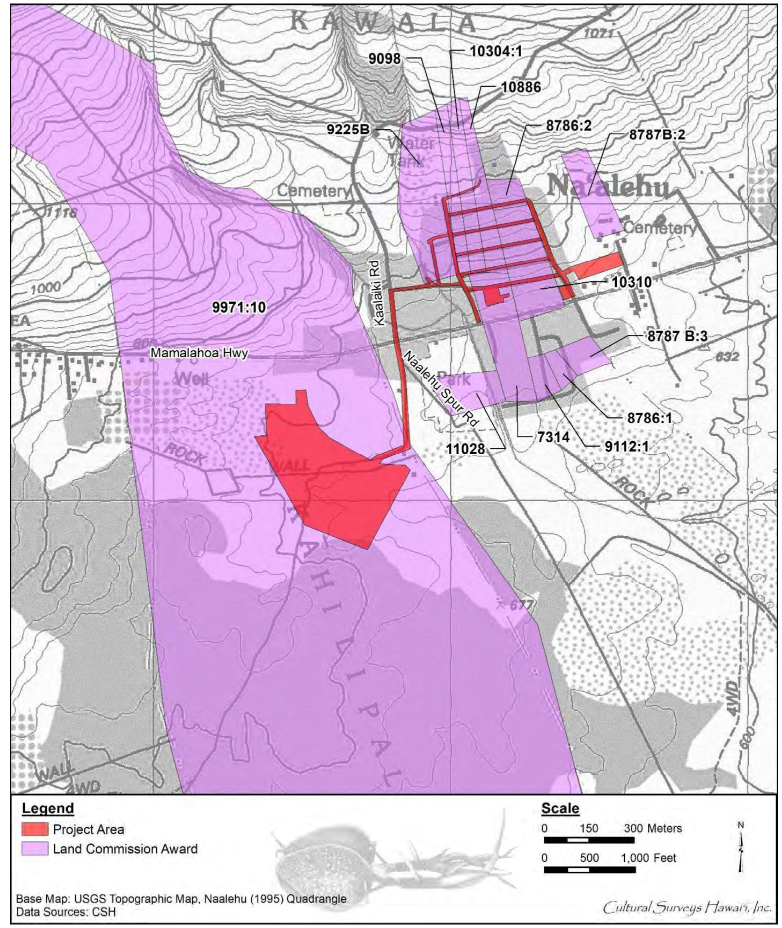

Figure 13. Portion of the 1995 Naalehu USGS 7.5-minute topographic quadrangle showing the location of LCAs within and in the immediate vicinity of the project area

Table 1. LCAs in the immediate vicinity of the project area

LCA #	Awardee	Ahupua‘a	Royal Patent #	Acreage
7314	Ku	Poupouwela [*Kāwala]	7326	13.9
8786:1	Kuaana	Paukui, Poupouwela, Papaikou [*Kāwala]	5313	3.4
8786:2	Kuaana	Paukui, Poupouwela, Papaikou [*Kāwala]	5313	5.26
8787B:2	Kupele	Papaikou, Kaunāmano, Paukui [*Kaunāmano]	3204	2.6
8787B:3	Kupele	Papaikou, Kaunāmano, Paukui [*Kāwala]	3204	4.8
9098	Kikoopua	Poupouwela, Aemalo, Kowala [*Kāwala]	6822	6.14
9112:1	Kahana	Poupouwela, Kowala [*Kāwala]	4169	6.0
9225B	Keawe	Poupouwela [*Kāwala]	7971	16.4
9971:10	Leleiohoku, William Pitt (*ali‘i* award)	Kahilipalinui	6882	2,155
10310	Nunanuna	Poupouwela, Kahilipali, Kaunamano [*Kāwala]	7927	12.6
10304:1	Nauka	Poupouwela, Aemalo [*Kāwala]	6660	5.0
10886	Nuinuimakua	Poupouwela [*Kāwala]	6455	7.18
11028	Peke, Samula	Poupouwela, Aemalo [*Kāwala]	7685	6.55

*Denotes post-Māhele *ahupua‘a* name designation

Table 2. Land use within *kuleana* awards overlapping the project area

LCA #	Awardee	Date Awarded	Land Use
7314	Ku	1848	[none given]
8786:2	Kuaana	1848	Three *kīhāpai* [garden, cultivated patch]
9098	Kikoopua	1849	One taro, one *wauke*, one fallow
9225B	Keawe	1848	[none given]
10304:1	Nauka	1875	One (3) taro
10310	Nunanuna	1890	Four taro, one banana
10886	Nuinuimakua	1872	Six taro

3.1.4 Mid- to Late 1800s

In the mid-nineteenth century Ka‘alu‘alu became an important locale for export of agriculture and livestock. In about 1852 a cart road was constructed between the bay and Wai‘ōhinu (Kelly 1980:18). During this time ranching became a significant industry in Ka‘ū, when Princess Ruth Ke‘elikolani started Ka‘alu‘alu Ranch with cattle brought from Waimea (Hansen and Kelly 1972:22). Cattle continued to be shipped out of Ka‘alu‘alu at least until the 1920s. Organized cattle ranching was focused at Ka‘alu‘alu, Kahuku, and Kapāpala (Kelly 1980:17). Other shorter-lived commercial pursuits in Ka‘ū included wheat and *pulu*, the soft, yellow material taken from the base of tree-fern leaf stalks (*Cibotium* spp.) for stuffing in mattresses and pillows; ultimately these ventures proved unsustainable (Kuykendall 1966:150; Kelly 1980:13–14).

The destructive earthquake and tsunami of 1868 caused an inland shift in populations from the coastal villages in Ka‘ū. That same year, Alexander Hutchinson and partner John Costa founded the Naalehu Sugar Company, and construction of a mill and plantation village in Nā‘ālehu ensued (Dorrance and Morgan 2000:108). The plantation started out small, with only 7.5 acres of planted cane. Lacking irrigation, the plantation relied entirely on rainfall, which fluctuates in the district and resulted in recurring droughts (Hawaiian Sugar Planters' Association 1990:2). Due to its isolated location, the company had difficulty retaining contract labor.

Hutchinson had also partnered with other foreign entrepreneurs to establish the Hilea Sugar Company, located 5 miles northeast of Nā‘ālehu (Dorrance and Morgan 2000:108). In 1877 Hutchinson bought out the nearby Waiohinu Plantation to the west, and by the end of the 1870s sugar mills were operating at Nā‘ālehu, Hīlea, and Honu‘apo (Dorrance and Morgan 2000:108–109). Though Hutchinson died in 1879, his name lived on in the Hutchinson Sugar Company, which continued to expand and consolidate plantation operations in Ka‘ū under the ownership of Claus Spreckles and William Irwin (Dorrance and Morgan 2000:109). An 1886 map (Figure 14) depicts the project area in relation to the closest Hutchinson Sugar Company mills at Nā‘ālehu and Honu‘apo, and associated wharf at Honu‘apo. It also shows roads located in the vicinity of the present Māmalahoa Highway and Ka‘alaiki Road (also known as the "Cane Haul Road"), both of which connected the villages of Nā‘ālehu and Pāhala to the northeast, and the road heading south to Ka‘alu‘alu from Wai‘ōhinu. An 1887 map (Figure 15) shows the location of the mill and managers' houses in Nā‘ālehu, as well as flumes, roads, rail lines, reservoirs, and animal pens.

In 1889 Hutchinson Sugar Company absorbed the nearby Hilea Sugar Company (Dorrance and Morgan 2000:109). The Hīlea mill was decommissioned in 1907, followed by decommissioning of the Nā‘ālehu mill in 1912 (Elwell and Elwell 2005) and a new, centralized mill was built at Honu‘apo. As a landing was also located at Honu‘apo, it became one of the cheapest sugar ports in the islands.

3.1.5 1900s

Nā‘ālehu continued to develop as a plantation town in the early twentieth century. The managers' houses were along the highway and the workers' camp above the town; this area is still referred to as "the Camp" (Elwell and Elwell 2015). A 1906 map (Figure 16) depicts the location of schools and post offices north and northwest of the project area. Figure 16 also illustrates the approximate boundaries of sugar plantation lands (in red) in relation to the forest lands *mauka* (in blue) and grazing lands west (in yellow) associated with Ka‘alu‘alu Ranch. This ranch was

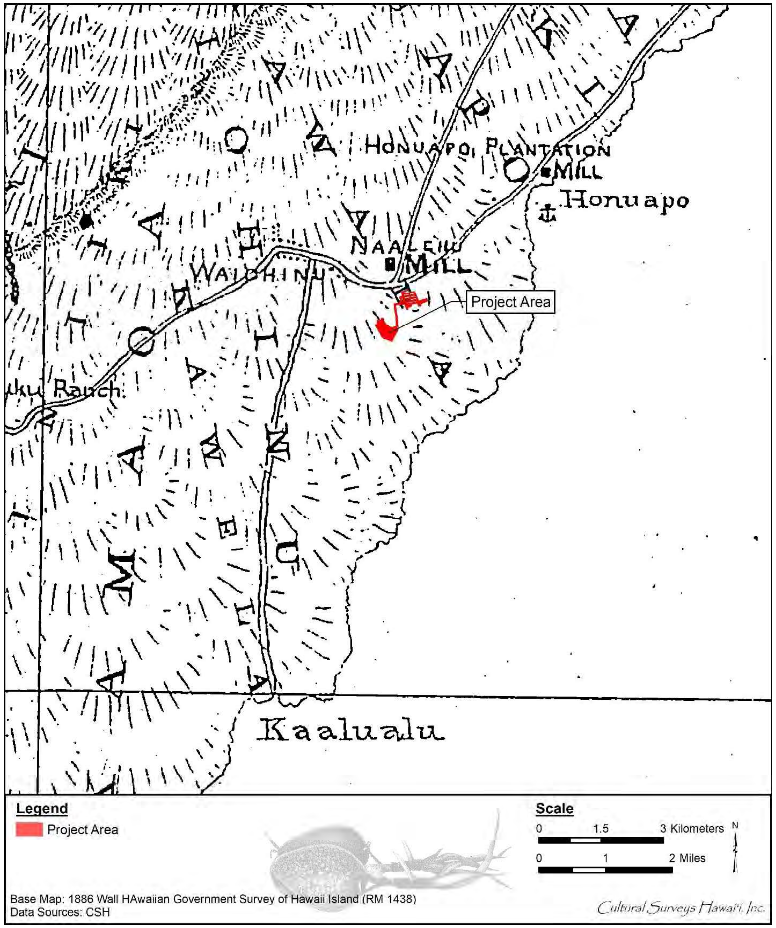

Figure 14. Portion of W.A. Wall 1886 map of Hawai‘i Island showing the project area in relation to sugar mills, the landing at Honu‘apo, and established transportation routes

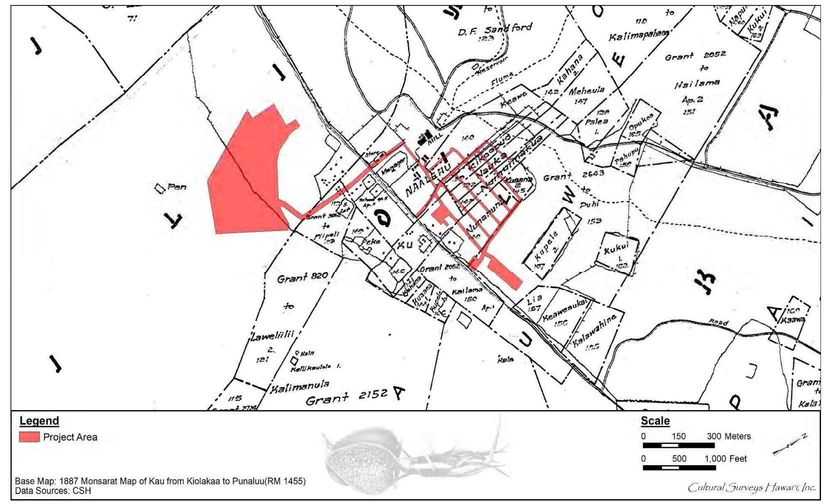

Figure 15. Portion of M.S. Monsarrat 1887 map of Ka‘ū showing the project area; note location of Naalehu Mill just north of the project area

Figure 16. Portion of J.M. Donn 1906 map of Hawai‘i Island showing the project area within sugar plantation lands

purchased by the Hutchinson Sugar Company in 1936; the ranch and a small dairy were "operated in conjunction with the plantation" (Hawaiian Sugar Planters' Association 1990:3). A 1921 U.S. Geological Survey (USGS) map (Figure 17) shows the locations of various workers camps above the town; it also includes the route of the "Hutchinson Plantation RR [Railroad]", crossing the Volcano Road (the precursor to the Māmalahoa Highway). Notable is the absence on Figure 16 and Figure 17 of a clearly marked route following that of the upper cane haul road (Ka‘alaiki Road), indicating this route may have been falling out of favor for general travel.

Nā‘ālehu School (also identified as Nā‘ālehu Elementary School) was established at its current location along the Māmalahoa Highway in 1928. The school is listed on the Hawai‘i Register of Historic Places under the thematic group "Public Schools on the Island of Hawai‘i" (State Inventory of Historic Places [SIHP] # 50-10-74-7522). A national register nomination form was completed for the school by Tonia Moy of SHPD in 2002.

Beginning the in 1920s flumes were utilized to transport cane to the railroad servicing the Honu‘apo Mill and relied on a system of tunnels and reservoirs "dug 3,000 to 8,000 feet into the mountain," (Dorrance and Morgan 2000:109). These flumes were used into the 1940s when transport shifted completely over to trucks. The Hawaiian Agricultural Company located in Pāhala to the east utilized a narrow-gauge railway to transport its milled sugar to Honu‘apo for export. The Honu‘apo landing was closed in 1942 due to the war.

In the 1940s the Māmalahoa Highway (Route 11) was constructed through Ka‘ū along the former Volcano Road alignment. Portions of this roadway located around the island have been designated as SIHP # 50-10-47-30187. The Māmalahoa Highway is visible on the 1962 topographic map (Figure 18) as well as the cane haul road (Ka‘alaiki Road), along which an airstrip is visible northeast of town. Figure 18 also depicts along the eastern side of town a driveway extending north from the highway toward a structure, likely associated with what may have been at the time a new dairy. These driveway and structure features are situated within the parcel containing a proposed sewer pump station (TMK: (3) 9-5-008:048); tax records indicate a milk parlor was constructed on the property in 1960. Figure 18 indicates that by the early 1960s residential development in Nā‘ālehu town appeared much as it does today.

The concrete drainage channel and an associated debris basin located between Ka‘alaiki Road and the residential neighborhood were completed in 1965. This curved feature is visible on a 1978 aerial photo (Figure 19), which also depicts further residential development south of the Māmalahoa Highway.

3.1.6 Contemporary Land Use

In 1971 Hutchinson Sugar Company was merged into the Hawaiian Agricultural Company to form the Kau Sugar Company, Inc., which would be renamed as the Kau Agribusiness Company in 1986 (Dorrance and Morgan 2000:112). Following the demise of the sugar industry in other parts of the island, Kau Agribusiness Company ceased its sugar operations in 1996 (Dorrance and Morgan 2000:112). Nā‘ālehu continues to serve a rural population supported by predominately agricultural and livestock economies. The town is also used as a stop-over for tourists visiting Punalu‘u Beach located 8 miles northeast, South Point located 15 miles southwest, and/or travelling between Hilo and Kailua-Kona.

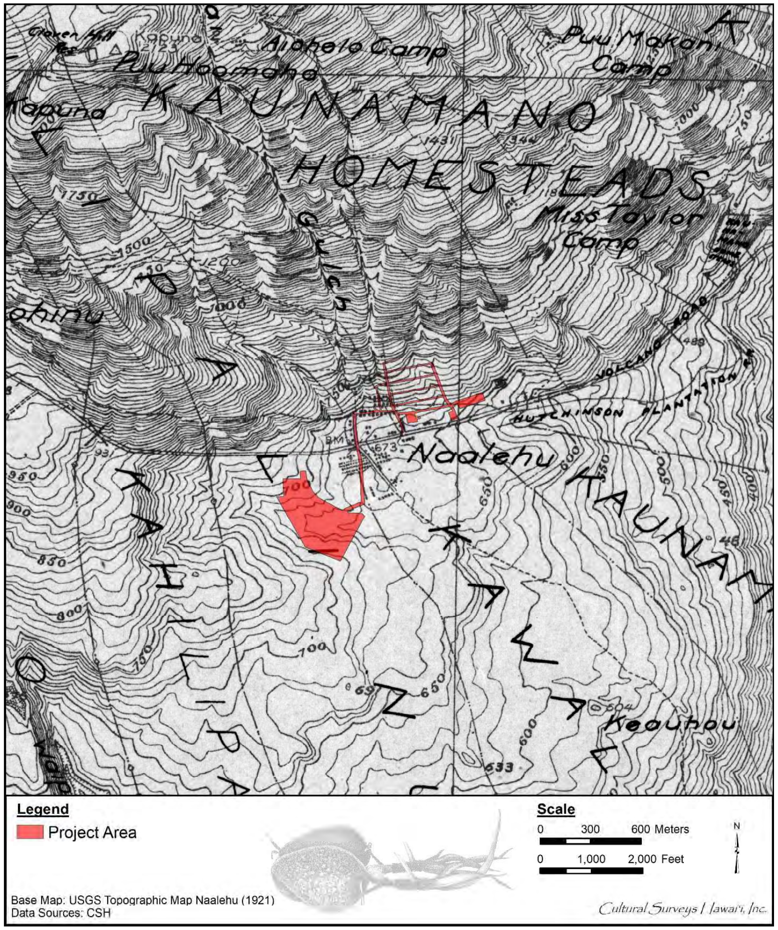

Figure 17. Portion of the 1921 Naalehu USGS 7.5-minute topographic quadrangle showing the project area

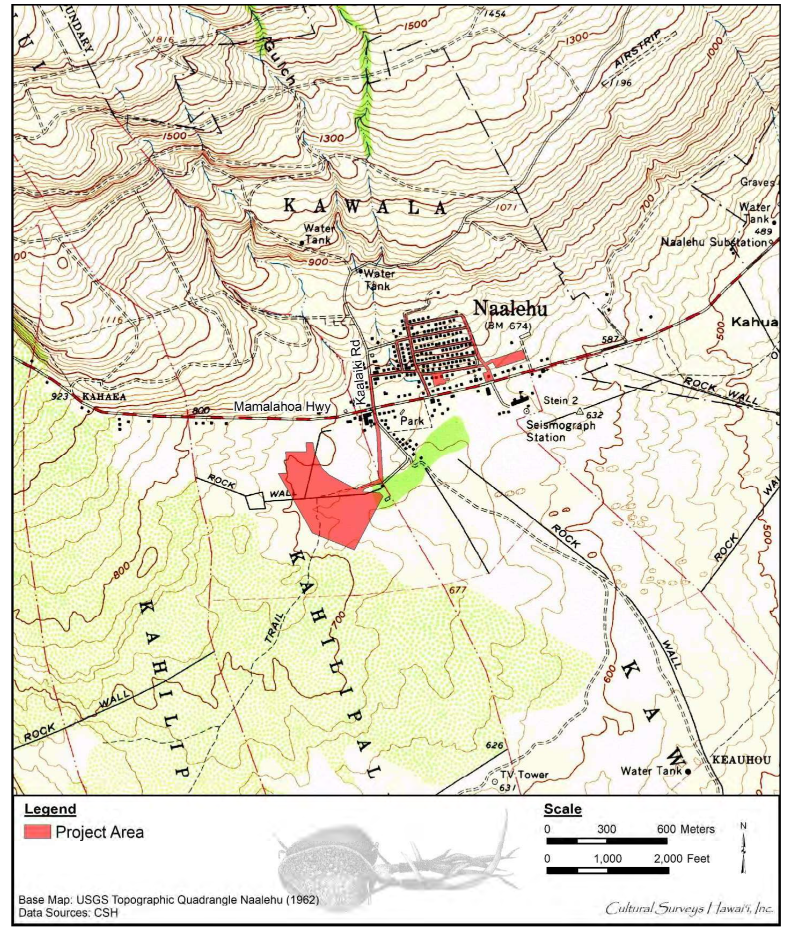

Figure 18. Portion of the 1962 Naalehu USGS 7.5-minute topographic quadrangle showing the project area

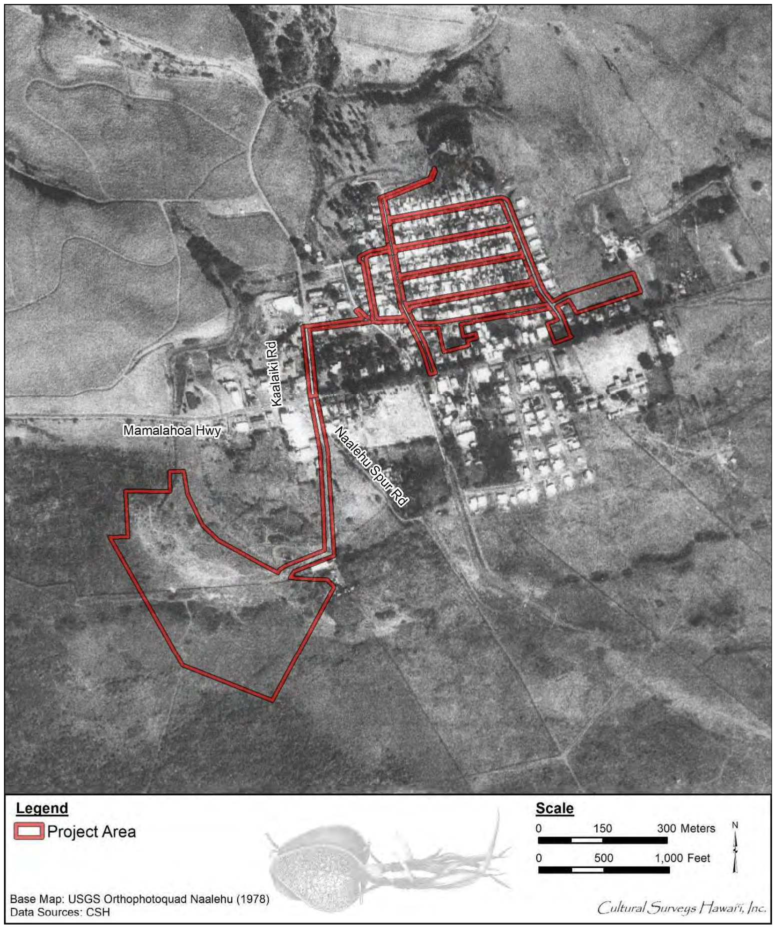

Figure 19. Portion of the 1978 USGS orthophotoquad aerial photo, Naalehu Quadrangle, showing the project area

On 16 December 2019, the County of Hawai‘i, State of Hawai‘i Department of Land and Natural Resources' Legacy Land Conservation Program (LLCP), Ka‘ū Mahi LLC, and The Trust for Public Land completed the sale and purchase of 2,317.844 acres of land called Waikapuna located at TMK: 9-5-007:016 adjacent to Nā‘ālehu. A portion of funds for the transaction were provided by the County of Hawai‘i's Public Access, Open Space, and Natural Resources Preservation (PONC) program. The Ala Kahakai Trail Association (ATA) is the fee simple owner of the parcel (TMK: 9-5-007:016). The transaction encumbered the majority of land with a perpetual conservation easement owned by the County restricting the land to agricultural and cultural preservation uses. This is the first conservation easement purchased by the County under the PONC program. An area of approximately 29 acres in the *mauka* portion of the parcel was excluded from the conservation easement to site the Nā‘ālehu treatment and disposal facility.

3.2 Previous Archaeological Research

Five previous archaeological studies have been identified within or in the immediate vicinity of the current project area. These studies and the historic properties documented therein are depicted in relation to the project area in Figure 20 and summarized in Table 3.

In 2005 Haun and Associates conducted an archaeological inventory survey (AIS) of an approximately 1.0-acre area located southeast of the current project area (Haun and Henry 2005; see Figure 20). Extensive prior impacts by historic and modern ranching activity were observed. No archaeological features were documented, and no further work was recommended. Based on the lack of findings the study was termed an "archaeological assessment" pursuant to HAR §13-284-5(5[A]).

In 2006 CSH undertook a literature review and field inspection (LRFI) for two Ka‘ū District schools as part of a state-wide Department of Education (DOE) wastewater systems improvement project. One of the two schools was Nā‘ālehu School, located across the Māmalahoa Highway from the southeastern portion of the project area (Hammatt and Shideler 2006; see Figure 20). The LFRI included data for LCAs in the vicinity of the school and noted that Nā‘ālehu School is listed on the Hawai‘i Register of Historic Places. An on-site archaeological monitoring program was recommended for the project.

In 2008 Rechtman Consulting conducted an AIS of 42.5 acres overlapping the western portion of the current project area (Clark et al. 2008; see Figure 20). The study documented three newly identified historic properties associated with historic-era ranching and sugar plantation activities: SIHP #s 50-10-74-26408 (complex of stone and concrete lined trenches representing possible latrines), SIHP # -26409 (concrete water trough), and -26410 (core-filled boundary wall) (see Figure 20 and Figure 21). No further work was recommended for these sites. Of the documented sites, SIHP # -26409 appears closest to the current project area but does not overlap it.

In 2009 CSH undertook archaeological monitoring for the DOE wastewater improvements project at Nā‘ālehu School (Wilkinson et al. 2009; see Figure 20). No cultural materials were exposed during project excavations.

In 2011 Rechtman Consulting completed an AIS of 2.24 acres located across the Māmalahoa Highway from the collection system portion of the current project area (Rechtman 2011; see Figure 20). The study documented six newly identified historic properties associated with historic land use: SIHP #s 50-10-74-28925 (post-1938 residential complex); -28926, -28927, and -28990

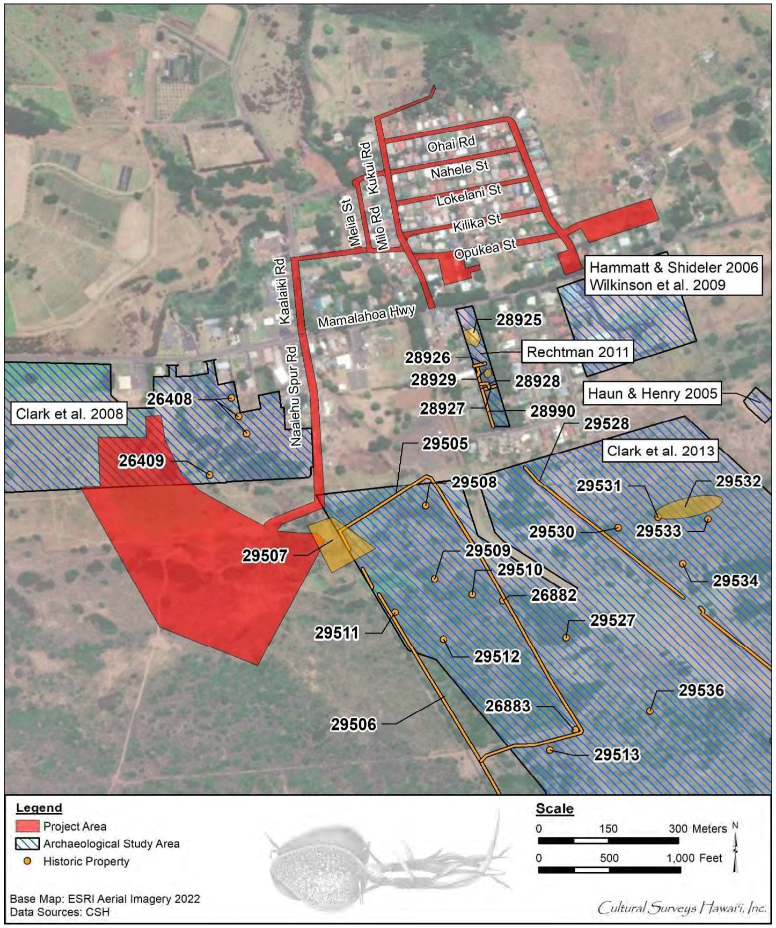

Figure 20. Aerial photograph (ESRI 2022) showing previous archaeological studies conducted and historic properties documented in the vicinity of the project area

Table 3. Previous archaeological studies in the vicinity of the project area

Reference	Type of Study	Location	Results
Haun and Henry 2005	Archaeological inventory survey	1 acre in Kaunāmano Ahupuaʻa; TMK: (3) 9-5-011:001 por.	No historic properties identified; noted extensive prior impacts throughout project area
Hammatt and Shideler 2006	Archaeological literature review and field inspection	Nāʻālehu School; TMKs: (3) 9-5-009:00-6, 015	Recommended on-site archaeological monitoring
Clark et al. 2008	Archaeological inventory survey	42.5 acres in Kāhilipalinui and Kāwala Ahupuaʻa; TMKs: (3) 9-5-021:015 and 9-5-022:001	Documented three newly identified historic properties: SIHP #s 50-10-74-26408, -26409, and -26410, all associated with historic period land use; none of these historic properties appear to be located within the current project area
Wilkinson et al. 2009	Archaeological monitoring	Nāʻālehu School; TMKs: (3) 9-5-009:006, 015	No cultural resources documented during monitoring
Rechtman 2011	Archaeological inventory survey	2.24 acres in Kāwala Ahupuaʻa; TMK: (3) 9-5-009:003	Documented six newly identified historic properties: SIHP #s 50-10-74-28925, -28926, -28927, -28928 and -28990
Clark et al. 2013	Archaeological inventory survey	1,044 acres in Kāhilipalinui and Kāwala Ahupuaʻa; TMK: (3) 9-5-010:001	Documented 204 historic properties of which 12 were previously documented and 192 were newly recorded; sites comprised a wide array of pre-Contact and historic era features used for including habitation, windbreaks and shelters, burials, ceremony, petroglyph, *papamū*, agriculture, transportation, and ranching; in closest proximity to current project area are SIHP #s 50-10-74-29505, historic wall, and -29507, historic ranching complex

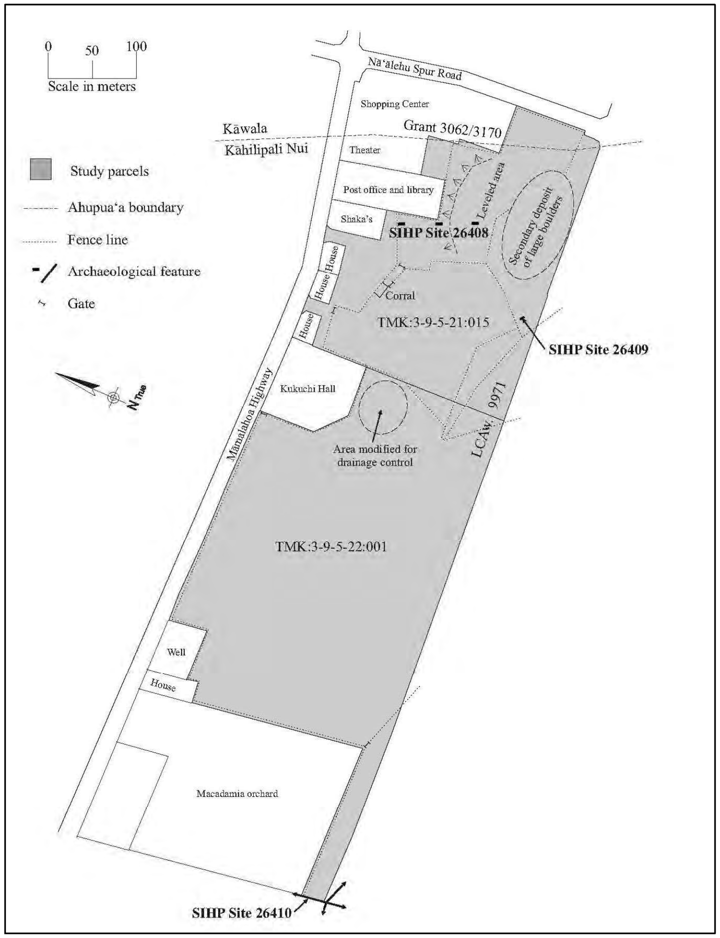

Figure 21. Site distribution map from Clark et al. (2008:19) showing the locations of documented historic properties

(three discrete mid-nineteenth century stone walls); -28928 (core-fill-walled enclosure); and -28929 (complex of historic rock clearing mounds) (see Figure 20). Archaeological monitoring was recommended for initial project ground disturbance.

In 2013 Rechtman Consulting completed an AIS of 1,044 acres located at TMK: (3) 9-5-010:001 in Kāhilipalinui and Kāwala Ahupua'a, bounding the proposed treatment plant facility portion of the current project area to the east (Clark et al. 2013; see Figure 20). The survey, which extended all the way down to the coast, documented 204 historic properties, including 12 previously documented sites and 192 newly documented sites (Figure 22). A wide array of pre-Contact and historic era features were recorded that functioned as habitation, windbreaks and shelters, burials, ceremony, petroglyph, *papamū*, agriculture, transportation, and ranching. The northwestern portion of the 2013 study area abuts the current project area; a historic ranch complex (SIHP # 50-10-74-29507) was documented overlapping with parcel 016 in this area, and a historic ranch wall (SIHP # 50-10-74-29505) was also recorded in the vicinity (see Figure 20). All the other sites recorded by Clark et al. (2013) are well away from the current project area.

In 2018 ASM Affiliates completed a draft AIS report for the entire 2,296-acre Waikapuna parcel at TMK: (3) 9-5-007:016 (Gastilo and Clark 2018), overlapping the proposed treatment plant facility portion of the current project area. This 2018 report has not been finalized with SHPD and therefore the study area is not included on Figure 20. Numerous sites were documented throughout Waikapuna; of these, three are indicated to overlap the current project area (SIHP #s 50-10-74-29507 ranch complex also documented by Clark et al. 2013; -30929, described as a pre-contact habitation and historic ranching complex; and -30930, historic rock wall). The current Waikapuna landowner, Ala Kahakai Trail Association, has graciously provided the excerpted draft site description information for SIHP #s -30929 and -30930 for reference in this report.

3.3 Background Summary and Predictive Model

The project area is within the district of Ka'ū on Hawai'i Island, which is generally accepted as one of the earliest settled areas in the Hawaiian archipelago. Despite its location away from the coast, in the pre-Contact period Nā'ālehu supported a considerable population with an abundance of agricultural fields. The eastern side of present Nā'ālehu town, including Kāwala Ahupua'a, was the focus of this settlement and also contained several types of *heiau* and a *mahahiki* grounds. Kahilipalinui to the east was likely utilized more for outlying agricultural fields.

Accounts from foreign travelers and missionaries following Contact at the end of the Eighteenth Century provide little direct information about Nā'ālehu. A mission was established at nearby Wai'ōhinu, and other accounts describe bustling villages at Ka'alu'alu and Honu'apo at the coast. In the Māhele, Kahilipalinui was retained as Konohiki Land, and no LCAs were awarded in the vicinity of the project area. In contrast, ten LCAs surround and in some cases overlap the portion of the project area within what is presently known as Kāwala Ahupua'a.

Sugar plantations proved to be the formative industry in the Nā'ālehu area from the late 1800s and into the early 1900s. The Naalehu Sugar Company established a mill and plantation village in Nā'ālehu in the 1860s, somewhat upslope from the current town center. Overland routes were improved facilitating transportation between plantations, mills, and coastal landings in Ka'ū. During the early 1900s the Naalehu Sugar Company operated a ranch to help supply its expanding plantation village; during this time most ranching was taking place further west at Ka Lae.

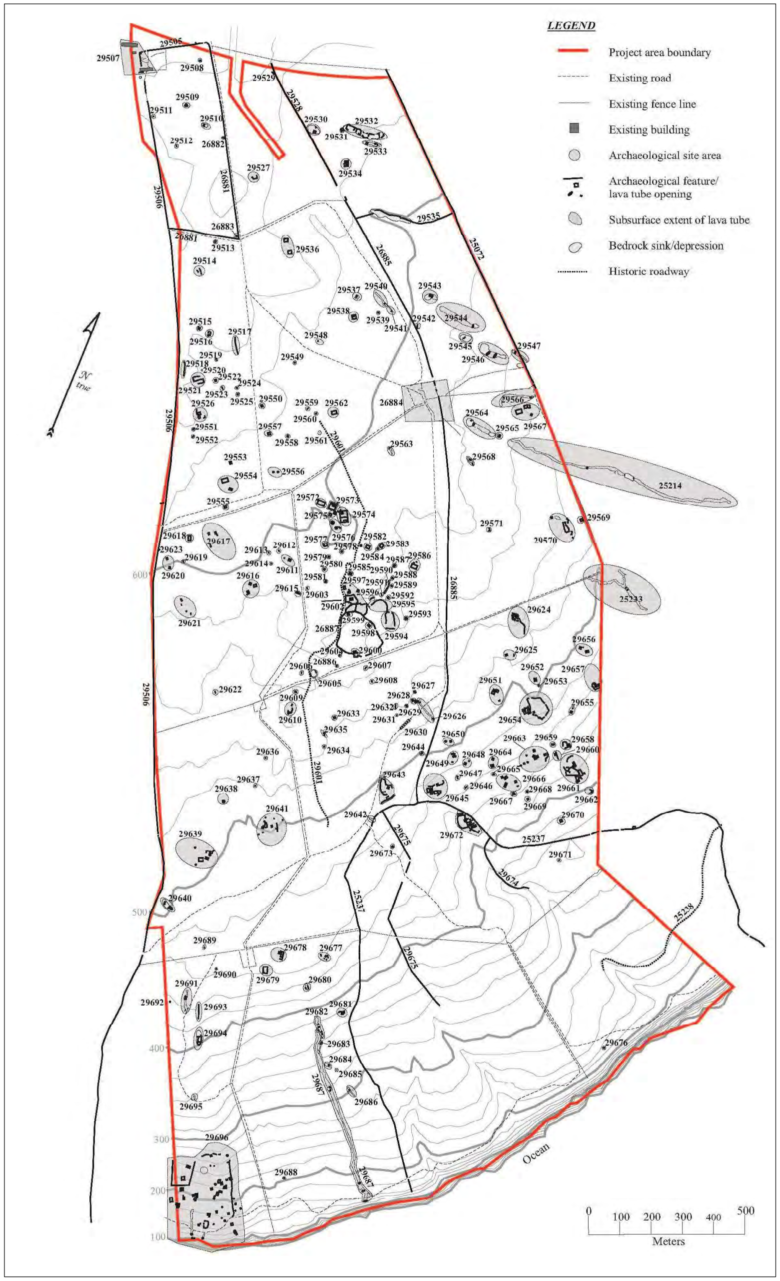

Figure 22. Site distribution map from Clark et al. (2013:123) showing the locations of documented historic properties

In the 1920s Nāʻālehu School was established, and in the 1940s the Māmalahoa Highway (Route 11) was constructed through Kaʻū along the former Volcano Road alignment. The town continued to grow along the highway into the 1960s, which is also when the large concrete drainage channel was completed. By this time sugar production in Kaʻū was winding down. The town continues to support an agrarian economy and is a popular tourist stopover.

Over a century of sugar cultivation, ranching, and town development have heavily impacted the pre-Contact environment in and around Nāʻālehu. Previous archaeological investigations in the vicinity of the project area have identified scattered and disturbed remnants of pre-Contact land use amongst historic-era habitation, agriculture, and ranching sites.

The project area extends along or crosses at least two significant historic roadway alignments, including an undocumented segment of Māmalahoa Highway (SIHP # 50-10-47-30187) and Kaʻalaʻiki Road, also known as Cane Haul Road. The concrete flood drainage channel crossed by the project area between Kaʻalaʻiki Road and Maile Street was built in 1965 and is therefore a historic property. Other structures within the project area may also be greater than 50 years old. The proposed wastewater treatment facility and sewer pump station sites are currently used for pasture and may contain remnants of ranching activities or other historic land use. A prior AIS (Clark et al. 2013) documented historic ranch features on the parcel immediately adjacent to the proposed wastewater treatment facility, and a portion of one of these sites (SIHP # 50-10-47-29507) is understood to overlap with the current project area. Another prior AIS (Gastilo and Clark 2018) was conducted in TMK: (3) 9-5-007:016 and overlaps the current proposed wastewater treatment facility area; while some of the sites documented during this study are indicated in the current project area, the AIS report was not finalized with SHPD. The proposed wastewater treatment facility and sewer pump station sites may also contain pre-Contact features located within lava tubes or other areas not disturbed by agricultural or ranching activities.

Section 4 Results of Fieldwork

Fieldwork was conducted between 26 October 2020 and 29 January 2021 by CSH archaeologist Samantha Purdy, B.A., and Project Director Olivier M. Bautista, B.A., under the general supervision of Principal Investigator Hallett H. Hammatt, Ph.D. This work required approximately 19 person-days to complete.

Fieldwork consisted of a 100% pedestrian of the project area and a program of subsurface testing. The results of the pedestrian survey are summarized in Section 4.1, and the results of the subsurface testing program are provided in Section 4.2.

4.1 Pedestrian Inspection Results

The pedestrian survey was accomplished with the two archaeologists walking transects throughout the project area spaced from 10 to 25 m apart depending on ground visibility. Overall, ground visibility was excellent, exhibited primarily by previously developed areas like roadways (Figure 23 through Figure 27) or by wide open pastures of lantana and guinea grass (Figure 28 through Figure 36). A depression caused by a collapsed lava tube system within the proposed treatment facility portion of the project area in TMK: (3) 9-5-007:016 was carefully explored for lava tube openings and surface archaeological features (Figure 37). One lava tube opening was encountered within the depression but found to be culturally sterile (Figure 38). The three existing LCCs within the project area were relocated at the ground surface and photographed (Figure 39 through Figure 44).

A total of eleven historic properties were documented during the survey, including portions or the entirety of four previously documented sites (SIHP #s -29507, ranching complex; -30187, Mamālahoa Highway; -30929, pre-Contact and historic complex; and -30930, historic ranch wall) and seven newly recorded sites assigned as SIHP #s -31268 through -31274 (Table 4). The distribution of these sites is shown in Figure 45 and Figure 46. Ten of the 11 documented sites are dated firmly within the historic era; the remaining site, SIHP # -30292, is a pre-Contact and historic complex identified within the natural depression bisecting the proposed treatment facility site. The remainder of the project area has been extensively impacted by development and/or historic ranching or agricultural endeavors, likely accounting for the lack of additional pre-Contact features outside of the depression. The ten historic-era sites are associated with transportation (SIHP #s -30187, -31270, -31271, -31272), ranching (SIHP #s -29507, -30930, -31269), water control (SIHP #s -31268, -31273), and property boundary (SIHP # -31274).

The historic properties identified within the project area were documented as described in Section 2.1.1. Detailed site descriptions are provided in Section 6. Manual test excavations were completed following the methods outlined in Section 2.1.2.2 at two features of SIHP # -30929. These manual test excavations were completed in an effort to yield data supporting assessments of site age and function (see Section 4.2.2). Materials collected from these test excavations were analyzed at the CSH laboratory in Hilo, Hawaiʻi; the results of the lab analysis are provided in Section 5. No human remains or grave goods were encountered anywhere within the project area.

Figure 23. Photograph looking down Kukui Road within the collection system portion of the project area; view to south

Figure 24. Photograph of a section of Milo Street within the collection system portion of the project area; view to east

Figure 25. Photograph overlooking the Nahele Street and Ohai Road intersection within the collection system portion of the project area; view to east

Figure 26. Photograph overlooking the Opukea Street and Kukui Road intersection within the collection system portion of the project area; view to east

Figure 27. Photograph showing a portion of Ohai Road within the collection system portion of the project area; view to north

Figure 28. Photograph overlooking a portion of the northern-most spur of the collection system above the Nāʻālehu town; evidence of cattle grazing was observed in this area; view to west

Figure 29. Photograph overlooking a portion of the northern-most spur of the collection system above the Nā'ālehu town; evidence of cattle grazing was observed in this area; view to north

Figure 30. Photograph overlooking the proposed pump station portion of the project area, at the site of the old Nā'ālehu Dairy; view to southwest

Figure 31. Photograph overlooking the proposed pump station portion of the project area, at the site of the old Nā'ālehu Dairy; view to north

Figure 32. Photo overlooking the portion of the project area connecting the proposed sewer pump station site to the collection system along Ohai Road; view to northeast

Figure 33. Photograph overlooking a portion of the proposed treatment facility site *makai* of Māmalahoa Highway; view to north

Figure 34. Photograph overlooking a portion of the proposed treatment facility site *makai* of Māmalahoa Highway; view to east

Figure 35. Photograph overlooking a portion of the proposed treatment facility site *makai* of Māmalahoa Highway; view to west

Figure 36. Photograph of cattle grazing in the proposed treatment facility site, in the SIHP # -31269 vicinity; view to east

Figure 37. Photograph taken within the natural depression bisecting the proposed treatment facility portion of the project area; view to west

Figure 38. Photograph showing the opening to a culturally sterile lava tube within the natural depression bisecting the proposed treatment facility portion of the project area; view to northwest

Figure 39. Photograph showing the vicinity of LCC 1 at TMK: (3) 9-5-024:011 along Opukea Street; view to southeast

Figure 40. Photograph of access to LCC 1 at TMK: (3) 9-5-024:011; view to southeast

Figure 41. Photograph showing the vicinity of LCC 2 at TMK: (3) 9-5-024:010 along Opukea Street; view to southwest

Figure 42. Photograph showing the access to LCC 2 at TMK: (3) 9-5-024:010; view to southwest

Figure 43. Photograph showing the vicinity of LCC 3 at TMK: (3) 9-5-024:001 adjacent to the Māmalahoa Highway and Ohai Road intersection; view to northwest

Figure 44. Photograph of access to LCC 3 at TMK: (3) 9-5-024:001; view to southwest

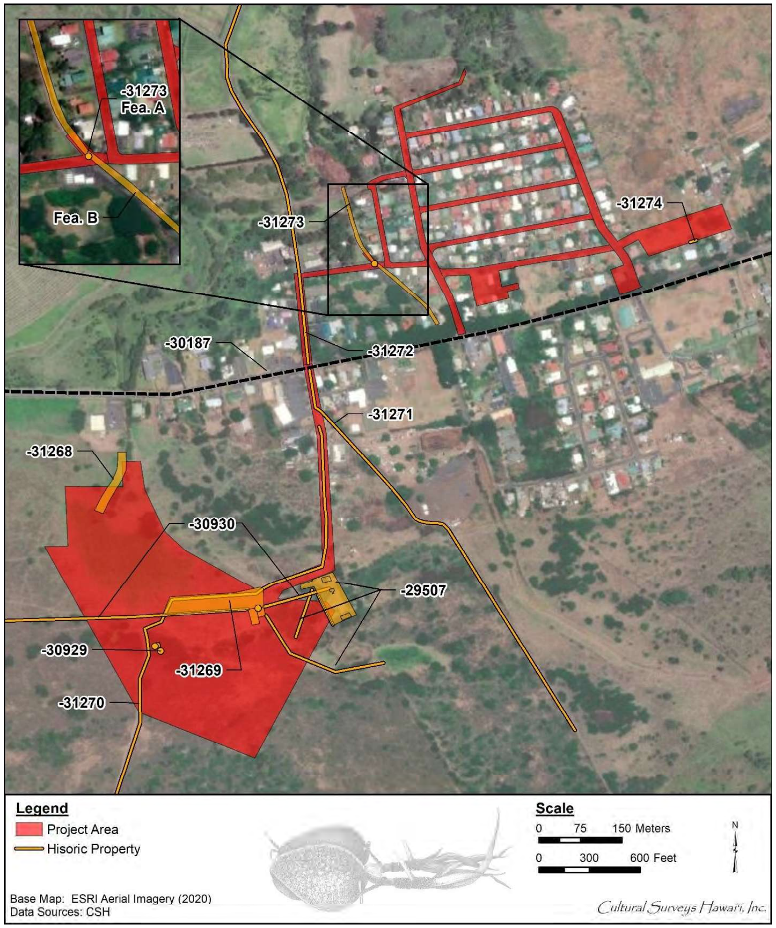

Figure 45. Aerial imagery (ESRI 2017-18) showing the location of historic properties in the project area

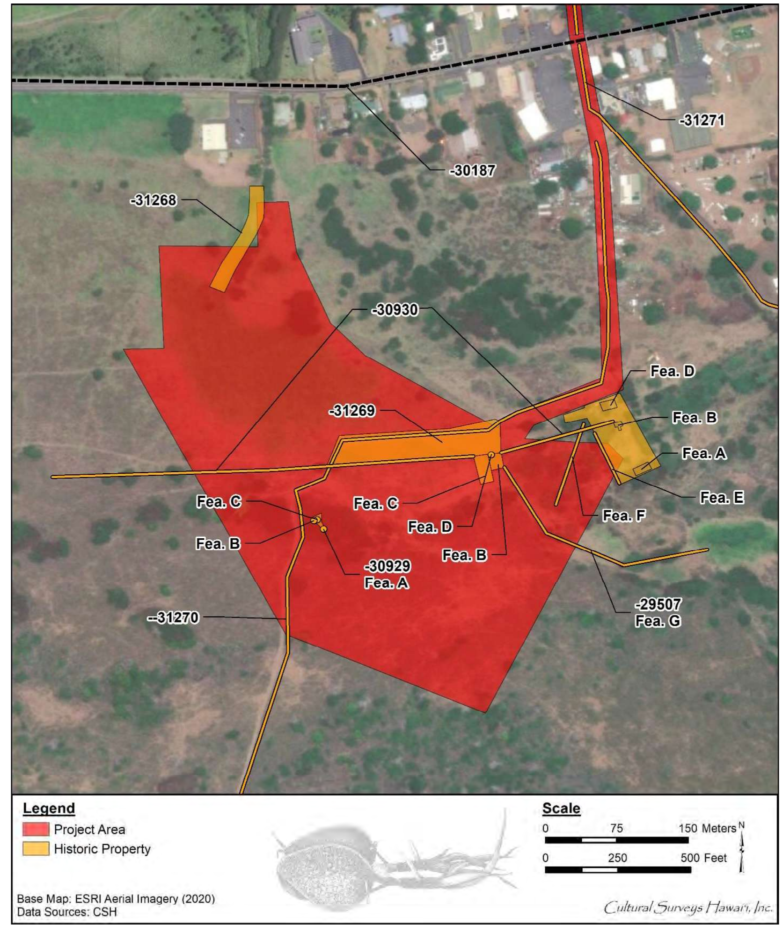

Figure 46. Aerial image showing the historic property and features identified within the southern portion of the project area

Table 4. Historic properties documented within the project area

SIHP # (50-10-74)	CSH Site #	Formal Type	Number of Features	Function	Age
-29507	-	Complex	7 (3 in current project area)	Ranching	Historic
[47]-30187	-	Māmalahoa Highway	1	Transportation	Historic
-30929	CSH 3	Complex	3	Activity Area, Ranching	Pre-Contact/ Historic
-30930	CSH 8	Wall	1	Ranching	Historic
-31268	CSH 1	Drainage Ditch	1	Water Control	Historic
-31269	CSH 2	Complex	4	Ranching	Historic
-31270	CSH 4	Jeep Road	1	Transportation	Historic
-31271	CSH 5	Nā‘ālehu Spur Road	1	Transportation	Historic
-31272	CSH 6	Ka‘alaiki Road	1	Transportation	Historic
-31273	CSH 7	Complex	2	Water Control	Historic
-31274	CSH 9	Wall	1	Boundary	Historic

4.2 Subsurface Testing Results

A subsurface testing program was undertaken comprising mechanical and manual excavation. Exploratory mechanical (i.e., "backhoe") testing was conducted to assess the potential for subsurface archaeological features throughout the undeveloped portions of the project area, including but not limited to buried cultural deposits and/or culturally modified lava tubes. The locations of all project test excavations (mechanical test trenches or "TT" and manual test units or "TU") are depicted on Figure 47. The results of the mechanical testing are provided in Section 4.2.1. Hand excavation was completed at -31270 in the proposed wastewater treatment facility site in an attempt to yield data to support assessments of site age and function; these results are presented in Section 4.2.2.

4.2.1 Mechanical Exploratory Trenching

The exploratory testing program involved the completion of 14 mechanically assisted exploratory test trenches (TT) distributed throughout the undeveloped portions of the project area. Eleven of the 14 completed trenches were excavated in the proposed wastewater treatment facility site at TMK: (3) 9-5-007:016, and the remaining three trenches were excavated within the proposed pump station site at TMK: (3) 9-5-008:048 (see Figure 47).

The test trenches were excavated using a compact excavator to either bedrock or the mechanical limits of the machine, whichever was encountered first. The trenches measured approximately 5 m (16.5 ft) long and 1 m (3.2 ft) wide. Bedrock was encountered at all but one trench (TT-1), where sediments exceeded the reach of excavator. In the other 13 trenches the depths of sediments ranged from approximately 20 cm below surface (cmbs) in the proposed treatment facility portion of the project area to approximately 100 cmbs in the proposed pump station portion of the project area. No new historic properties were encountered during the exploratory testing. A modern soda can was observed at approximately 40–60 cmbs (in Stratum I) in TT-13; other than this modern trash, no cultural materials were observed in any of the exploratory test trenches.

The exploratory testing program generally revealed two distinct areas of sedimentary deposition within the project area. Sediments exposed during excavation of TTs -1–11 in the proposed wastewater treatment facility portion of the project area *makai* of Māmalahoa Highway were not as expected. USDA soil survey data indicates this portion or the project area is characterized by shallow, dark-colored peats belonging to the Punaluu and Kaimu series, and an area of rock land in the southeastern portion of the proposed treatment facility site (see Section 1.3.1 and Figure 9). While three units contain possible layers of natural peat sediments situated directly atop basalt bedrock (TTs -2, -7, and -10), all 11 trenches in this area contained substantial layers of yellowish-hued silty clay loams. The two most likely explanations for the widespread presence of this yellowish silty clay loam through the area are that they accumulated across the area in storm runoff, potentially originating from existing drainage channels (e.g., SIHP # -31268), or that these sediments formed naturally in volcanic ash. The Ka Lae vicinity is known to contain areas characterized by deep, yellowish brown ash deposits commonly called "Pahala Ash;" however it is unclear why the USDA soil surveys would not have noted its presence in this area.

Sediments exposed during excavation of TTs -12–14 in the proposed pump station portion of the project area *mauka* of Māmalahoa Highway exposed sediments consistent with the known sediment type for this area (Naalehu silty clay loam; see Section 1.3.1 and Figure 9).

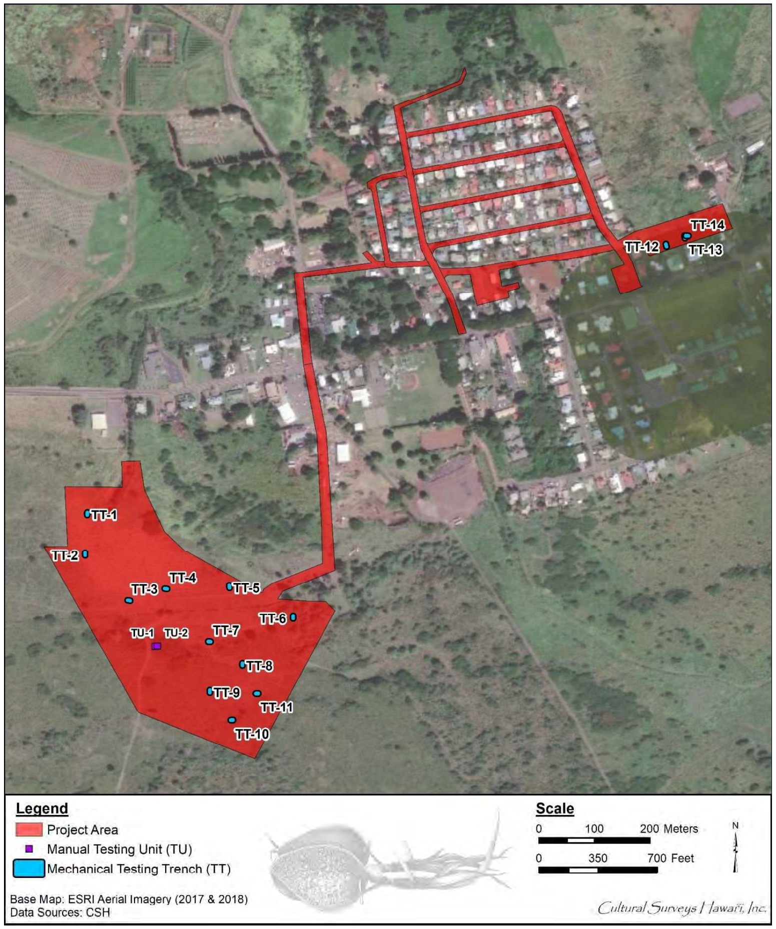

Figure 47. Aerial photograph (ESRI 2017 and 2018) showing the locations of mechanical test trenches (TT) and manual test units (TU) throughout the project area

4.2.1.1 Test Trench 1 (TT-1)

Test Trench 1 (TT-1) was located in the northern portion of the proposed treatment facility site where a disposal grove is planned for development (see Figure 10 and Figure 47). Figure 48 shows TT-1 marked out with orange flagging tape prior to excavation. TT-1 measured approximately 5m long by 1 m wide. It was excavated to a maximum depth of 262 cmbs through one layer of yellowish brown silty clay loam (Stratum I) and terminated at the physical limitations of the excavator (Figure 49 through Figure 51 and Table 5). No subsurface features or cultural materials were observed within TT-1. Modern rubbish is scattered across the ground surface in proximity to TT-1, most likely washout from the nearby drainage channel (-31268).

The sediments encountered at TT-1 do not appear to reflect the natural Punaluu extremely rocky peat, 6 to 20 percent slopes (rPYD) soil type anticipated in this area (see Section 1.3.1 and Figure 9). Sato et al. (1973:48) describe these as thin soils with dark-colored peat characteristics; the representative profile information provided by Sato et al. (1973:49) describe a layer of black peat only 4 inches thick atop bedrock. While we can expect to see some deviation in profile characteristics within a given soil type, the TT-1 profile is quite different. Here we see a deep, yellowish brown silty clay loam. The deviance in soil characteristics may be due to prior agricultural use of the area and/or its location adjacent to an existing drainage channel, where overflow sediments may have accumulated over time. Evidence of the former interpretation is found in the presence of the scattered modern trash on the ground surrounding the trench. Alternatively, these sediments may represent deposit(s) of "Pahala Ash" known to be present in the Ka Lae area.

Figure 48. Photograph of TT-1 marked out with flagging tape prior to excavation; view to east

Figure 49. Photograph of TT-1 post-excavation; view to northwest

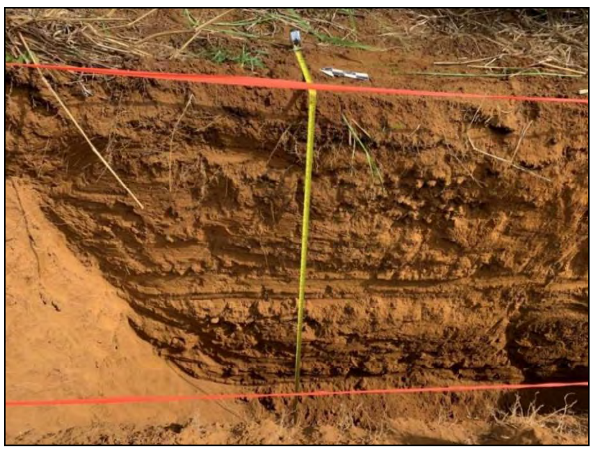

Figure 50. Photograph of TT-1 east sidewall profile; view to east

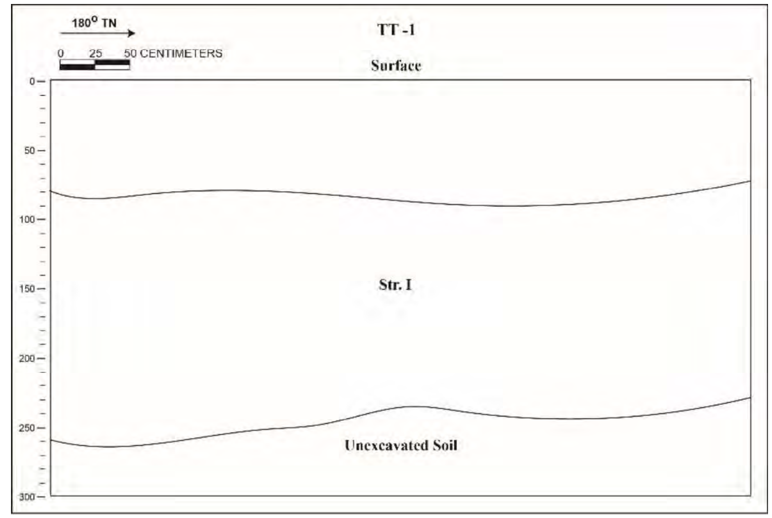

Figure 51. Profile of TT-1 east sidewall

Table 5. TT-1 Stratigraphic Description

Stratum	Depth (cmbs)	Description of Sediment
I	0-262	10YR, 5/6, yellowish brown; silty clay loam; fine, granular structure; moist, very friable consistence; weak cementation; non plastic; terrigenous; lower boundary not exposed; few, fine roots; no cultural material present

4.2.1.2 Test Trench 2 (TT-2)

Test Trench 2 (TT-2) was located in the northern portion of the proposed treatment facility site where a disposal grove is planned for development (see Figure 10 and Figure 47). Figure 52 shows TT-2 marked out with orange flagging tape prior to excavation. TT-2 measured approximately 5m long by 1 m wide. It was excavated to a maximum depth of 180 cmbs through three layers pf yellowish brown silty clay loam (Strata I, II and III) and one layer of potential Punaluu series sediment (Stratum IV), and terminated at basalt bedrock (Figure 53 through Figure 55 and Table 6). No subsurface features or cultural materials were observed within TT-2.

The sediments encountered at TT-2 are similar to those observed at TT-1, except for the base (Stratum IV) layer of darker silt loam that may represent a form of natural Punaluu series sediment. Strata I and III exhibit essentially identical characteristics, potentially signifying typical sedimentary accumulation interrupted by a significant flooding event (gravelly Stratum II). If the Strata I and III sediments are in fact Pahala Ash, their relationship to Stratum II is unclear.

Figure 52. Photograph of TT-2 marked out with flagging tape prior to excavation; view to southwest

Figure 53. Photograph of TT-2 post-excavation; view to southeast

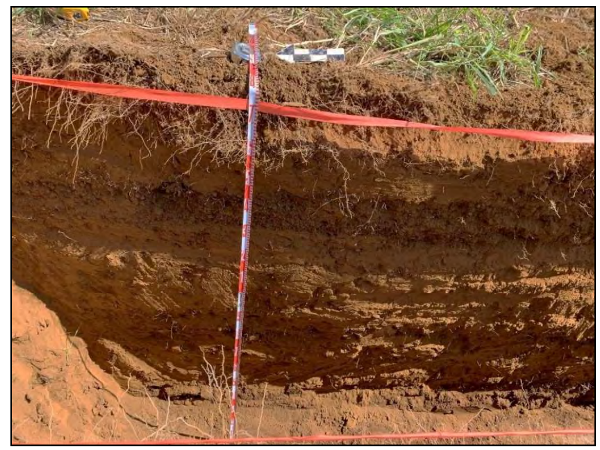

Figure 54. Photograph of TT-2 east sidewall profile; view to east

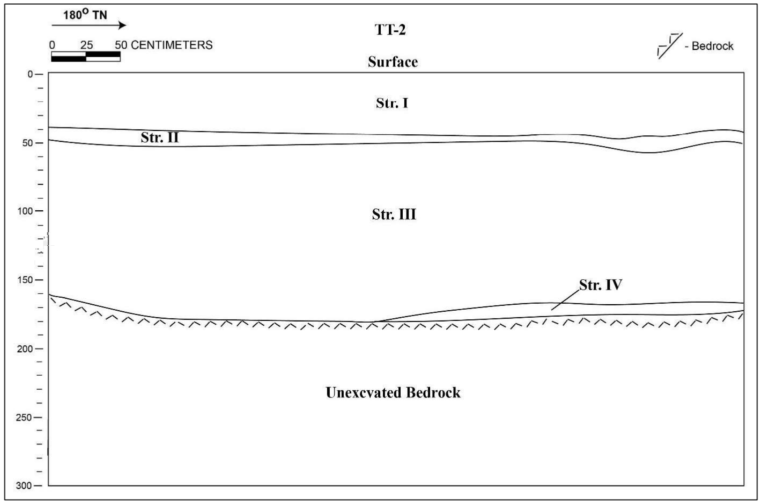

Figure 55. Profile of TT-2 east sidewall

Table 6. TT-2 Stratigraphic Description

Stratum	Depth (cmbs)	Description of Sediment
I	0-45	10YR 4/4, dark yellowish brown; silty clay loam; fine, granular structure; moist, very friable consistence; weak cementation; non plastic; terrigenous; clear, smooth lower boundary; fine to medium roots common; no cultural material present
II	45-52	10YR 5/6, yellowish brown; extremely gravely silty clay loam; fine, granular structure; moist, very friable consistence; weak cementation; non plastic; terrigenous; clear, smooth lower boundary; no roots observed; no cultural material present
III	50-180	10YR 4/4, dark yellowish brown; silty clay loam; fine, granular structure; moist, very friable consistence; weak cementation; non plastic; terrigenous; clear, smooth lower boundary, terminating in northern end of trench on bedrock; no roots observed; no cultural material present
IV	165-180	10YR 4/2, dark grayish brown; silty loam; fine, granular structure; moist, very friable consistence; weak cementation; non plastic; terrigenous; abrupt, smooth lower boundary, terminating at bedrock; no roots observed; no cultural material present

4.2.1.3 Test Trench 3 (TT-3)

Test Trench 3 (TT-3) was located near the central portion of the proposed treatment facility site where a disposal grove is planned for development (see Figure 10 and Figure 47). Figure 56 shows TT-3 marked out with orange flagging tape prior to excavation. TT-3 measured approximately 5m long by 1 m wide. It was excavated to a maximum depth of 120 cmbs through two layers of yellowish brown silty clay loam (Strata I and II) and terminated at basalt bedrock (Figure 57 through Figure 59 and Table 7). No charcoal or cultural materials were observed within TT-3.

The sediments observed at TT-3 are similar to those observed at TTs -1 and -2 in the vicinity, potentially representing sediment accumulation from drainage runoff or with Pahala Ash deposition(s).

Figure 56. Photograph of TT-3 marked out with flagging tape prior to excavation; view to north

Figure 57. Photograph of TT-3 post-excavation; view to northeast

Figure 58. Photograph of TT-3 north sidewall profile; view to north

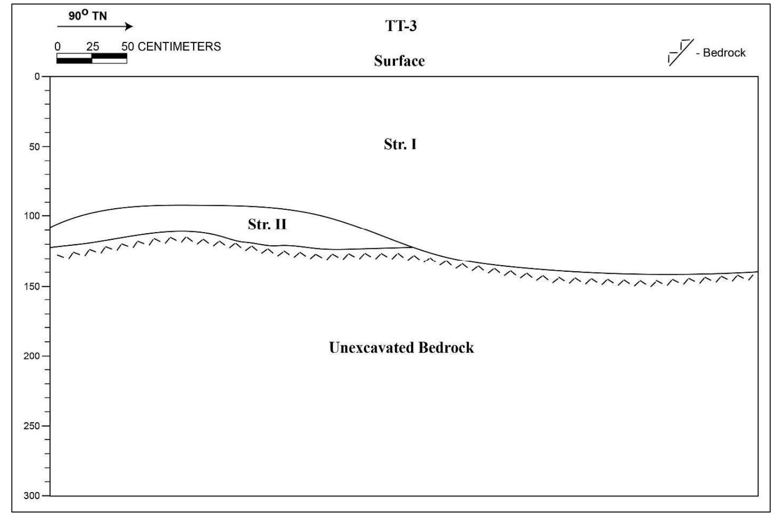

Figure 59. Profile of TT-3 north sidewall

Table 7. TT-3 Stratigraphic Description

Stratum	Depth (cmbs)	Description of Sediment
I	0-138	10YR 5/8, yellowish brown; fine, granular structure; moist, very friable consistence; weak cementation; non plastic; terrigenous; clear, wavy lower boundary; no roots observed; no cultural material present
II	90-120	10YR 4/4, dark yellowish brown; silty clay loam; fine, granular structure; moist, very friable consistence; weak cementation; non plastic; terrigenous; abrupt, smooth lower boundary, terminating at bedrock; no roots observed; no cultural material present

4.2.1.4 Test Trench 4 (TT-4)

Test Trench 4 (TT-4) was located near the central portion of the proposed treatment facility site where a disposal grove is planned for development (see Figure 10 and Figure 47). Figure 60 shows TT-4 marked out with orange flagging tape prior to excavation. TT-4 measured approximately 5m long by 1 m wide. It was excavated to a maximum depth of 100 cmbs through two layers of yellowish brown silty clay loam (Strata I and II) and terminated at basalt bedrock (Figure 61 through Figure 63 and Table 8). No subsurface features or cultural materials were observed within TT-4.

The sediments observed at TT-4 are similar to those observed at TTs -1–3 in the vicinity, potentially representing sediment accumulation from drainage runoff or with Pahala Ash deposition(s).

Figure 60. Photograph of TT-4 marked out with flagging tape prior to excavation; view to north

Figure 61. Photograph of TT-4 post-excavation; view to northwest

Figure 62. Photograph of TT-4 north sidewall, view to the north

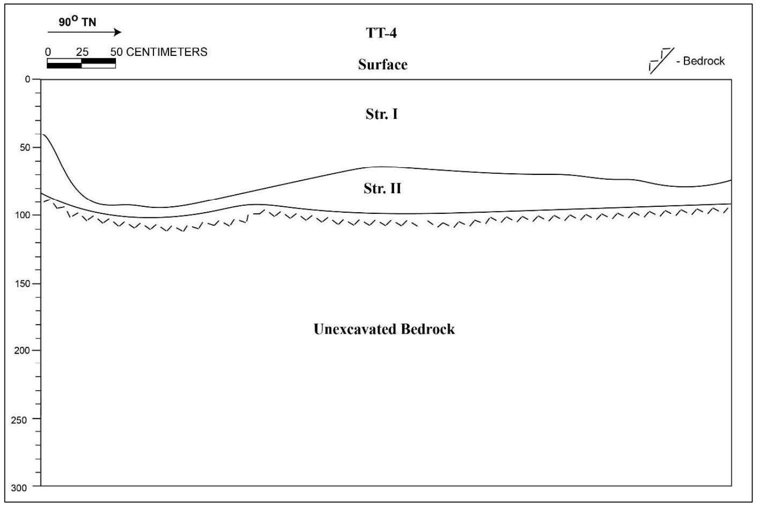

Figure 63. Profile of TT-4 north sidewall

Table 8. TT-4 Stratigraphic Description

Stratum	Depth (cmbs)	Description of Sediment
I	0-90	10 YR 5/6, yellowish brown; silty clay loam; fine, granular structure; moist, very friable consistence; weak cementation; non plastic; terrigenous; clear, wavy lower boundary; many, fine roots; no cultural material present
II	40-100	10YR 3/4, dark yellowish brown; silty clay loam; fine, granular structure; moist, very friable consistence; weak cementation; non plastic; terrigenous; abrupt, smooth lower boundary, terminating at bedrock; few, fine roots; no cultural material present

4.2.1.5 Test Trench 5 (TT-5)

Test Trench 5 (TT-5) was located in the northern-central portion of the proposed treatment facility site where the drainage channel realignment is planned for development (see Figure 10 and Figure 47). Figure 64 shows TT-5 marked out with orange flagging tape prior to excavation. TT-5 measured approximately 5 m long by 1 m wide. It was excavated to a maximum depth of 50 cmbs through a single layer of dark yellowish brown silty clay loam (Strata I) and terminated at basalt bedrock (Figure 65 through Figure 67 and Table 9). No subsurface features or cultural materials were observed within TT-5.

The sediments observed at TT-5 are similar to those observed at TTs -1–4 in the vicinity. While the sediment profile is considerably shallower, it lacks the darker-colored peat attributes associated with the Kaimu and Punaluu series sediments understood to characterize this area (see Section 1.3.1 and Figure 9). The sediments at TT-5 are therefore assessed as potentially representing sediment accumulation from drainage runoff or with Pahala Ash deposition(s).

Figure 64. Photograph of TT-5 marked out with flagging tape prior to excavation, view to west

Figure 65. Photograph of TT-5 post excavation; view to the northwest

Figure 66. Photograph of TT-5 west sidewall, view to west

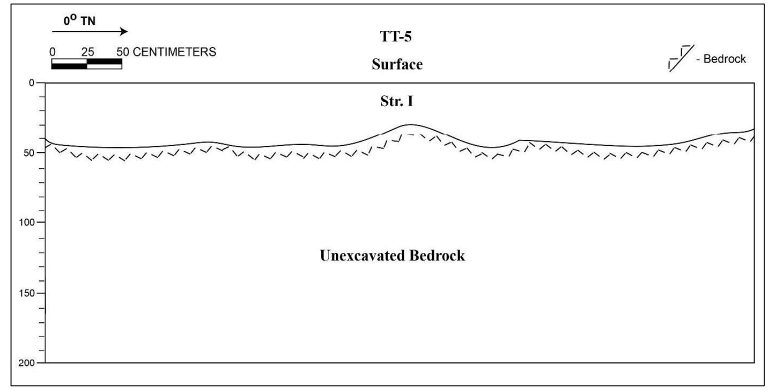

Figure 67. Profile of TT-5 west sidewall

Table 9. TT-5 Stratigraphic Description

Stratum	Depth (cmbs)	Description of Sediment
I	0-50	10YR 4/4, dark yellowish brown; silty clay loam; fine, granular structure; moist, very friable consistence; weak cementation; non plastic; terrigenous; abrupt, smooth lower boundary, terminating at bedrock; many, fine/medium roots; no cultural material present

4.2.1.6 Test Trench 6 (TT-6)

Test Trench 6 (TT-6) was located in the eastern portion of the proposed treatment facility site where the realigned drainage channel outlet is planned for development (see Figure 10 and Figure 47). Figure 68 shows TT-6 marked out with orange flagging tape prior to excavation. TT-6 measured approximately 5 m long by 1 m wide. It was excavated to a maximum depth of 90 cmbs through one layer of dark yellowish brown silty clay loam (Stratum I) and one layer of dark brown silt loam (Stratum II) and terminated at basalt bedrock (Figure 69 through Figure 71 and Table 10). No subsurface features or cultural materials were observed within TT-6.

The sediments observed at TT-6 appear to include a variation of the yellowish brown silty clay loam seen at TTs -1–5 atop a darker, more stony silt loam that may represent a form of the natural Kaimu series soils understood to characterize this area (see Section 1.3.1 and Figure 9).

Figure 68. Photograph of TT-6 marked out with flagging tape prior to excavation; view to southeast

Figure 69. Photograph of TT-6 post-excavation; view to west

Figure 70. Photograph of TT-6 east sidewall profile, view to east

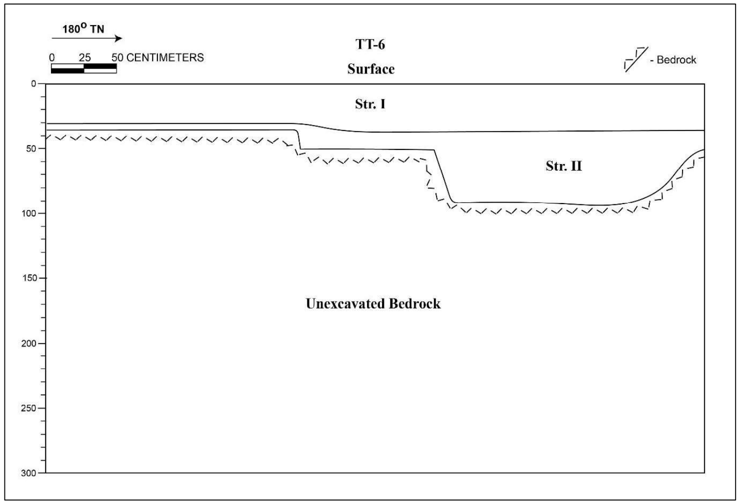

Figure 71. Profile of TT-6 east sidewall

Table 10. TT-6 Stratigraphic Description

Stratum	Depth (cmbs)	Description of Sediment
I	0-40	10YR 4/4, dark yellowish brown; stony silty clay loam; fine, granular structure; moist, very friable consistence; weak cementation; non plastic; terrigenous; clear, smooth lower boundary; many, very fine/fine roots; no cultural material present
II	40-90	10YR 3/3, dark brown; extremely stony silt loam; fine, granular structure; moist, very friable consistence; weak cementation; non plastic; terrigenous; abrupt, wavy lower boundary, terminating at bedrock; no roots observed; no cultural material present

4.2.1.7 Test Trench 7 (TT-7)

Test Trench 7 (TT-7) was located near the central portion of the proposed treatment facility site where a disposal grove is planned for development (see Figure 10 and Figure 47). Figure 72 shows TT-7 marked out with orange flagging tape prior to excavation. TT-7 measured approximately 5 m long by 1 m wide. It was excavated to a maximum depth of 95 cmbs through two layers of yellowish brown silty clay loam (Strata I and II) and one layer of dark grayish brown silt loam (Stratum III) and terminated at basalt bedrock (Figure 73 through Figure 75 and Table 11). No subsurface features or cultural materials were observed within TT-7.

The sediments observed at TT-7 appear to include variations of the yellowish brown silty clay loams seen at TTs -1–6 atop a darker, more stony silt loam that may represent a form of the natural Punaluu series soils understood to characterize this area (see Section 1.3.1 and Figure 9).

Figure 72. Photograph of TT 7 marked out with flagging tape prior to excavation; view to north

Figure 73. Photograph of TT-7 post-excavation; view to north

Figure 74. Photograph of TT-7 north sidewall profile; view to north

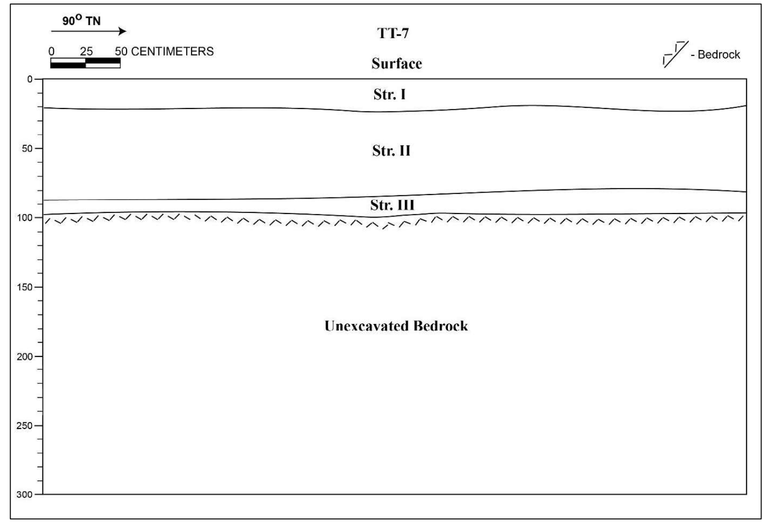

Figure 75. Profile of TT-7 north sidewall

Table 11. TT-7 Stratigraphic Description

Stratum	Depth (cmbs)	Description of Sediment
I	0-20	10 YR 4/4, dark yellowish brown; silty clay loam; fine, granular structure; moist, very friable consistence; weak cementation; non plastic; terrigenous; clear, smooth lower boundary; few, fine roots; no cultural material present
II	20-85	10 YR 5/6, yellowish brown; silty clay loam; fine, granular structure; moist, very friable consistence; weak cementation; non plastic; terrigenous; clear, smooth lower boundary; no roots observed; no cultural material present
III	80-95	10 YR 4/2, dark grayish brown; extremely stony silt loam; fine, granular structure; moist, very friable consistence; weak cementation; slightly plastic; terrigenous; abrupt, smooth lower boundary, terminating at bedrock; many, fine roots; no cultural material present

4.2.1.8 Test Trench 8 (TT-8)

Test Trench 8 (TT-8) was located in the southern-central portion of the proposed treatment facility site where a wetland and operations buildings are planned for development (see Figure 10 and Figure 47). Figure 76 shows TT-8 marked out with orange flagging tape prior to excavation. TT-8 measured approximately 5 m long by 1 m wide. It was excavated to a maximum depth of 90 cmbs through to layers of silty clay loam (Strata I and II) and terminated at basalt bedrock (Figure 77 through Figure 79 and Table 12). No subsurface features or cultural materials were observed within TT-8.

The sediments observed at TT-8 are similar to those observed at TTs -1–7 in the vicinity, potentially representing sediment accumulation from drainage runoff or with Pahala Ash deposition(s).

Figure 76. Photograph of TT-8 marked out with flagging tape prior to excavation; view to west

Figure 77. Photograph of TT-8 post-excavation; view to west

Figure 78. Photograph of TT-8 east sidewall profile; view to east

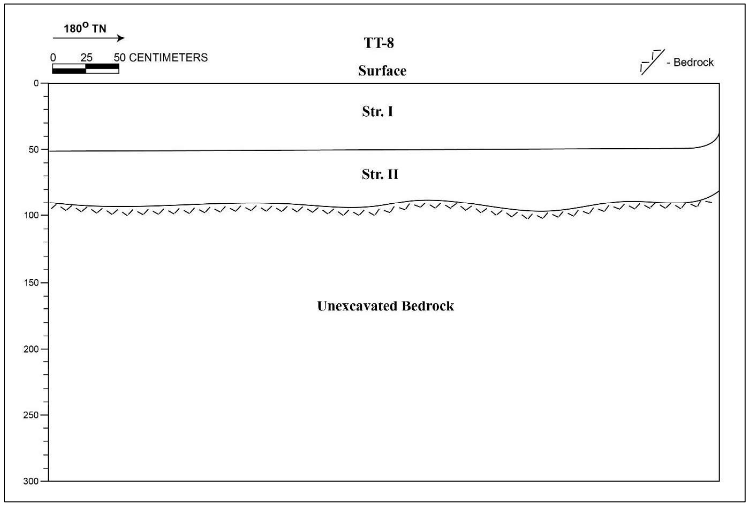

Figure 79. Profile of TT-8 east sidewall

Table 12. TT-8 Stratigraphic Description

Stratum	Depth (cmbs)	Description of Sediment
I	0-50	10 YR 5/8, dark yellowish brown; silty clay loam; fine, granular structure; moist, very friable consistence; weak cementation; non plastic; terrigenous; clear, smooth lower boundary; few, fine roots; no cultural material present
II	45-95	10 YR 4/3, brown; silty clay loam; fine, granular structure; moist, very friable consistence; weak cementation; non plastic; terrigenous; abrupt, wavy lower boundary, terminating at bedrock; many, fine roots; no cultural material present

4.2.1.9 Test Trench 9 (TT-9)

Test Trench 9 (TT-9) was located in the southern-central portion of the proposed treatment facility site where treatment lagoons are planned for development (see Figure 10 and Figure 47). Figure 80 shows TT-9 marked out with orange flagging tape prior to excavation. TT-9 measured approximately 5 m long by 1 m wide. It was excavated to a maximum depth of 52 cmbs through a single layer of dark yellowish brown silty clay loam (Strata I) and terminated at basalt bedrock (Figure 81 through Figure 83 and Table 13). No charcoal or cultural materials were observed within TT-9.

The sediments observed at TT-9 are similar to those observed at TTs -1–8 in the vicinity, potentially representing sediment accumulation from drainage runoff or with Pahala Ash deposition(s).

Figure 80. Photograph of TT-9 marked out with flagging tape prior to excavation; view to east

Figure 81. Photograph of TT-9 post-excavation; view to east

Figure 82. Photograph of TT-9 west sidewall profile; view to west

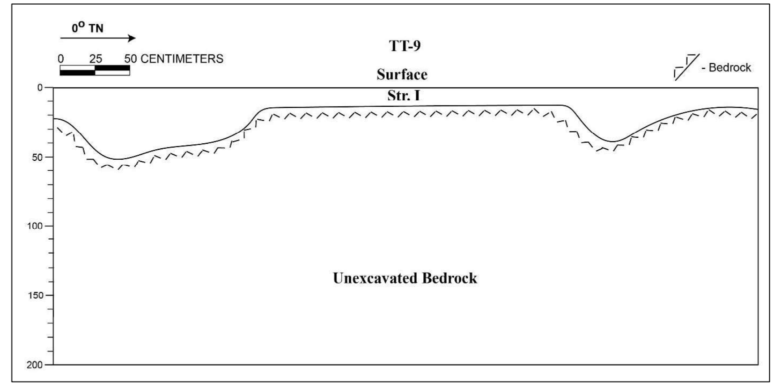

Figure 83. Profile of TT-9 west sidewall

Table 13. TT-9 Stratigraphic Description

Stratum	Depth (cmbs)	Description of Sediment
I	0-52	10YR 3/4, dark yellowish brown; silty clay loam; fine, granular structure; moist, very friable consistence; weak cementation; non plastic; terrigenous; abrupt, wavy lower boundary; few, very fine roots; no cultural material present

4.2.1.10 Test Trench 10 (TT-10)

Test Trench 10 (TT-10) was located near the southern corner of the proposed treatment facility site where a treatment lagoon is planned for development (see Figure 10 and Figure 47). Figure 84 shows TT-10 marked out with orange flagging tape prior to excavation. TT-10 measured approximately 5 m long by 1 m wide. It was excavated to a maximum depth of 55 cmbs through one layer of yellowish brown silty clay loam (Stratum I) and one layer of dark grayish brown silt loam (Stratum II) and terminated at basalt bedrock (Figure 85 through Figure 87 and Table 14). No subsurface features or cultural materials were observed within TT-10.

USDA soil survey data indicate TT-10 is within an area characterized by the miscellaneous land type "rock land" (*pāhoehoe* bedrock covered in places by a thin layer of soil, per Sato et al. 1972:51; see Section 1.3.1 and Figure 9). However, the sediments observed at TT-10 appear to include a variation of the yellowish brown silty clay loams seen at TTs-1–9 atop a darker, more stony silt loam that may represent a form of the natural Punaluu series soils, which are also understood to be present nearby to the north.

Figure 84. Photograph of TT-10 marked out with flagging tape prior to excavation, view to west

Figure 85. Photograph of TT-10 post-excavation; view to west

Figure 86. Photograph of TT-10 west wall; view to west

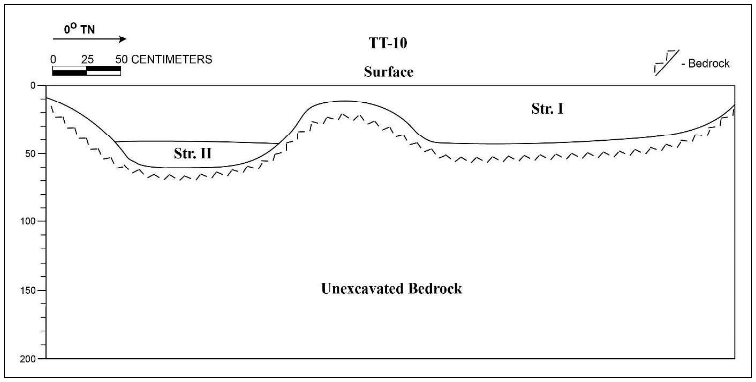

Figure 87. Profile of TT-10 west sidewall

Table 14. TT-10 Stratigraphic Description

Stratum	Depth (cmbs)	Description of Sediment
I	0-40	10 YR 4/4, dark yellowish brown; silty clay loam; fine, granular structure; moist, very friable consistence; weak cementation; non plastic; terrigenous; clear to abrupt, smooth lower boundary, terminating at bedrock where not underlain by Stratum II; few, fine roots; no cultural material present
II	40-55	10 YR 4/2, dark grayish brown; extremely stony silt loam; fine, granular structure; moist, very friable consistence; weak cementation; non plastic; terrigenous; abrupt, smooth lower boundary, terminating at bedrock; many, fine roots; no cultural material present

4.2.1.11 Test Trench 11 (TT-11)

Test Trench 11 (TT-11) was located in the southeastern corner of the proposed treatment facility site where a treatment lagoon is planned for development (see Figure 10 and Figure 47). Figure 88 shows TT-11 marked out with orange flagging tape prior to excavation. TT-11 measured approximately 5 m long by 1 m wide. It was excavated to a maximum depth of 35 cmbs through a single layer of dark yellowish brown silty clay loam (Stratum I) and terminated at basalt bedrock (Figure 89 through Figure 91 and Table 15). No subsurface features or cultural materials were observed within TT-11.

The sediments observed at TT-11 are similar to those observed at TTs-1–10 in the vicinity, potentially representing sediment accumulation from drainage runoff or with Pahala Ash deposition(s).

Figure 88. Photograph of TT-11 marked out with flagging tape prior to excavation; view to north

Figure 89. Photograph of TT-11 post-excavation; view to north

Figure 90. Photograph of TT-11 south sidewall, view to south

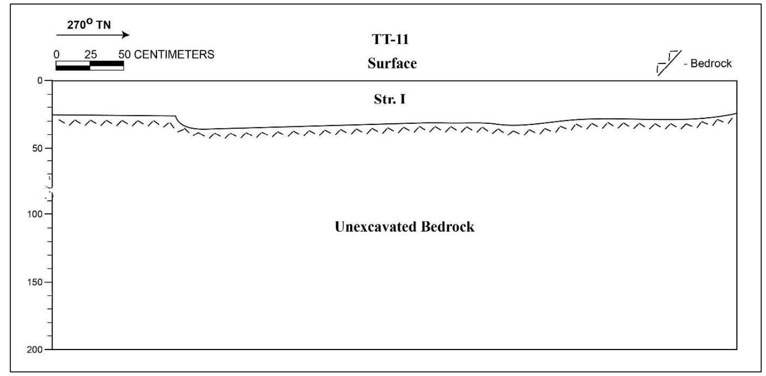

Figure 91. Profile of TT-11 south sidewall

Table 15. TT-11 Stratigraphic Description

Stratum	Depth (cmbs)	Description of Sediment
I	0-35	10YR 4/6, dark yellowish brown; silty clay loam; silty clay loam; fine, granular structure; moist, very friable consistence; weak cementation non plastic; terrigenous; abrupt, smooth lower boundary, terminating at bedrock; few, fine roots; no cultural material present

4.2.1.12 Test Trench 12 (TT-12)

Test Trench 12 (TT-12) was located within the central portion of the proposed pump station site at TMK: (3) 9-5-008:048, along the route of an access and utility easement planned for development (see Figure 11 and Figure 47). Figure 92 shows TT-12 marked out with orange flagging tape prior to excavation. TT-12 measured approximately 5 m long by 1 m wide. It was excavated to a maximum depth of 145 cmbs through two layers of natural Naalehu series sediment (Strata I and II) and terminated at basalt bedrock (Figure 93 through Figure 95 and Table 16). No subsurface features or cultural materials were observed within TT-12.

The sediments observed at TT-12 were as expected given the natural soil type understood to characterize this portion of the project area.

Figure 92. Photograph of TT-12 marked out with flagging tape prior to excavation; view to east

Figure 93. Photograph of TT-12 post-excavation; view to east

Figure 94. Photograph of TT-12 west sidewall profile; view to west

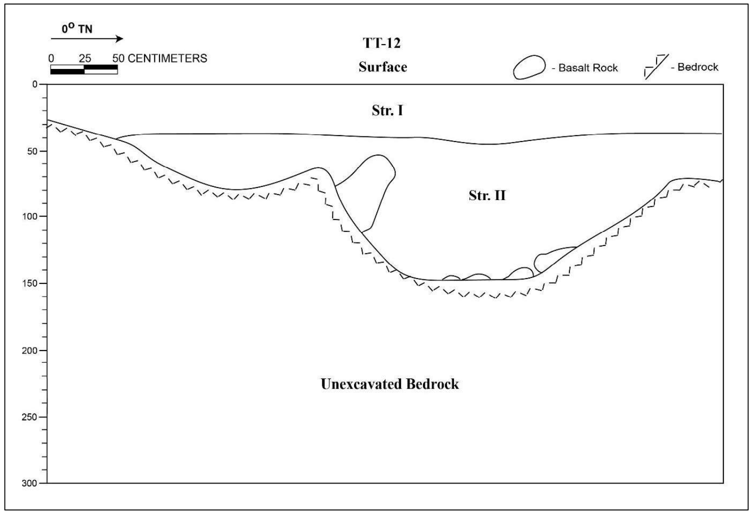

Figure 95. Profile of TT-12 west sidewall

Table 16. TT-12 Stratigraphic Description

Stratum	Depth (cmbs)	Description of Sediment
I	0-45	10YR 4/4, dark yellowish brown; silty clay loam; fine, granular structure; moist, very friable consistence; weak cementation; non plastic; terrigenous; diffuse, smooth lower boundary; many, fine roots; no cultural material present
II	40-145	5YR 5/6, yellowish red; silty clay loam; fine, granular structure; moist, very friable consistence; weak cementation; non plastic; terrigenous; abrupt, wavy lower boundary, terminating at bedrock; few, fine roots; no cultural material present

4.2.1.13 Test Trench 13 (TT-13)

Test Trench 13 (TT-13) was located within the central portion of the proposed pump station site at TMK: (3) 9-5-008:048, where pump station structures are planned for development (see Figure 11 and Figure 47). Figure 96 shows TT-13 marked out with orange flagging tape prior to excavation. TT-13 measured approximately 5 m long by 1 m wide. It was excavated to a maximum depth of 110 cmbs through two layers of natural Naalehu series sediments (Strata I and II) and terminated at basalt bedrock (Figure 97 through Figure 99 and Table 18). No subsurface features were observed within TT-13; a modern soda can was observed at approximately 40–60 cmbs (in Stratum I).

The sediments observed at TT-13 were similar to those observed at TT-12 and were as expected given the natural soil type understood to characterize this portion of the project area. The presence of a soda can within Stratum I indicates some level of prior disturbance in this area.

Figure 96. Photograph of TT-13 marked out with flagging tape prior to excavation; view to northwest

Figure 97. Photograph of TT-13 post-excavation; view to northeast

Figure 98. Photograph of TT-13 east sidewall, view to the east

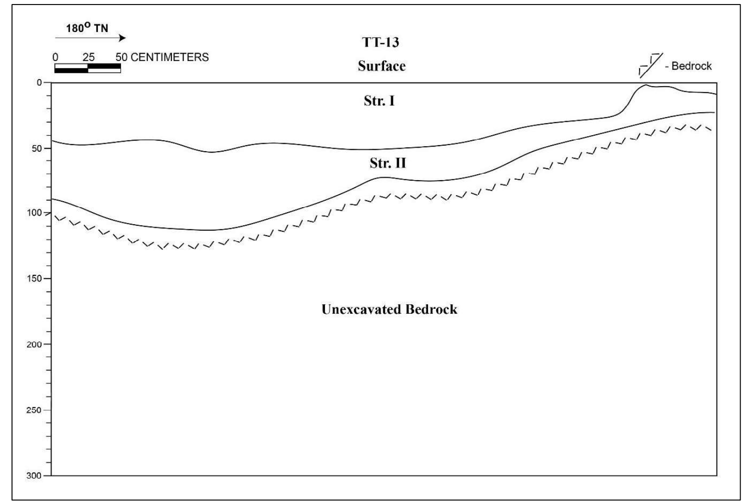

Figure 99. Profile of TT-13 east sidewall

Table 17. TT-13 Stratigraphic Description

Stratum	Depth (cmbs)	Description of Sediment
I	0-50	10YR 3/3, dark brown; silty clay loam; silty clay loam; fine, granular structure; moist, very friable consistence; weak cementation; non plastic; terrigenous; diffuse, wavy lower boundary; many, fine roots; no cultural material present
II	45-110	5YR 5/6, yellowish red; silty clay loam; fine, granular structure; moist, very friable consistence; weak cementation; non plastic; terrigenous; abrupt, wavy lower boundary, terminating at bedrock; few, fine roots; no cultural material present

4.2.1.14 Test Trench 14 (TT-14)

Test Trench 14 (TT-14) was located within the central portion of the proposed pump station site at TMK: (3) 9-5-008:048, where pump station structures are planned for development (see Figure 11 and Figure 47). Figure 100 shows TT-14 marked out with orange flagging tape prior to excavation. TT-14 measured approximately 5 m long by 1 m wide. It was excavated to a maximum depth of 70 cmbs through two layers of natural Naalehu series sediment (Strata I and II) and terminated at basalt bedrock (Figure 101 through Figure 103 and Table 18). No subsurface features or cultural materials were observed within TT-14.

The sediments observed at TT-14 were similar to those observed at TTs-12 and -13 and were as expected given the natural soil type understood to characterize this portion of the project area.

Figure 100. Photograph of TT 14 marked out with flagging tape prior to excavation; view to south

Figure 101. Photograph of TT 14 post-excavation; view to southwest

Figure 102. Photograph of TT 14 north sidewall profile; view to east

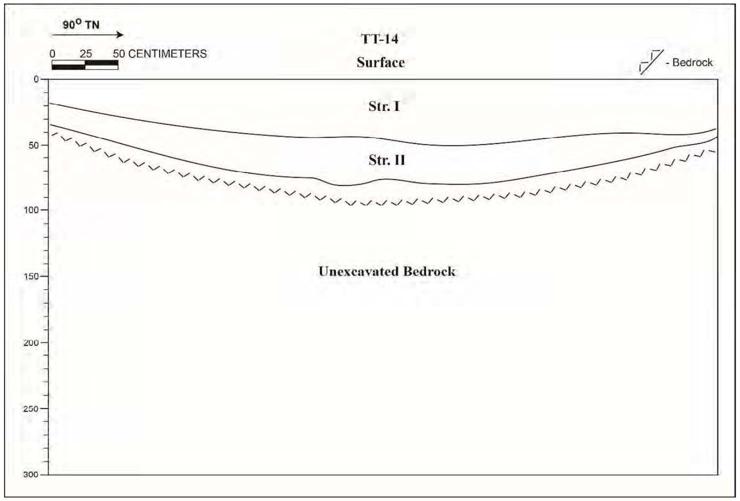

Figure 103. Profile of TT 14 north sidewall

Table 18. TT 14 Stratigraphic Description

Stratum	Depth (cmbs)	Description of Sediment
I	0-50	10YR 3/3, dark brown; silty clay loam; silty clay loam; fine, granular structure; dry, very friable consistence; weak cementation; non plastic; terrigenous; diffuse, wavy lower boundary; many, fine roots; no cultural material present
II	20-70	5YR 3/4, dark reddish brown; silty clay loam; fine, granular structure; moist, very friable consistence; weak cementation; non plastic; terrigenous; abrupt, smooth lower boundary, terminating at bedrock; few, fine roots; no cultural material present

4.2.2 Manual Test Excavations

Two 1-m by 1-m test units (TU) were excavated by hand at SIHP # -30929 in an attempt to yield data to support assessments of site age and function (see Figure 47). TU-1 at SIHP # -30929 Feature A contained cultural material which was collected for laboratory analysis (see Section 5). TU-2 at SIHP # -30929 Feature B was culturally sterile.

4.2.2.1 Test Unit 1 (TU-1)

Test Unit 1 (TU-1) was excavated within the central portion of SIHP # -30929 Feature A, which is located in the natural depression within the proposed treatment facility site (see Figure 47 and Section 6.3). The unit was placed within the central area of the feature where a notable slab type stone was observed to cover a void. Figure 104 shows TU-1 marked out with pin flags and string prior to excavation. TU-1 measured approximately 1-m-sq. TU-1 was excavated to a maximum depth of 78 cmbs through a single layer of very dark grayish brown stony silty loam (Stratum I) containing basalt cobbles and small boulders (Figure 105 through Figure 107 and Table 19). An adze fragment and a coral abrader were observed at approximately 64 cmbs (110 cm below datum [cmbd]) and 69 cmbs (115 cmbd), respectively, in pockets of sediment in between the larger subsurface rock materials. Small charcoal fragments or flecks were observed distributed evenly throughout the unit from 14 cmbs (60 cmbd) to the base of excavation, which terminated at basalt bedrock. These materials, including the largest pieces of charcoal identified, were collected for laboratory analysis (see Section 5).

The sedimentary profile observed at TU-1 indicates Feature A was constructed in a very rocky area exhibiting an accumulation of natural silt loam sediments.

Figure 104. Photograph of TU-1 marked out with pin flags and string prior to excavation, view to southwest

Figure 105. Photograph of TU-1 post-excavation; view to southwest

Figure 106. Photograph of TU-1 southwest sidewall profile; view to southwest

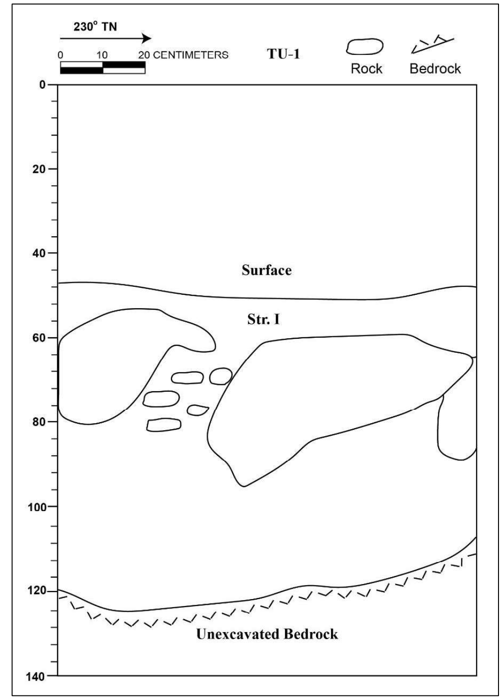

Figure 107. Profile of TU-1 (showing depths in cm below datum)

Table 19. TU 1 Stratigraphic Description

Stratum	Depth (cmbd)	Description of Sediment
I	46-124	10YR 3/2, very dark grayish brown; very stony silty loam; fine, granular structure; dry, loose consistence; weak cementation; non plastic; terrigenous; abrupt, smooth boundary, terminating at bedrock; many very fine to coarse roots; cultural materials present including an adze fragment at 110 cmbd, coral abrader at 115 cmbd, and charcoal fragments from 60 cmbd to base of excavation

4.2.2.2 Test Unit 2 (TU-2)

Test Unit 2 (TU-2) was excavated near the center of SIHP # -30929 Feature B, which is located in the natural depression within the proposed treatment facility site (see Figure 47 and Section 6.3). The unit was placed in a portion of the feature containing both architectural materials and sedimentary deposit. Figure 108 shows TU-2 marked out with string prior to excavation. TU-2 measured approximately 1-m-sq. It was excavated to a maximum depth of 41 cmbs through one layer of very dark grayish brown; silty loam (Figure 109 through Figure 111 and Table 20). Large interlocking basalt boulders were not removed, but soil was excavated to bedrock. No cultural materials were observed within TU-2.

The sedimentary profile observed at TU-2 indicates the Feature B architecture was constructed atop basalt bedrock. The silt loam sediments represent a subsequent natural soil accumulation within the Feature B construction.

Figure 108. Photograph of TU-2 marked out with string prior to excavation, view to west

Figure 109. Photograph of TU-2 post-excavation; view to west

Figure 110. Photograph of TU-2 west sidewall profile; view to west

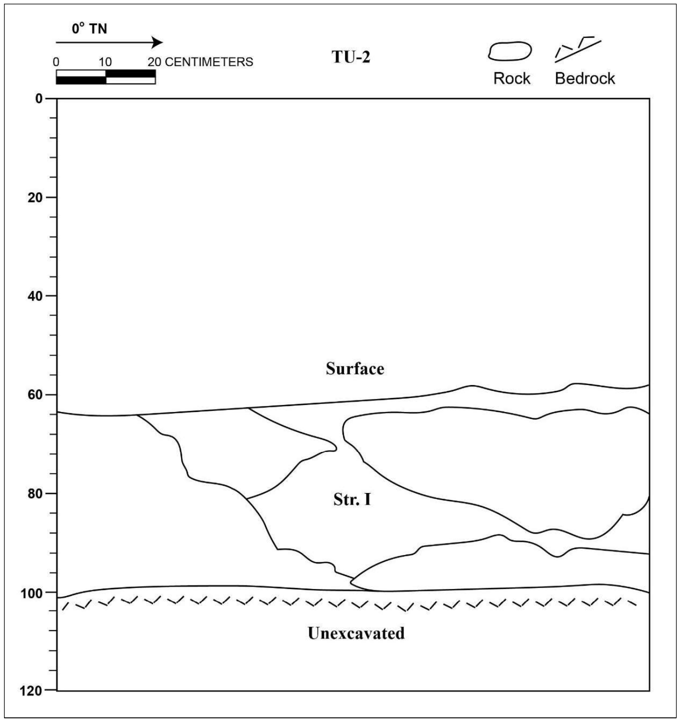

Figure 111. Profile of TU-2 west sidewall (showing depths in cm below datum)

Table 20. TU-2 Stratigraphic Description

Stratum	Depth (cmbs)	Description of Sediment
I	59-100	10YR 3/2, very dark grayish brown; extremely stony silty loam; fine, granular structure; dry, loose consistence; weak cementation; non plastic; terrigenous; abrupt, smooth lower boundary, terminating at bedrock; many very fine to coarse roots, no cultural material present

Section 5 Results of Laboratory Analysis

Collection of artifacts and cultural materials for laboratory analysis was undertaken as part of the AIS investigation. All materials collected from the project area for laboratory analysis were recovered from the screen (1/8-inch mesh) during excavation of TU-1 at SIHP # -30929 Feature A. The artifacts and cultural materials encountered during screening were noted on historic property description and/or excavation forms and assessed in the field for datable and/or representative characteristics. The materials selected for laboratory analysis were washed and sorted in the laboratory as applicable.

This section describes the findings of the laboratory analysis. Section 5.1 addresses the artifacts collected for analysis. Section 5.2 provides wood taxa and radiocarbon analysis results for select charcoal samples collected during test excavations.

5.1 Artifact Analysis

Two artifacts were collected from TU-1 at SIHP # -30929 Feature A. These artifacts are presented in Table 21. The artifacts include a basalt adze and coral abrader, which are generally assessed as traditional Hawaiian artefactual materials. These artifacts are discussed in greater detail in Section 5.1.1. No historic-era artifacts were discovered during excavation.

5.1.1 Traditional Hawaiian Artifacts

The artifacts encountered within the project area that could be associated with traditional or pre-contact land use include a lithic object (basalt adze) and a coral abrader (see Table 21).

Catalog #001 is a basalt adze (Figure 112) collected during excavation of TU-1. The artifact was encountered at 64 cmbs (110 cmbd) near the center of the unit. The artifact has a polished appearance with some chipping present on the beveled edge. It measures 6.44 cm long, 3.88 cm wide, and 2.24 cm thick, with a weight of 111.1 g. The adze was sent to the UH-Hilo geoarchaeology lab for EDXRF analysis in an attempt to ascertain information about the source the lithic material found in the project area (Section 5.1.1.1).

Catalog #003 is a coral abrader (Figure 113) collected during excavation of TU-1. The artifact was encountered at 69 cmbs (115 cmbd) in the northeastern quadrant of the unit. The irregular-shaped artifact is 3.09 cm long, 2.41 cm wide, and 2.36 cm thick. It weighs 10.5 g.

5.1.1.1 Energy-Dispersive X-ray Fluorescence (EDXRF) Results

The basalt adze found during excavation of TU-1 at SIHP # -30929 Feature A was submitted to the UH-Hilo geoarchaeology lab for EDXRF analysis. The results of this analysis are summarized in Table 22 and in Figure 114 and Figure 115; full report is in Appendix D. Dr Peter Mills provides the following analysis of the results:

> As I mentioned, this adze falls out smack dab in the middle of "Group F" which is common in Ka'u and Kona. In the Excel file, I plotted it against a backdrop of Bishop Museum artifacts that we analyzed from Waiahukini (H8) and other sites at Ka Lae [see Figure 114 and Figure 115], some of that data is presented in the attached Kahn et al. [2016] article, which also discusses Group F. Kilauea and Mauna Loa both produce lava flows with this range of geochemistry and EDXRF

Table 21. Artifact catalog (all materials collected from TU-1 at SIHP # -30929 Feature A)

Catalog #	Context (Stratum; depth)	Description	# of Pieces	Material Type	Dimensions (centimeters)	Weight (grams)	Photo Reference
001	Str. I; 64 cmbs	Basalt adze	1	Lithic	6.44 Long 3.88 Wide 2.24 Thick	111.1	Figure 112
003	Str. I; 69 cmbs	Coral Abrader	1	Coral	3.09 Long 2.41 Wide 2.36 Thick	10.5	Figure 113

Figure 112. Photos of Catalog #001, basalt adze

Figure 113. Photos of Catalog # 003, coral abrader

Table 22. EDXRF Results for Basalt Adze (Catalog #001) from TU-1

EDXRF Sample ID	Description	Rb (ppm)	Nb (ppm)	Sr (ppm)	Zr (ppm)	Source Interpretation
Kahilipalinui 3 Acc 1 TU1 -31270 fea b adze fragment 111.1g	Basalt adze	8	11	315	138	Group F (Kona and Ka'ū)

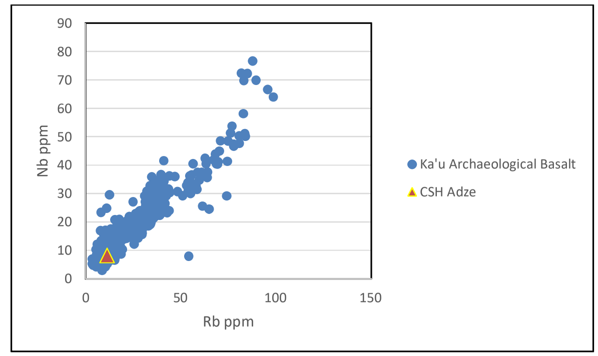

Figure 114. Bivariate plot showing Niobium (Nb) vs. Rubidium (Rb) ratios of "CSH Adze" in relation to other basalt samples from Ka'ū (courtesy UHH EDXRF Lab)

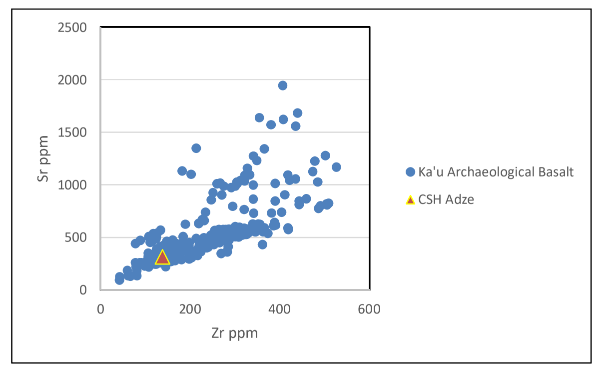

Figure 115. Bivariate plot showing Strontium (Sr) vs. Zirconium (Zr) ratios of "CSH Adze" in relation to other basalt samples from Ka'ū (courtesy UHH EDXRF Lab)

> is not great at sorting the two out in this geochemical range. [Dr Mills, 16 March 2021 email correspondence]

5.2 Charcoal Analysis

Procurement of charcoal samples for chronological analysis was one of the goals of the subsurface testing program. Charcoal was collected from the screen during excavation of TU-1 at SIHP # -30929 Feature A (Table 23). Small charcoal fragments or flecks were observed throughout the unit from 14 cmbs (60 cmbd) to the base of excavation; the largest pieces were collected for analysis.

A bulk sample comprising all of the collected charcoal was submitted for wood taxa identification; individual pieces identified as short-lived wood species were then submitted for radiocarbon analysis.

Table 23. Charcoal catalog (all materials collected from TU-1)

Catalog #	Context (stratum; depth)	Description	Weight (grams)
002	Str. I; 14 cmbs (60 cmbd) to BOE	Charcoal (9 pcs)	2.1

5.2.1 Wood Taxa Analysis

All of the charcoal collected from TU-1 at SIHP # -30929 Feature A (9 pieces) were submitted to the Wood Taxa Identification Lab (WIDL) on O'ahu for the purpose of identifying short-lived taxa appropriate for radiocarbon dating. Unfortunately, due to personnel issues at the WIDL, CSH was unable to obtain a full analysis report. A brief email summary was provided to CSH instead, focused on identifying which samples might be best suited for radiocarbon analysis:

> I am not able to identify all of the charcoal but I have looked through the sample for known historical introductions and found none. I also managed to pick out a couple of possibilities for radiocarbon dating. One is akoko (Euphorbia spp), a native shrub previously known as Chamaesyce. The second is aheahea (Chenopodium oahuense), another native shrub which is a tree at Pohakuloa. (Is your site near Pohakuloa?) There is only one piece of the aheahea so you may need to date the akoko instead. [Gail Murakami, 27 April 2021 email correspondence]

Notably, no historically introduced woods were identified in the charcoal sample. The pieces noted to be suitable for radiocarbon analysis consisted of '*akoko* (*Euphorbia* spp.) and *'aheahea* (*Chenopodium oahuense*). The following description of *'akoko* and its traditional uses comes from results of a wood taxa analysis completed for a prior CSH project on Hawai'i Island:

> EUPHORBIACEAE (Spurge family)
>
> *Euphorbia* spp. (*'Akoko*)
>
> Distribution of the 15 endemic Hawaiian shrubs and small trees in this genus range from coastal environments to upper forest zones on the main islands (Wagner et al. 1990:602-617). Eight native species, and a number of naturalized introductions, are found on Hawai'i Island today in a wide range of habitats. 'Akoko was once valued for firewood by the Hawaiians (Hillebrand 1981:396) and the milky sap was once considered a possible source for rubber (Rock 1974:261). Some members of this genus were once known as Chamaesyce but the Hawaiian species have since been reassigned to the genus Euphorbia (Govearts et al. 2000; Steinman and Porter 2002; Yang and Berry 2011). [Murakami 2020:3]

According to the Bishop Museum's online ethnobotany database, *'aheahea* in an endemic shrub that is part of the Chenopodiaceae family "Occurring as a common or occasional element of dry habitats, ranging from 0–2520 m from coastal zones to dry forest and subalpine shrubland (Wagner et al. 1990:538) on most main islands and some NWHI [North West Hawaiian Islands]," (Bishop Museum 2021). The plant was used traditionally for food and medicine, in the making of composite fishhooks, and for spiritual purposes (Bishop Museum 2021).

Some of the material within the bulk charcoal sample was identified as charred fragmental *kukui* or candlenut (*Aleurites moluccanus*) nutshell. The presence of *kukui* can be indicative of past land use and activity as these nuts were traditionally utilized for food, lighting, medicine, and other uses (Handy and Handy 1972:231–232). In an agricultural context they may have been used to enrich planting soils.

The bulk charcoal sample was returned to CSH. Of the sample, 1.7 g was marked as unidentified. The remaining 0.4 g of charcoal comprised the *'aheahea*, *'akoko*, and *kukui* nutshell samples, which were separated by type into small, labeled ziptop bags. Some of the charcoal pieces were shattered into smaller pieces throughout the process of shipping, handling, and identification activities. The *'aheahea* and *'akoko* samples were prepared for forwarding to Beta Analytic for radiocarbon analysis.

5.2.2 Radiocarbon Analysis

Following the recommendations of Gail Murakami from the WIDL, two charcoal samples representing short-lived wood species were submitted to Beta Analytic in Florida for radiocarbon analysis. These included the entirety of the *'akoko* (total = 0.3 g) and *'aheahea* (total = >0.1 g) charcoals from CSH Catalog # 002, collected from TU-1 at SIHP # -30929 Feature A. The two samples were assigned respectively by the Beta Analytic lab as "Beta-592957" (Beta sample code 2a) and "Beta-592958" (Beta sample code 2b); the results of the radiocarbon analyses for these samples are summarized in Table 24. The full Beta Analytic report is in Appendix E.

A 2-sigma calibration of the radiocarbon analysis of Sample Beta-592957 / 2a suggested four possible date ranges, AD 1656 to 1698 (19.2%), AD 1722 to 1814 (49.9%), AD 1836 to 1880 (7.3%), and AD 1910 to Post 1950 (19.0%), with the late pre-Contact/early post-Contact date range (1722 to 1814) being the most probable (see Table 24 and Figure 116).

A 2-sigma calibration of the radiocarbon analysis of Beta-592958 / 2b suggested three possible date ranges, AD 1666 to 1783 (42.8%), AD 1796 to 1894 (33.8%), and AD 1903 to Post 1950 (18.8%), with the late pre-Contact date range (1666 to 1783) being the most probable (see Table 24 and Figure 117).

Table 24. Radiocarbon dating analysis (2-sigma calibration) for short-lived species charcoal collected from TU-1

Laboratory Number / Sample Code	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age	2-Sigma Calibration (95.4% Probability)
Beta–592957 / 2a	101.06 +/- 0.37 pMC	-8.8 o/oo	180 +/- 30 BP	AD 1722 to 1814 (49.9%) AD 1656 to 1698 (19.2%) AD 1910 to Post 1950 (19.0%) AD 1836 to 1880 (7.3%)
Beta–592958 / 2b	150 +/- 30 BP	-25.2 o/oo	150 +/- 30	AD 1666 to 1783 (42.8%) AD 1796 to 1894 (33.8%) AD 1903 to Post 1950 (18.8%)

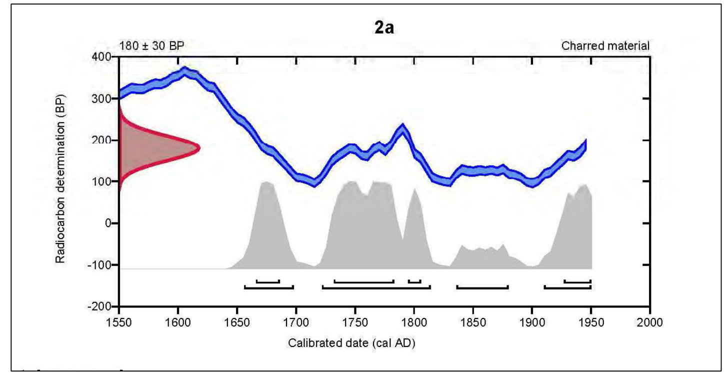

Figure 116. Calibration data and calibration curve for Sample Beta–592957 / 2a from TU-1 (courtesy of Beta Analytic)

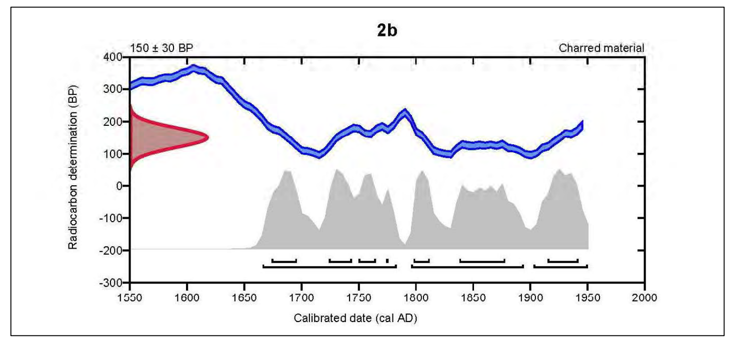

Figure 117. Calibration data and calibration curve for Sample Beta–592958 / 2b from TU-1 (courtesy of Beta Analytic)

Section 6 Site Descriptions

6.1 SIHP # 50-10-74-29507

FORMAL TYPE:	Complex
FUNCTION:	Ranching
NUMBER OF FEATURES:	7 (3 newly recorded features in project area)
AGE:	Historic
TEST EXCAVATIONS:	None
TAX MAP KEY:	(3) 9-5-007:016; 9-5-010:001 (outside current project area)
PREVIOUS DOCUMENTATION:	Clark et al. 2013 (portion in 9-5-010:001)

SIHP # -29507 is an approximately 100-m-sq complex associated with Onipa‘a Ranch. The site overlaps the far eastern extent of the proposed treatment plant facility portion of the project area (Figure 45 and Figure 46). The site is within an area used for pasture, accessed via Nā‘ālehu Spur Road (SIHP # -31271) and the Onipa‘a Ranch Road (SIHP # -31270). The site majority of the site lies in TMK: (3) 9-5-010:001 which bounds the current project area to the east; this portion of the site was first identified and documented by Clark et al. (2013). At that time, some additional associated features were also observed to extend into TMK: (3) 9-5-007:016 but were not fully documented or assigned feature designations at that time. Figure 118 is the SIHP # -29507 plan view map from Clark et al. (2013:185), adapted to show the extent of the documented features (Features A through D) in relation to the current project area bounds. As Figure 118 shows, portions of what are now assigned as Features E (rock wall) and F (concrete and earthen channel) were noted during the 2013 survey. A wire fence line associated with the site was also documented in the current survey as Feature G (see Figure 46).

The following are excerpts from the SIHP # -29507 site description in Clark et al. (2013); the detailed descriptions for Features A, B, C, and D are omitted below as these features are situated outside the current project area. The full site description is provided in Appendix F.

> **SIHP Site 29507**
>
> Site 29507 is a complex of old ranch buildings located in the northwestern corner of the project area near the junction of the Site 29505 and Site 29506 walls ... The complex includes three main buildings (Features A, B, and D), an old piece of machinery from the Nā‘ālehu Sugar Mill on a stone platform (Feature C), and several associated features (i.e. fence lines, water lines, rock walls, gates, a water trough, a small shed, a kennel, a recent *imu* pit, a wooden corral, hitching posts, a gravel parking area, modern farm equipment, trash, etc.) within a roughly 100 meter by 100 meter area [see Figure 118]. The complex is located at the gated outlet of Nā‘ālehu Spur Road in the northwestern corner of the study parcel. The gate is used almost exclusively to access the adjoining parcel to the west (TMK:3-9-5-07:016), as vehicular access is not possible from this gate to the remainder of the current project area located on the eastern side of Site 29506. Only one of the buildings

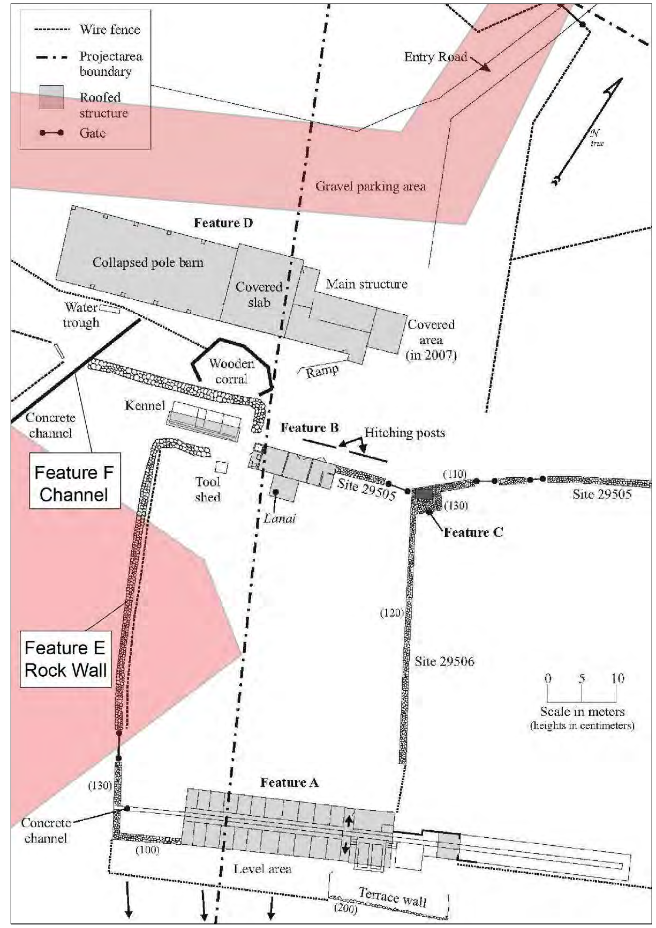

Figure 118. Plan view map of SIHP # -29507 from Clark et al. (2013:185) overlain with the *approximated* current project area extent (in pink) and showing the locations of newly assigned Features E and F

(Feature B) is situated wholly within the boundaries of the current study parcel, the other two are situated partially within the study parcel, and partially on the neighboring parcel to the west. A map of the entire site (prepared by Rechtman Consulting, LLC during fieldwork conducted on the neighboring parcel in 2007 [this study was never finalized]) is presented below, but only the site's features that occur within the current study parcel were assigned feature designations and recorded in detail…

The features of Site 29507 … include a long metal and wood structure on a concrete slab located at the southern end of the complex (Feature A), a small wooden building (Feature B) located at the southwestern end of Site 29505, a large wooden building at the northern extent of the complex next to the gravel parking area (Feature C), and an old piece of machinery from the original Nā‘ālehu sugar mill that has been set up on a cobble platform (Feature C) at the intersection of Sites 29505 and 29506. All of the buildings are in various states of disrepair, and they do not appear to have been used (except for storage purposes) for a number of years. Features A, B, C, and D of Site 29507, which are all at least partially located within the boundaries of the current project area, are described in detail below. Their locations relative to the project area boundaries, Sites 29505 and 29506, and the other features of Site 29507 that are situated on the neighboring parcel to the west are depicted in [Figure 118]. [Clark et al. 2013:184]

The Site 29507 ranch building complex appears to have been built during the early twentieth century, by the ranching subsidiary of the Hutchinson Sugar Plantation (Ka‘alu‘alu Ranch/Nā‘ālehu Ranch and Dairy, Inc.). The formal attributes of the building suggest their functions, and a review of the Hutchinson Sugar Plantation Company Annual Reports for the years 1903 to 1969 (available at the University of Hawai‘i at Hilo Mookini Library) provides additional information relating to the construction and use of the buildings. Feature A functioned as a piggery with an attached slaughterhouse for pigs; Feature B was constructed as a small stable with three stalls, but was later turned into a bunk house; and Feature D was the slaughterhouse for cattle, but was converted to a ranch headquarters and equipment storage area when the slaughterhouse shut down in the mid-1950s. Feature C, which is not a building, seems to be a piece of equipment removed from the original Nā‘ālehu Sugar Mill and placed on top of a cobble foundation at the junction of the Site 29505 and Site 29506 ranch walls. The specific use of Feature C at Site 29507 is not clear; it may have been purely a decorative addition to the ranching complex.

The first mention of Site 29507 in the Hutchinson Sugar Plantation Company Annual Reports occurs in 1918 when it was reported by the plantation manager that 108 cattle were slaughtered at the company's own slaughterhouse (Feature D). Henke (1929) also mentions that the ranch had its own slaughterhouse, at which roughly 100 head of cattle were slaughtered annually. The location of the slaughterhouse is shown on a March 1931 map of the Nā'ālehu Ranch and Dairy, Inc. lands in the northwestern corner of the project area adjacent to Dairy Paddock # 8 … and the Site 29505 and Site 29506 ranch walls. Feature A is specifically mentioned in the annual report for 1944 (H. P. S. C. 1944), when Manager J. S.

Beatty reported on the expenses incurred by additions to buildings at the piggery. A 1944 date inscribed in concrete of the furrowing pens at the western end of the Feature A structure confirms the additions occurred in that year. No specific mention of Features B and C was found in the annual reports. The writing on Feature C, however, indicates that the machinery was produced in 1871 by W. A. McOnie Company of Scotland Street Engine works, Glasgow, Scotland (founded in 1840), who were the manufacturer's [sic] of sugar mills and engines that were shipped all over the world (Grace's Guide 2007). The year written on Feature C corresponds to the date the Nā‘ālehu Sugar Mill was erected, and the machinery was likely moved to the location of Site 29507 after the mill was dismantled in ca. 1910.

The Nā‘ālehu slaughterhouse closed in the mid-1950s, and the ranch's beef was then marketed through the Hilo Meat Co. (The Gilmore Hawaii Sugar Manual 1954:46). After the closure of the slaughterhouse the Feature D building was converted to serve as an office building (ranch headquarters), workshop and equipment storage area. It is likely around this time that the covered structures attached to its western end were added. Feature D is known to have served as the headquarters [for] several ranches that ran cattle on the project area lands during the second half of the twentieth century, including the Hawaiian Ranch Co. (Ka‘alu‘alu Ranch; ca. 1967), Parker Ranch (ca. 1978), Kawaihae Ranch (ca. 1987), and Onipa‘a Ranch (unknown date). The stable (Feature B) was converted to a bunkhouse at this time as well (probably by Onipa‘a Ranch, which is inscribed in the concrete at Feature B). When Feature A ceased to be used as a piggery is unknown. [Clark et al. 2013:207]

Feature E is a stacked, core-filled rock wall located along the western side of the SIHP # -29507 complex (see Figure 46 and Figure 118 through Figure 120). The wall measures 59 m long overall, of which 36.5 m is in the current project area. The wall ranges in height from 100–120 cm and is approximately 100 cm wide. Un-milled wooden posts and modern metal t-posts support a single strand of barbed wire fence running along the surface of the wall. Portions of the wall exhibit minor collapse. One gate is present near the current southern project area boundary (see Figure 118).

Feature F is a concrete and earthen drainage channel located between Features E and G (see Figure 46, Figure 118, Figure 121, Figure 122, and Figure 123). Figure 118 indicates the channel inlet is situated 2 or 3 m south of Feature D, outside the current project area; this portion of the channel was found to be obscured by sediment and vegetation during the current fieldwork. The channel was visible beginning where it passes a rock wall. The channel trends downslope to the southeast, protected by a wire fence offset a distance of 3–5 m to the west. It is characterized as a concrete channel measuring 50 cm wide at the surface, tapering to 18 cm wide at its interior base, with a depth of 13 cm. This concrete section of the channel beginning at the rock wall is 50.4 m long; of this, 30.5 m is within the current project area. The concrete channel opens into a wider, earthen channel draining into a level field. The earthen portion of the channel is approximately 39.6 m long, 3.5–4.5m wide, and 10–35 cm deep. The entire earthen portion of the channel is within the project area.

Figure 119. Photograph of a portion of the SIHP # -29507 Feature E rock wall; view to northeast

Figure 120. Photograph of a portion of the SIHP # -29507 Feature E rock wall; view to northeast

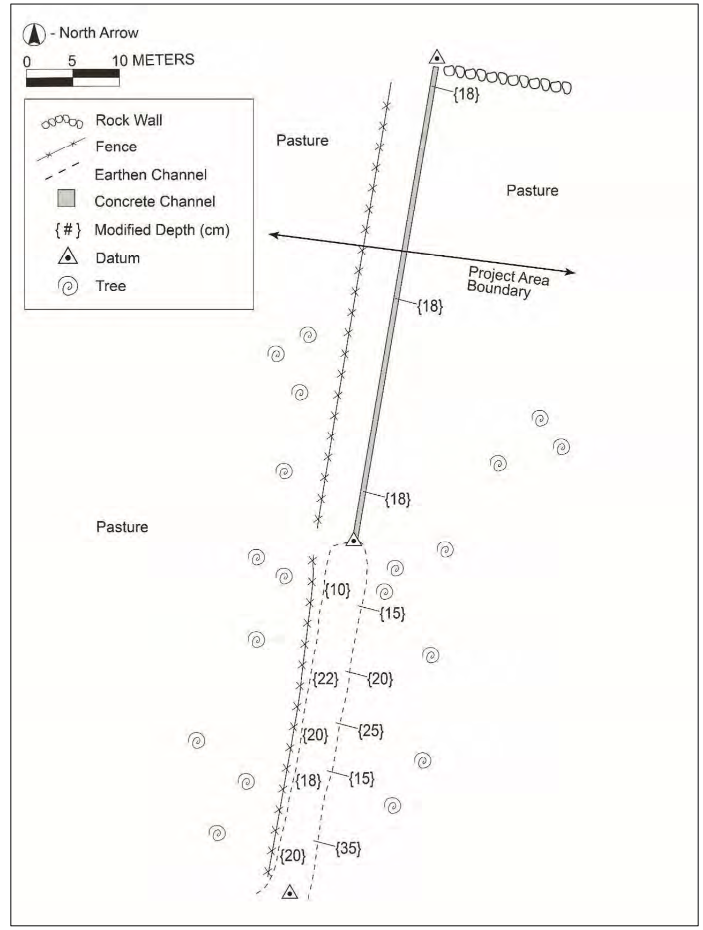

Figure 121. Plan view of SIHP # -29507 Feature F, drainage channel

Figure 122. Photograph of a concrete section of the SIHP # -29507 Feature F drainage channel; view to southeast

Figure 123. Photograph showing an earthen section of the SIHP # -29507 Feature F drainage channel, with the parallel wire fence visible in background; view to southeast

Feature G is a wire fence line extending from the -31269 Feature B vicinity to the south and east back toward the main part of the SIHP # -29507 complex (see Figure 46, Figure 118, Figure 124 and Figure 125). Overall, 260 m of Feature G fence line was recorded during the survey, of which 115 m is within the current project area bounds. The fence is constructed with three to four strands of barbed wire supported with milled wooden post and modern metal t-posts.

SIHP # -29507 is in remnant to good condition. The site retains integrity of location, design, setting, materials, workmanship, feeling, and association. Clark et al. (2013:1392, 1397) assessed SIHP # -29507 as significant under Criterion d for the information it has yielded about historic land use and recommended the site for no further work. The results of the current survey support the prior assessment made by Clark et al. (2013). The three newly documented features within the current project area are likewise assessed as significant under Criterion d for the information they have yielded about historic ranching activity (see Section 8.1).

The available records suggest SIHP # -29507 has not been previously evaluated for eligibility to be listed on the National Register. Based on the findings of the current AIS the site is evaluated as not eligible for listing on the National Register. Its information content has been adequately documented, and the site is recommended for no further work (see Section 8.2).

Figure 124. Photograph showing SIHP # -29507 Feature G fence connecting to the southeastern corner of SIHP # -31269 Feature B holding pens; view to west

Figure 125. Photograph of a portion of SIHP # -29507 Feature G fence, showing typical construction; view to west

6.2 SIHP # 50-10-47-30187

FORMAL TYPE:	Māmalahoa Highway
FUNCTION:	Transportation
NUMBER OF FEATURES:	1
AGE:	Historic
TEST EXCAVATIONS:	None
TAX MAP KEY:	9-5-021:999
PREVIOUS DOCUMENTATION:	None in current project area; portions elsewhere documented by Clark et al. (2014), Belluomini and Hammatt (2017), LaChance et al. (2017), Yucha and Hammatt (2017)

SIHP # -30187 comprises the former and present alignments of the Māmalahoa Highway, also known as the Belt Road (variably State Routes 11, 19, 180, and 190). A very small (15-m or 50-ft) portion of the Māmalahoa Highway is in the current project area, where the proposed force main crosses it at the Kaʻalaiki Road/Nāʻālehu Spur Road intersection in the middle of Nāʻālehu town (see Figure 46). The Māmalahoa Highway was first assigned as SIHP # -30187 under a prior study (Clark et al. 2014:81) conducted along Route 11 in the Captain Cook area of South Kona. This SIHP designation has been used in subsequent studies (e.g., Belluomini and Hammatt 2017, LaChance et al. 2017, Yucha and Hammatt 2017) to document portions of the Māmalahoa Highway around the island. Closest to the current project area is the portion documented by Belluomini and Hammatt (2017), in Hīlea Ahupuaʻa 6.0 mi (9.7 km) m northeast of Nāʻālehu. SIHP # -30187 initially included five features documented by Clark et al. (2014) in South Kona consisting of a stone revetment (Feature A), two stone retaining walls (Feature B and C), one abandoned segment of roadway (Feature D), one concrete culvert (Feature E). Clark et al. (2014) provide the following introduction to the site:

> [Māmalahoa Highway] has developed from what was once a footpath (Kealaehu; Maly and Maly 2001), into its current Highway 11 form through incremental improvements over more than a century. The improvements come in the form of straightening, widening, grade changes, and enhanced storm water drainage systems that are upgraded routinely, but especially during large scale construction projects. The first large scale endeavor that transformed this roadway from a footpath/mule trail into one that automobiles could negotiate was the Kona to Kaʻū portion of the upper Government Road, which was conducted in the late 1800s to early 1900s. By 1933 the Māmalahoa Highway (Hawaiʻi Belt Road) was constructed over the same general corridor as the older Government Road, but advances in earth moving technology enabled engineers to cut and fill the sloping land more efficiently, and thus were able to create a more direct, less curvy route. [Clark et al. 2014:52]

The five features documented by Clark et al. (2014) are suggested to be fairly typical for the Māmalahoa Highway. The full SIHP # -30187 site description from Clark et al. (2014) is included in Appendix F. Belluomini and Hammatt (2017) provide the following description for the portions of the Belt Road closest to the current project area, in the context of a project to replace the Hīlea Stream Bridge:

> The portions of SIHP # 50-10-47-30187 that extends through the current project APE and the nearby Yucha and Hammatt (2017) project APE for the Nīnole Bridge Replacement Project are similar in condition. Highway 11 extends north to south through both project’s APE’s [sic] as a gently crowned, two-lane (one lane in each direction, approximately 11-feet wide) asphalt highway with white line shoulder striping and reflectors down the center [Figure 126 and Figure 127]. This portion of Highway 11 was constructed in the late 1930s and early 1940s, likely around the time of the construction of Hīlea Bridge (SIHP # 50-10-74-30298) and Nīnole Bridge (SIHP # 50-10-68-30299) in 1940 as a straightening of the Old Government Road that is northwest of the project APE. The roadway has been repaved and modified in modern times [see Figure 126 and Figure 127]. Some minor signs of wear such as cracking were observed. The raised pavement markers are mostly intact and the road surface markings have some cracking, but have not faded. [Belluomini and Hammatt 2017:54]

The portion of the Māmalahoa Highway within the current project area is similar in character to those portions documented by Belluomini and Hammatt (2017) and Yucha and Hammatt (2017). Figure 128 and Figure 129 depict the 15-m wide portion of Māmalahoa Highway within the project area. No culverts or other architectural features are present along this portion of the highway. Crosswalks are employed along all sides of the intersection, and concrete sidewalks are present at the northeastern and southeastern corners.

The 15-m (50-ft) portion of SIHP # -30187 (Māmalahoa Highway) within the current project area is in good, maintained condition as an active roadway. Based on the nature of the roadway in this specific location, comprising the historic corridor only and absent any other contributing elements such as bridges, culverts, or guardrails, the site retains integrity of location only, as all the constructed elements of the original Māmalahoa Highway are no longer evident today. SIHP # -30187 was previously assessed as significant by Clark et al. (2014:81) per HAR §13-284-6 under Criterion “A” for its association with “important late nineteenth and early twentieth events in establishing a regional transportation network that has its roots in antiquity” and Criterion “D” for its information potential. Belluomini and Hammatt (2017:54) note, “It is the understanding of this study that the Clark et al. (2014) assessment of significance was explicitly under HAR “§13-284-6” as significant under Criteria a and d. This report supports the Clark et al. (2014) assessment of significance.” The current study also supports these past assessments of significance. Therefore, pursuant to HAR §13-275-6, the portion of SIHP # -30187 in the current project area is assessed as significant under Criterion a for its association with events that have made an important contribution to the development of transportation routes on Hawaii Island, and under Criterion d for having yielded information about historic transportation in the project area.

Similarly, the findings of this AIS at SIHP # -30187 support the previous evaluation of eligibility for listing on the National Register of a similar portion of the roadway made by Belluomini and Hammatt (2017). This previous evaluation found that SIHP # -30187 is eligible for inclusion in the National Register under Criterion A (for its association with events that have made a significant contribution to the broad patterns of our history) and Criterion D (for having

Figure 126. Photograph from Belluomini and Hammatt (2017:39) of SIHP # -30187 (Māmalahoa Highway) in Hīlea; view to south

Figure 127. Photograph from Yucha and Hammatt (2017:35) of SIHP # -30187 (Māmalahoa Highway) in Nīnole; view to north

Figure 128. Photograph overlooking the portion of SIHP # -30187 (Māmalahoa Highway) within the project area; view to northeast

Figure 129. Photograph overlooking the portion of SIHP # -30187 (Māmalahoa Highway) within the project area; view to southwest

yielded, or being likely to yield, information important in history). As noted above, the subject portion of this site retains integrity of location only, as all the constructed elements of the original Māmalahoa Highway are no longer evident today. While the project will affect the modern roadway elements, these elements will be replaced following construction, and the integrity and significance of the highway will not be diminished. Therefore, the project will have no adverse effect on SIHP # -30187 and no further work is recommended.

6.3 SIHP # 50-10-74-30929

FORMAL TYPE:	Complex
FUNCTION:	Activity area, ranching
NUMBER OF FEATURES:	3
AGE:	Pre-Contact/Historic
TEST EXCAVATIONS:	2 (TU-1 and TU-2)
TAX MAP KEY:	(3) 9-5-007:016
PREVIOUS DOCUMENTATION:	Gastilo and Clark (2018; Draft)

SIHP # -30929 is a pre-Contact and historic complex located along the interior edge of a natural depression in the central-western portion of the proposed wastewater treatment facility site (see Figure 46). The SIHP # -31270 jeep road is situated approximately 10 m to the west. The natural depression is shaded by a dense canopy of Christmasberry and *kukui* trees, and contains a ground cover of ferns, invasive vines, and grasses. The ground surface within the depression is uneven, with numerous basalt outcroppings and scattered basalt boulders and cobbles. The topography surrounding the site slopes generally towards the north and east into the depression.

SIHP # -30929 was previously documented by ASM (Gastilo and Clark 2018) as follows:

> Site 30929 consists of an enclosure, an L-shaped pavement, and a pathway … that are located approximately 150 meters northeast of Site 30933 in the northern portion of the current study area ... The terrain surrounding Site 30929 consists of undulating pāhoehoe bedrock, numerous bedrock outcrops, and some areas of soil accumulation. To the immediate south of Site 30929 is a large section of the current study area that has been heavily impacted by bulldozing activities over the past several decades. These activities have occurred as recently as 2015. Vegetation in the area consists of koa haole, Christmas-berry, lantana, Java plum, and Guinea grass. Site 30929 is described in detail below. Based on its formal attributes, Site 30929 was likely used for Precontact habitation and storage purposes, as well as for Historic ranching purposes.
>
> The enclosure is located to the immediate southwest of the L-shaped pavement and is constructed of small to large pāhoehoe cobbles ... The northern, eastern, and southern edges of the enclosure form a semi-circle while its western edge is formed by a pile of large cobbles. It measures roughly three meters long by three meters wide, and ranges between 0.2 to 0.6 meters tall. The interior of the enclosure contains a thin layer of soil on top of bedrock, loose cobbles, and koa haole. Noted along the northwestern corner of the enclosure are two flat-laid slabs that appear to be covering a sub-surface void that is approximately 0.3 meters deep ….
>
> The L-shaped pavement is located roughly one to 1.5 meters northeast of the enclosure and is constructed of small to large cobbles and slabs ... In total, the pavement measures 11.1 meters long by 2.3 to 3.8 meters wide, and ranges between 0.2 to 1.4 meters tall. However, the northern edge of the western pavement

> terminates at a steep cobble slope which elevates the pavement up to 1.4 meters above the adjacent ground surface to the north. These cobbles were likely never stacked and may be naturally occurring.
>
> Noted to the east of the pavement is what appears to be a possible pathway. It extends to the north and south across a shallow portion of the surrounding depression and along the level area on which the pavement is constructed. The pathway measures roughly 1.5 meters wide, extends an unknown distance to the north and south, and consists of soil, loose cobbles, and exposed bedrock. In some sections the pathway is lined with loosely piled cobbles ... Noted between the pavement and the pathway is a subsurface void that measures approximately 0.2 meters deep. To the east of the pathway is a 6.2-meter-long section of a galvanized metal pipe that measures approximately 3.8 centimeters in diameter ... No other cultural materials were noted at Site 30929. Based on its formal attributes, Site 30929 was likely used for Precontact and Historic habitation and ranching purposes however, the voids may have been utilized for storage or burial purposes. The pathway and the galvanized metal pipe suggest that the area was modified for ranching purposes. [Gastilo and Clark 2018:145–147]

The full Gastilo and Clark (2018) draft site description is provided in Appendix F for reference. The photos included with the description indicate significant changes in vegetation have occurred since that time, as the vegetation density has since increased. Two other notable differences were observed in the current documentation: the section of metal pipe noted by Gastilo and Clark (2018:147) along the eastern side of the site is no longer present; and an additional feature, a rock mound, was newly identified to the south of Feature B. Based on the current site observations, SIHP # -30929 is described as a complex comprising three discrete features: a semi-circular alignment of stones (Feature A) correlating with ASM's enclosure feature; a large, paved area with some stacking along its edges (Feature B) correlating with ASM's pavement and possible pathway features; and a stone mound (Feature C) (Figure 130). Overall, the site measures approximately 20 m long (N/S) by up to 13 m wide (E/W). No portable artifacts were observed on the ground surface.

Feature A is a small semicircular alignment of stones located approximately 10 m east of the SIHP # -31270 road (see Figure 130, Figure 131, and Figure 132). The feature is generally constructed of a 1–2 course circular alignment of placed basalt cobbles and small boulders and incorporates natural bedrock formations to the west. A void along the western interior edge of the feature appeared partially covered by basalt slabs. Feature A measures approximately 4.3 m (N/S) by 3.5 m (E/W), with heights ranging from 10–56 cm. The feature is in fair condition with some potential damage from tree roots. Excavation potential was assessed as good, and a 1-m-sq test unit (TU-1) was excavated near the center of Feature A, incorporating the void area, in an attempt to yield data that may support the assessment of feature function and age (see Section 4.2.2.1). Testing yielded cultural materials including an adze fragment, coral abrader, and charcoal. These materials were collected for laboratory analysis (see Section 5).

Feature B is a large, paved area comprising the majority of the SIHP # -30929 site footprint (see Figure 130, Figure 133, and Figure 134). It is situated approximately 1 m west of Feature A. The feature is comprised of basalt cobbles and boulders placed on a natural basalt outcrop to form a paved, level area. The paved area is roughly triangular in shape, widest along the northern

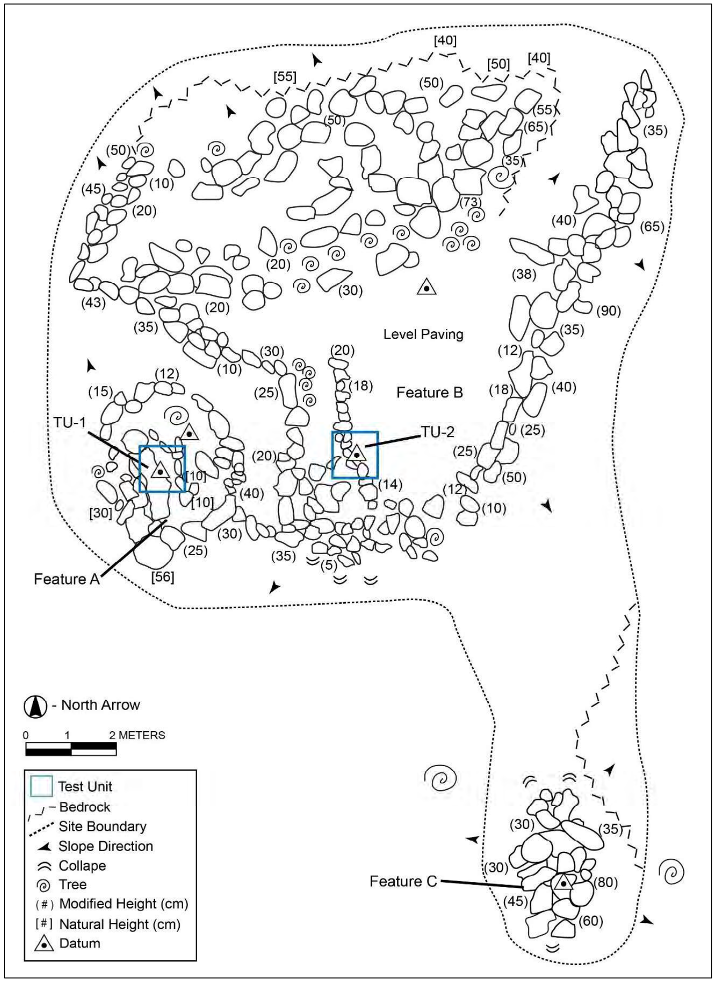

Figure 130. Plan view of SIHP # -30929 complex

Figure 131. Photograph of SIHP # -30929 Feature A alignment; view to southeast

Figure 132. Photograph of SIHP # -30929 Feature A alignment; view to south

Figure 133. Photograph of SIHP # -30929 Feature B paved area; view to north

Figure 134. Photograph of SIHP # -30929 Feature B paved area; view to east

exposed outcrop edge and tapering to a curved point at the southern end. The eastern side of the feature exhibits a sloped area containing fewer stones that may have served as a ramped pathway into the depression. The space between Features A and B is similarly devoid of stones. Overall Feature B measures approximately 13.5 m (N/S) by up to 12.5 m (E/W), with heights ranging from 5 cm to up to 90 cm at stacking along the eastern outcrop edge. Feature B is in fair condition with some collapse visible at the southern end, and potential tree root damage throughout. Excavation potential was assessed as good, and a 1-m-sq test unit (TU-2) was excavated near the southern end of Feature B in an attempt to yield data that may support the assessment of feature function and age (see Section 4.2.2.2). Aside from the architectural paving stones no cultural materials were encountered.

Feature C is an oblong stone mound located approximately 5 m south of Feature B (see Figure 130 and Figure 135). The mound consists of a loose pile of basalt cobbles and boulders atop a bedrock outcrop. Feature C measures 3.8 m long (N/S) by 2.0 m wide (E/W) with heights ranging from 30–80 cm. It is in fair condition, exhibiting some areas of collapse on the northern and southern sides. Excavation potential was assessed as poor due to lack of sedimentary deposit in this location and given the presence of visible voids revealing the interior of the mound, which were observed to contain no cultural material. It is unlikely that ASM would not have noticed this mound during their documentation, indicating it may have been constructed since that time, or attributed to the bulldozing noted to the south by Gastilo and Clark (2018:145).

The presence of traditional artefactual materials (adze, coral abrader) and radiocarbon analysis of charcoal found within TU-1 at SIHP # -30929 Feature A indicate the site is likely pre-Contact or early post-Contact in age. While the *kukui* fragments found in TU-1 may have been naturally deposited by trees within the depression, the remaining materials are indicative of a traditional work environment. Furthermore, research about land use in this part of the project area indicates pre-Contact habitation was likely focused to the east of Kahilipalinui, with agricultural activity being the more predominant land use in the proposed treatment facility vicinity. The section of galvanized metal pipe observed at the site previously by ASM may have been coincidental to the presence of the nearby jeep road, particularly as no other remnants of a historic pipeline were observed. Regardless, the site has very likely experienced impacts and modification from historic and ongoing modern land use. Based on the past (Gastilo and Clark 2018) and current observations, SIHP # -30929 is assessed as a pre-Contact activity area, likely associated with agriculture, with continued historic use.

SIHP # -30929 is in overall fair condition, based on some areas of minor collapse and tree-related disturbance. The site retains integrity of location, design, setting, materials, and workmanship. The prior assessment of significance by Gastilo and Clark (2018) was not available. Based on the current findings it is assessed as significant under Criterion d for the information it has provided about traditional and historic land use in the project area (see Section 8.1).

The available records suggest SIHP # -30929 has not been previously evaluated for eligibility to be listed on the National Register. Based on the findings of the current AIS the site is evaluated as not eligible for listing on the National Register. Its information content has been adequately documented, and the site is recommended for no further work (see Section 8.2).

Figure 135. Photograph of SIHP # -30929 Feature C rock mound; view to the northwest

6.4 SIHP # 50-10-74-30930

FORMAL TYPE:	Rock Wall
FUNCTION:	Ranching
NUMBER OF FEATURES:	1
AGE:	Historic
TEST EXCAVATIONS:	None
TAX MAP KEY:	(3) 9-5-007:016
PREVIOUS DOCUMENTATION:	Gastilo and Clark (2018; Draft)

SIHP # -30930 is a historic core-filled rock wall bisecting the proposed wastewater treatment facility portion of the project area (see Figure 46 and Figure 136 through Figure 139). The wall is in an area used for pasture, where the terrain is gently sloping to the south with exposed bedrock outcrops, and Christmasberry and lantana are common. SIHP # -30930 provides the backbone for the SIHP # -31269 ranching complex.

SIHP # -30930 was previously documented by ASM (Gastilo and Clark 2018) as follows:

> Site 30930 is a core-filled wall that is located near a bulldozed pasture in the northern section of the current study area .… The wall is constructed of large stacked pāhoehoe cobbles and extends 920 meters to the east/west .… It measures 1.1 meters wide and up to 1.2 meters tall. The western end of the wall intersects with Site 26410 while its eastern termination adjoins Site 29507. The wall is collapsed in some areas and is interrupted by a metal gate in an area that is north of Site 30929. Based on its formal attributes, Site 30930 was likely used for ranching purposes during the first part of the 20th century. [Gastilo and Clark 2018:149]

The full Gastilo and Clark (2018) draft site description is provided in Appendix F for reference. CSH observed SIHP # -30930 to be as described by ASM. SIHP # -30930 trends roughly east-west for an overall distance of approximately 375 m in the project area. It utilizes classic core-filled construction, with large basalt cobbles and small boulders forming the outer wall faces and a fill of smaller cobbles. The wall is an average of 1.0 m wide with heights ranging from 1.1–1.3 m. SIHP # -30930 continues west beyond the project area an unknown distance. To the east, the wall terminates just west of SIHP # -29507. Clark et al. (2013) documented another core-filled ranch wall, SIHP # -29505, extending east from SIHP # -29507; at one time SIHP # -30930 and SIHP # -29505 may have been one continuous wall that was interrupted by development of the ranch buildings. Several other breaches were observed within the current project area. A portion of the wall at the eastern end of SIHP # -31269 was repurposed for construction of the SIHP # -31269 Feature D cattle loading ramp (see Section 6.6). Another breach is present where the SIHP # -31270 jeep road passes through it at the SIHP # -31269 Feature A paddock (see Section 6.7). A 20-m-wide breach is present approximately 60 m west of the SIHP # -31270 passage; this area contains considerable amounts of modern trash and may have been used as a modern dump site. The breach at this latter location has been repaired using modern wire fencing and t-posts, indicating the wall still functions as a livestock fence. Aside from this modern trash, no cultural

Figure 136. Photograph overlooking the western section of the SIHP # -30930 rock wall; view to northeast

Figure 137. Photograph showing typical construction along a section of the SIHP # -30930 rock wall; view to the north

Figure 138. Photograph showing core-filled construction along a section of the SIHP # -30930 rock wall; view to north

Figure 139. Photograph of the breach in the SIHP # -30930 rock wall, and the modern fencing used for repair; view to west

material was observed on or around the site. Excavation would be unlikely to yield information impacting the assessment of site age and function.

SIHP # -30930 is a historic ranching wall likely constructed as a cattle fence. The wall pre-dates the SIHP # -31269 ranching complex and, based on the presence of a similar wall (SIHP # -29505) on the parcel to the west, it may also pre-date the SIHP # -29507 ranching complex.

SIHP # -30930 is in overall fair condition with continued maintenance and use. Despite its intermittent breaches and repurposing of component material elsewhere, the site retains integrity of location, design, setting, materials, workmanship, feeling, and association. The prior assessment of significance by Gastilo and Clark (2018) was not available. Based on the current findings it is assessed as significant under Criterion d for the information it has provided about historic ranching activity in the project area (see Section 8.1).

The available records suggest SIHP # -30930 has not been previously evaluated for eligibility to be listed on the National Register. Based on the findings of the current AIS the site is evaluated as not eligible for listing on the National Register. Its information content has been adequately documented, and the site is recommended for no further work (see Section 8.2).

6.5 SIHP # 50-10-74-31268

FORMAL TYPE:	Ditch
FUNCTION:	Storm Drainage
NUMBER OF FEATURES:	1
AGE:	Historic
TEST EXCAVATIONS:	None
TAX MAP KEY:	(3) 9-5-022:001
PREVIOUS DOCUMENTATION:	None

SIHP # -31268 is a historic earthen drainage ditch located in the northwestern portion of the proposed treatment facility site (see Figure 45 and Figure 46). Project plans call for redevelopment of this ditch in order to divert storm water away from the proposed treatment facility to the southeast (see Figure 10). The ditch extends from the vicinity of the Latter-Day Saints church on the *makai* side of Māmalahoa Highway downslope to the south-southwest; the northernmost portion of the ditch is outside the project area limits (see Figure 46). The site is situated within an area dominated by tall guinea grass and scattered trees.

SIHP # -31268 measures 280 m long by 15-20 m wide (Figure 140 through Figure 144). It is defined by two parallel, wide earthen berms set 5-8 m apart. The gradually sloping berms range in width from approximately 3–7 m. The exterior berm edges are generally 1–2 m above the surrounding ground surface, and up to 2.8 m above the interior channel floor. A series of small trees runs along the northern half of the eastern berm. The interior of the ditch is level and slopes mildly to the south-southwest. An earthen spillway is located at about the midpoint of the ditch channel; the spillway has a height of up to 40 cm. No cultural material was observed on or near the site.

SIHP # -31268 is likely historic in age. It appears to be visible on the 1978 orthophoto (see Figure 19). While the site contains areas of deep sediment, these sediments are primarily local fill material used for berm construction and runoff accumulation. Any cultural materials deposited within the ditch would likely be swept away by storm water. Therefore, excavation potential is assessed as low. Two exploratory test trenches (TT-1 and TT-2) were excavated near SIHP # -31268 but did not yield any cultural materials.

SIHP # -31268 is in good condition and continues to function to channel storm water. The site retains integrity of location, design, setting, materials, workmanship, feeling, and association. It is assessed as significant under Criterion d for the information it has provided about historic water control activity in the project area (see Section 8.1).

SIHP # -31268 is evaluated as not eligible for listing on the National Register. Its information content has been adequately documented, and it is recommended for no further work (see Section 8.2).

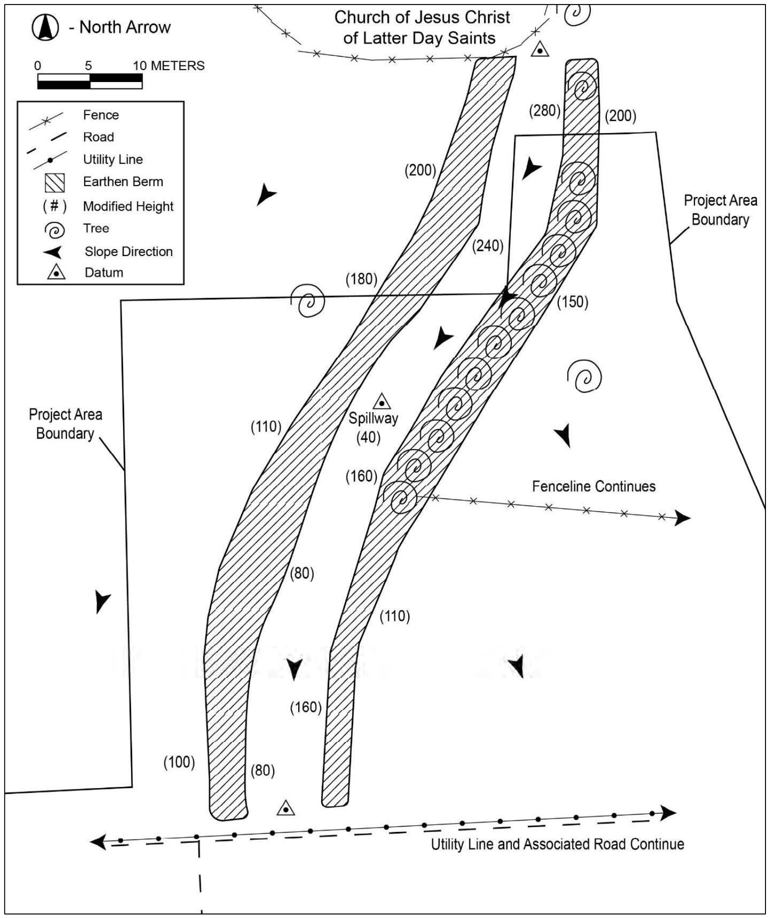

Figure 140. Plan view of SIHP # -31268, drainage ditch

Figure 141. Photograph of SIHP # -31268 taken atop the earthen berm forming the eastern ditch embankment; view to north

Figure 142. Photograph of SIHP # -31268, taken from within the ditch and looking toward the western berm (scale is leaning against interior berm wall); view to northwest

Figure 143. Photograph of SIHP # -31268 interior ditch channel, looking upslope from the southern end of the ditch; view to north

Figure 144. Photograph of earthen spillway within SIHP # -31268 ditch; view to northwest

6.6 SIHP # 50-10-74-31269

FORMAL TYPE:	Complex
FUNCTION:	Ranching
NUMBER OF FEATURES:	4
AGE:	Historic
TEST EXCAVATIONS:	None
TAX MAP KEY:	(3) 9-5-007:016
PREVIOUS DOCUMENTATION:	None

SIHP # -31269 is a historic ranching complex located in the eastern portion of the proposed wastewater treatment facility site (see Figure 46). The site is situated in a relatively level, grassy area with occasional bedrock outcrops used for pasture (see Figure 36). It is comprised of four interconnected features including a large, bisected paddock (Feature A), adjoining holding pens and corrals (Features B and C), and cattle loading ramp (Feature D) (Figure 145). Overall, SIHP # -31269 measures approximately 65 m (N/S) by 185 m (E/W). Its component features are constructed along the historic SIHP # -30930 rock wall, which continues east and west beyond the limits of SIHP # -31269 (see Figure 46 and Figure 145). The SIHP # -31270 jeep road extends through the interior of the Feature A paddock (see Figure 46 and Figure 145). No portable artifacts or cultural deposits were encountered throughout the site, though scattered modern trash was observed. Some abandoned vehicles are present outside the Feature A paddock to the north.

Feature A is a large, irregularly shaped livestock paddock formed by a series of fences abutting the northern side of the SIHP # -30930 rock wall (see Figure 46 and Figure 145 through Figure 149). The paddock measures approximately 180 m long (E/W/) by 30 m wide (N/S) with fence heights of 140 cm. It is bisected by an interior fence with an access gate at its northern end. The fence lines comprising the paddock are constructed of hog and barbed wire, milled and un-milled wooden posts, metal "T" posts, and galvanized metal gates, and occasionally incorporate other materials such as repurposed guardrail. The SIHP # -31270 jeep road extends through the paddock, through one of two access gates at the northeastern corner, the gate in the bisecting fence line, and another gate situated within the SIHP # -30930 wall at the southwestern corner of the paddock (see Figure 145). A functioning metal water trough is situated along the easternmost fence, approximately 10 m south of the gate at the northeastern paddock corner; this trough measures 3.10 m long, 0.85 m wide, and 0.64 m high.

Feature B consists of two adjoining rectangular pens situated east and south of Features C and D, respectively (see Figure 46, Figure 145, Figure 150, and Figure 151). The pens, which served to hold cattle waiting to be loaded onto the Feature D ramp, are constructed using large metal posts and tubes. The western pen measures approximately 7 m long (N/S) by 6 m wide (E/W), and the eastern pen measures approximately 7 m long (N/S) by 5 m wide (E/W). The pens have similar heights of approximately 2 m. A functioning concrete water trough measuring 1.5 m long (N/S) by 0.6 m wide (E/W) is situated in the northwestern corner of the eastern pen (see Figure 151). A wire fence extending from the southeastern corner of Feature B circles back around toward SIHP # -29507 and has been recorded as Feature G of that site (see Figure 46 and Section 6.1).

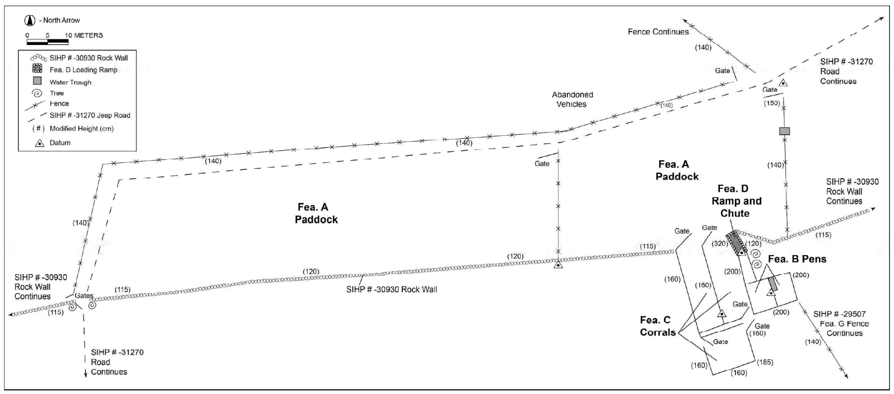

Figure 145. Plan view of SIHP # -31269, ranching complex

Figure 146. Photograph overlooking the SIHP # -31269 Feature A paddock from its northeastern corner; view to north

Figure 147. Photograph overlooking SIHP # -31270 jeep road extending through the eastern portion of the SIHP # -31269 Feature A paddock; view to west

Figure 148. Photograph of water trough along eastern side of SIHP # -31269 Feature A paddock; view to north

Figure 149. Photograph overlooking the western portion of the SIHP # -31269 Feature A paddock (SIHP # -31270 jeep road visible at center); view to east

Figure 150. Photograph of overlooking the SIHP # -31269 Feature B holding pens; view to northwest

Figure 151. Photograph of interior of the western SIHP # -31269 Feature B holding pen, with concrete trough visible at center; view to east

Feature C is a series of rectangular, gated corrals situated south of Feature A and directly west of Features B and D (see Figure 46, Figure 145, and Figure 152 through Figure 155). It comprises three discrete corrals: two parallel corrals accessed from within the Feature A paddock, and another corral to the south accessed only from outside of Feature A. Overall, Feature C measures approximately 30 m long (N/S) by up to 14 m wide. Heights range from 160–200 cm. The northwestern corral measures approximately 18 m long by up to 6 m wide. The northeastern corral measures approximately 18 m long by up to 15 m wide. The southern corral measures approximately 10-m-sq. A 1-m-wide gated corridor separates the southern corral from the two northern corrals. All of the Feature C corrals are constructed using a variety of materials including milled and un-milled wooden posts, metal posts and rails, range wire, and repurposed gates.

Feature D is a concrete and stone cattle loading ramp and associated squeeze chute located in the southeastern portion of the SIHP # -31269 complex (see Figure 46, Figure 145, Figure 155 through Figure 157). The rectangular-shaped ramp is constructed with stacked subangular basalt cobbles and boulders capped with concrete. The basalt stone material appears to have been sourced from an adjacent portion of the SIHP # -30930 rock wall. Cattle would have been funneled onto the ramp from the Feature B holding pens via the squeeze chute and loaded onto a vehicle parked within the Feature A paddock. The ramp portion of Feature D measures 5.5 m long (NW/SE) by 2.5 m wide (NE/SW). The ramp slopes from the ground surface at its southeastern end to 1.2 m high at the loading platform. The portion of the chute leading from the Feature B pens to the ramp is approximately 6 m long by 3 m wide; it is constructed of metal posts and rails and measures up to 1.6 m high. The loading ramp incorporates an extension of the chute, with plywood sidewalls utilized on the platform portion.

SIHP # -31269 is a historic ranching complex, likely part of the larger defunct Onipa‘a Ranch. The ground surface within the site had been heavily impacted by livestock and vehicular activity, as indicated on the 1978 orthophoto (see Figure 19). Excavation would be unlikely to yield information impacting the assessment of site age and function. Three exploratory test trenches (TTs -4, -5, and -7) were excavated in areas surrounding but not within SIHP # -31269 and did not yield any cultural materials.

Overall, SIHP # -31269 is in good, maintained condition. The site exhibits evidence of repurposing of materials throughout. The presence of cattle at the site indicates it is still in active use to some extent. Despite continued maintenance and incorporation of repurposed and modern material in places, the site retains integrity of location, design, setting, materials, workmanship, feeling, and association. It is assessed as significant under Criterion d for the information it has provided about historic land ranching activity the project area (see Section 8.1).

SIHP # -31269 is evaluated as not eligible for listing on the National Register. Its information content has been adequately documented, and it is recommended for no further work (see Section 8.2).

Figure 152. Photograph overlooking SIHP # -31269 Feature C corrals; view to east

Figure 153. Photograph of the southern corral at SIHP # -31269 Feature C; view to northwest

Figure 154. Photograph of the corridor between the northern and southern corrals at SIHP # -31269 Feature C; view to east north

Figure 155. Photograph showing the access to the northeastern corral at SIHP # -31269 Feature C adjacent to the Feature D loading ramp; view to south

Figure 156. Photograph overlooking the SIHP # -31269 Feature D loading ramp and squeeze chute from within the northeastern Feature C corral; view to northeast

Figure 157. Photograph overlooking the SIHP # -31269 Feature D loading ramp and squeeze chute with Feature B holding pens visible at background right; view to southeast

6.7 SIHP # 50-10-74-31270

FORMAL TYPE:	Road
FUNCTION:	Transportation
NUMBER OF FEATURES:	1
AGE:	Historic
TEST EXCAVATIONS:	None
TAX MAP KEY:	(3) 9-5-007:016 and 9-5-010:001
PREVIOUS DOCUMENTATION:	None

SIHP # -31270 is a historic jeep road that extends along a portion of the proposed gravity sewer line corridor and through the proposed treatment facility site in the southern portion of the project area (see Figure 46, Figure 147, Figure 149, and Figure 158 through Figure 161). The road is accessed from Nāʻālehu Spur Road (SIHP # -31271) just south of the shopping center, extending through the gated Taylor Built Construction yard, and continuing south through another gate into the Onipaʻa Ranch. The road passes just north of the SIHP # -29507 ranch complex, then west through the SIHP # -31269 Feature A paddock and southwest through the SIHP # -30930 rock wall, continuing downslope outside of the project area to the southwest (see Figure 46). Vegetation in the areas surrounding the road are predominately invasive grasses, Christmasberry, and lantana. These areas are actively used for pasture.

SIHP # -31270 is a "jeep" road with a predominately dirt and gravel travel surface measuring approximately 3-4 m wide. The portion of the road extending between the Taylor Built Construction yard and the Onipaʻa Ranch gate exhibits patches of remnant asphalt but has generally devolved into a dirt roadway. An approximately 775 m-long portion of the road is within the project area. No cultural material was observed on or near the site. Excavation potential is assessed as poor due to the nature of the site (dirt road).

SIHP # -31270 is used for transportation, specifically to access the Onipaʻa Ranch and other areas downslope from the Nāʻālehu Spur Road (SIHP # -31271). The road is in good condition with continued use and maintenance. The road appears as a "jeep trail" on the 1962 Nāʻālehu USGS topographic map (see Figure 18), meaning it is an historic road alignment. It is also visible on a the 1978 Nāʻālehu orthophoto quad map (see Figure 19). The initial date of construction for this road is unknown, but it likely was developed in association with the historic ranch and associated infrastructure in this area around the turn of the twentieth century (see Section 6.1).

SIHP # -31270 is in good condition with continued maintenance and use. The site retains integrity of location, design, setting, materials, workmanship, feeling, and association. It is assessed as significant under Criterion d for the information it has provided about historic transportation in the project area (see Section 8.1).

SIHP # -31270 is evaluated as not eligible for listing on the National Register. Its information content has been adequately documented, and it is recommended for no further work (see Section 8.2).

Figure 158. Photograph overlooking the portion of SIHP # -31270 jeep road near its intersection with Nāʻālehu Spur Road; view to south

Figure 159. Photograph overlooking the portion of SIHP # -31270 jeep road between the Taylor Built Construction yard and the Onipaʻa Ranch entry gate; view to north

Figure 160. Photograph overlooking a portion of the SIHP # -31270 jeep road *makai* of SIHP #s -30930 and -31269; view to south

Figure 161. Photograph of SIHP # -31270 jeep road passing through a gate along the SIHP # -30930 rock wall and into the SIHP # -31269 Feature A paddock; view to northeast

6.8 SIHP # 50-10-74-31271

FORMAL TYPE:	Nā‘ālehu Spur Road
FUNCTION:	Transportation
NUMBER OF FEATURES:	1
AGE:	Historic
TEST EXCAVATIONS:	None
TAX MAP KEY:	(3) 9-5-010:001
PREVIOUS DOCUMENTATION:	None

SIHP # -31271 is the historic Nā‘ālehu Spur Road located *makai* of Māmalahoa Highway (see Figure 46, Figure 162, and Figure 163). A small section of this roadway corresponds with a portion of the proposed sewer line corridor. From the Māmalahoa Highway intersection, SIHP # -31271 passes a shopping center and other commercial establishments, continuing southeast beyond the project area into ranch lands used for pasture.

An approximately 81.5-m-long portion of SIHP # -31271 is within the project area. This section of the road exhibits a 6–7 m-wide asphalt travel surface with no striping or sidewalks except at the Māmalahoa Highway intersection. Where the road diverges from the SIHP # -31270 Onipa‘a Ranch Road and veers southeast outside of the project area, it narrows to a 5–6-m-wide asphalt travel surface with no striping or sidewalks. This section of the road extends southwest approximately 200 m, at which point it continues an unknown distance as an unimproved dirt road. No cultural material was observed on or near the site. Excavation potential is assessed as poor due to the nature of the site (asphalt road).

SIHP # -31271 is used for transportation, specifically to access the commercial establishments and ranch lands located *makai* of Māmalahoa Highway. It appears as a substantial road alignment on both the 1921 and 1962 Nā‘ālehu USGS topographic maps (see Figure 17 and Figure 18). Notably, Figure 18 (and the 1978 Nā‘ālehu orthophotoquad map; see Figure 19) indicate the road at that time turned back east toward the SIHP # -29507 Onipa‘a Ranch complex, with a jeep road also continuing southeast along the current alignment. Modern aerial imagery (see Figure 8) indicates this former portion of the road, which is located outside the project area bounds, is no longer in use. The initial date of construction for the Nā‘ālehu Spur Road is unknown, but it likely was developed in association with the historic plantation town and subsequent ranches during the early twentieth century prior to 1921 (see Section 3.1.5).

SIHP # -31271 is in fair to good condition with continued maintenance and use. The site retains integrity of location, design, setting, materials, workmanship, feeling, and association. It is assessed as significant under Criterion d for the information it has provided about historic transportation in the project area (see Section 8.1).

SIHP # -31271 is evaluated as not eligible for listing on the National Register. Its information content has been adequately documented, and it is recommended for no further work (see Section 8.2).

Figure 162. Photograph overlooking the portion of SIHP # -31271 (Nāʻālehu Spur Road) within the project area; view to north

Figure 163. Photograph overlooking the portion of SIHP # -31271 (Nāʻālehu Spur Road) within the project area; view to south

6.9 SIHP # 50-10-74-31272

FORMAL TYPE:	Road
FUNCTION:	Transportation
NUMBER OF FEATURES:	1
AGE:	Historic
TEST EXCAVATIONS:	None
TAX MAP KEY:	(3) 9-5-008:033
PREVIOUS DOCUMENTATION:	None

SIHP # -31272 is the historic Kaʻalaʻiki Road located *mauka* of Māmalahoa Highway (see Figure 46, Figure 164, and Figure 165). A small section of this roadway corresponds with a portion of the proposed sewer force main corridor. The section of this roadway within the project area extends between the Māmalahoa Highway and the gravel road used to access the SIHP # -31273 drainage channel, passing several commercial establishments and residences. The road continues beyond the project area limits to the northeast.

An approximately 165-m-long portion of SIHP # -31272 is within the project area. This section of the road exhibits a 7–8-m-wide asphalt travel surface with no striping or sidewalks. The asphalt is worn and in need of repaving. No cultural material was observed on or near the site. Excavation potential is assessed as poor due to the nature of the site (asphalt road).

SIHP # -31272 is used for transportation. The road is currently utilized primarily to access businesses and homes *mauka* of Māmalahoa Highway, or as a detour route between Nāʻālehu and Pāhala to the east when the highway is closed due to flooding. For a time, this roadway was a major transportation route between Nāʻālehu and Pāhala and was instrumental in the development and operations of sugar plantations in the area (see Section 3.1.4). Some of the earliest sections of this alignment may be visible on maps from the late 1800s (see Figure 14 and Figure 15).

SIHP # -31272 is in fair to good condition with continued maintenance and use. The site retains integrity of location, design, setting, materials, workmanship, feeling, and association. It is assessed as significant under Criterion d for the information it has provided about historic transportation in the project area (see Section 8.1).

SIHP # -31272 is evaluated as not eligible for listing on the National Register. Its information content has been adequately documented, and it is recommended for no further work (see Section 8.2).

Figure 164. Photograph overlooking the portion of SIHP # -31272 (Kaʻalaiki Road) within the project area; view to north

Figure 165. Photograph overlooking the portion of SIHP # -31272 (Kaʻalaiki Road) within the project area; view to southwest

6.10 SIHP # 50-10-74-31273

FORMAL TYPE:	Complex
FUNCTION:	Water control
NUMBER OF FEATURES:	2
AGE:	Historic
TEST EXCAVATIONS:	None
TAX MAP KEY:	(3) 9-5-025:002
PREVIOUS DOCUMENTATION:	None

SIHP # -31273 is a historic water control complex overlapped by the central portion of the project area west of the main residential neighborhood (see Figure 45). The site is crossed by the proposed sewer force main corridor. The site comprises two features: Feature A is concrete drainage channel used to carry storm runoff from upslope safely through the town, and Feature B is a footbridge that crosses the channel. The proposed sewer force main corridor will extend across SIHP # -31273 in the vicinity of the footbridge. The site is surrounded by residential properties. No cultural material was observed within the portions of the site overlapped by the project area.

Feature A is an open concrete drainage channel extending downslope from a debris catch basin. Feature A plans are provided in Appendix G. Storm runoff accumulates in the catch basin until it overflows into a spillway serving as the channel inlet. Water flows down the channel past the main residential area, through a culvert under the Māmalahoa Highway, and through a continuation of the open concrete channel along the eastern side of Nāʻālehu Park. The concrete channel ends just beyond the park, where the stormwater is dispersed into an earthen drainage. Access roads run along either side of the channel and chain link fences along the length of the channel prevent unauthorized access. The channel is 6 m wide with vertical sidewalls and has a depth of up to 1.2 m below the surrounding ground surface. An approximately 40-m-long section of the overall channel is situated within the project area (Figure 166 and Figure 167). The concrete is cracked in places and weeds are growing along the edges of the channel. The archaeologists did not have access to the interior of the channel during fieldwork.

Feature B is a concrete footbridge crossing the Feature A channel (Figure 168 and Figure 169). The footbridge is located between the western terminus of Melia Street and the gravel access road located on the eastern side of Kaʻalaiki Road. The footbridge comprises a concrete slab measuring 8 m long by 2 m wide and 10 cm thick. On the southern side of the footbridge is a stylized concrete railing measuring 1.1 m high and 15 cm wide. On the northern side of the footbridge is a metal handrail measuring 1.2 m high.

SIHP # -31273 is a historic water diversion channel and associated footbridge. The original channel plans (see Appendix G) indicate the site was constructed in the 1960s, making it over 50 years old. Excavation potential was assessed as poor due to the nature of the site.

SIHP # -31273 is in overall good condition with continued maintenance and use. The site retains integrity of location, design, setting, materials, workmanship, feeling, and association. It is assessed as significant under Criterion d for the information it has provided about historic water control activity in the project area (see Section 8.1).

Figure 166. Photograph overlooking the portion of SIHP # -31273 Feature A drainage channel within the project area; view is to north from Feature B footbridge as archaeologists did not have access to the channel

Figure 167. Photograph overlooking the portion of SIHP # -31273 Feature A drainage channel within the project area; view is to southeast from Feature B footbridge as archaeologists did not have access to the channel

Figure 168. Photograph overlooking the SIHP # -31273 Feature B footbridge toward Melia Street in the background; view to northeast

Figure 169. Photograph showing the stylized concrete railing at the SIHP # -31274 Feature B footbridge; view to southeast

SIHP # -31273 is evaluated as not eligible for listing on the National Register. Its information content has been adequately documented, and it is recommended for no further work (see Section 8.2).

6.11 SIHP # 50-10-74-31274

FORMAL TYPE:	Rock Wall
FUNCTION:	Boundary
NUMBER OF FEATURES:	1
AGE:	Historic
TEST EXCAVATIONS:	None
TAX MAP KEY:	(3) 9-5-008:048
PREVIOUS DOCUMENTATION:	None

SIHP # -31274 is a historic wall located along a portion of the property boundary between the proposed pump station site at TMK: (3) 9-5-008:048 and the Iglesia Ni Cristo Church (see Figure 45, Figure 170, and Figure 171). The wall appears to be located 1 m inside the parcel 048 boundary, which is delineated by a fence constructed of repurposed metal roofing material. The terrain in this area is fairly level fallow pasture, with head-high guinea grass. A large avocado tree shades the eastern portion of the wall, and the western portion was obscured by dead grasses.

SIHP # -31274 is a low, linear wall constructed of 2–3 courses of loosely stacked basalt cobbles and small boulders. It measures 6.2 m long (E/W), 1.0 m wide, with heights of 30–70 cm. A four-strand barbed wire has been placed along the northern side of the wall facing the pasture. The barbed wire is supported with rusted metal t-posts. The wall is in poor condition, with some areas of collapse. No cultural material was observed on or near the site. Excavation is poor due to the lack of surface artifacts and assessed function of the site.

SIHP # -31274 is a historic wall likely constructed to keep grazing livestock from impacting the church property. This wall appears to predate the metal roofing fence behind it. The barbed wire appears to have been added later to keep livestock off the low wall, potentially after some impacts to the wall occurred. It is unclear why this wall extends only a short distance; perhaps it is a remnant of what was once a longer wall.

Despite its poor condition, SIHP # -31274 retains integrity of location, design, setting, materials, and workmanship. It is assessed as significant under Criterion d for the information it has provided about historic land use in the project area (see Section 8.1).

SIHP # -31274 is evaluated as not eligible for listing on the National Register. Its information content has been adequately documented, and it is recommended for no further work (see Section 8.2).

Figure 170. Photograph of SIHP # -31274 rock wall; view to southeast

Figure 171. Photograph showing construction of SIHP # -31274 rock wall with barbed wire; view to south

Section 7 Summary and Interpretation

Fieldwork was conducted between 26 October 2020 and 29 January 2021. This work required approximately 19 person-days to complete. Fieldwork consisted of a 100% pedestrian survey of the project area, GPS data collection, and a program of subsurface testing. Overall, ground visibility was excellent throughout the project area, which comprises previously developed areas like roadways and wide-open pastures impacted by longstanding ranching activity.

A total of eleven historic properties were documented during the survey, including portions or the entirety of four previously documented sites (SIHP #s -29507, ranching complex; -30187, Mamālahoa Highway; -30929, pre-Contact and historic complex; and -30930, historic ranch wall) and seven newly recorded sites (SIHP #s -31268, historic earthen drainage ditch; -31269, historic ranching complex; -31270, historic jeep road; -31271, historic Nāʻālehu Spur Road; -31272, historic Kaʻalaiki Spur Road; -31273, historic storm drainage complex; and -31276, historic boundary wall). That ten of the 11 documented sites date to the historic era is significant in illustrating the impacted nature of the project area lands, given the extent of land use in the Nāʻālehu area during pre-Contact times. The single site exhibiting pre-Contact origins, SIHP # -30929, was identified within the natural depression bisecting the proposed treatment facility site that appears to have avoided extensive impact by historical land use. The site does exhibit some evidence of later modification.

Test excavations at SIHP # -30929 yielded traditional artifacts including an adze fragment made with basalt likely sourced from Kona or Kaʻū and a coral abrader. Charcoal was also collected during excavation at SIHP # -30929 and, following a cursory wood taxa analysis, two samples representing short-lived wood species were submitted for radiocarbon analysis. Notably, the two samples returned results with overlapping highest probability radiocarbon age ranges (AD 1722 to 1814 [Beta–592957 / 2a] and AD 1666 to 1783 [Beta–592958 / 2b]). These results support the interpretation that SIHP # -30929 originated as a pre-Contact activity area, likely associated with agricultural activity in Kahilipalinui.

In addition to the manual test excavations at SIHP # -30929, a program exploratory mechanical testing was conducted to assess the potential for subsurface archaeological features throughout the undeveloped portions of the project area. The exploratory testing program involved excavation of 14 test trenches, including 11 trenches in the proposed wastewater treatment facility site at TMK: (3) 9-5-007:016, and three trenches in the proposed pump station site at TMK: (3) 9-5-008:048. All but one trench was excavated to bedrock; at TT-1 sedimentary deposits exceeded the reach of the excavator (>260cmbs), likely due to its location near an earthen drainage channel (SIHP # -31268). In the other 13 trenches the depths of sediments ranged from approximately 20 cmbs in the proposed treatment facility portion of the project area to approximately 100 cmbs in the proposed pump station portion of the project area. No new historic properties or cultural deposits were encountered during the exploratory testing. Exploratory testing within the proposed wastewater treatment facility site exposed substantial layers of yellowish-hued silty clay loams throughout that are characteristically inconsistent with the rocky peats understood to comprise this area. Exploratory testing within the proposed pump station portion of the project area exposed sediments consistent with the Naalehu silty clay loam sediment type known to be present in this area.

Section 8 Significance Assessments and Nation Register Eligibility Determinations

This AIS identified four previously documented and seven newly documented historic properties in the project area, for a total of 11sites in the project area. Section 8.1 provides significance assessments under HRS §6E, while Section 8.2 provides National Register eligibility determinations.

8.1 Significance Assessments under HRS §6E

Under HRS §6E, for a historic property to be significant under HAR §13-275-6 (applicable to government projects), the historic property should possess integrity of location, design, setting, materials, workmanship, feeling, and/or association, and meet one or more of the following significance criteria:

a Be associated with events that have made an important contribution to the broad patterns of our history;

b Be associated with the lives of persons important in our past;

c Embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, or possess high artistic value;

d Have yielded, or is likely to yield, information important for research on prehistory or history; or

e Have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group's history and cultural identity.

8.1.1 SIHP # 50-10-74-29507

SIHP # -29507 (historic ranching complex) is in remnant to good condition. The site retains integrity of location, design, setting, materials, workmanship, feeling, and association. Clark et al. (2013:1392, 1397) assessed SIHP # -29507 as significant under Criterion d for the information it has yielded about historic land use and recommended the site for no further work. The results of the current survey support the prior assessment made by Clark et al. (2013). The three newly documented features within the current project area are likewise assessed as significant under Criterion d for the information they have yielded about historic ranching activity.

8.1.2 SIHP # 50-10-47-30187

The 15-m (50-ft) portion of SIHP # -30187 (Māmalahoa Highway) within the current project area is in good, maintained condition as an active roadway. Based on the nature of the roadway in this specific location, comprising the historic corridor only and absent any other contributing elements such as bridges, culverts, or guardrails, the site retains integrity of location only as all the constructed elements of the original Māmalahoa Highway are no longer evident today. SIHP # -30187 was previously assessed as significant by Clark et al. (2014:81) per HAR "§13-284-6"

under Criterion "A" for its association with "important late nineteenth and early twentieth events in establishing a regional transportation network that has its roots in antiquity" and Criterion "D" for its information potential. Belluomini and Hammatt (2017:54) note, "It is the understanding of this study that the Clark et al. (2014) assessment of significance was explicitly under HAR "§13-284-6" as significant under Criteria a and d. This report supports the Clark et al. (2014) assessment of significance." The current study also supports these past assessments of significance. Therefore, pursuant to HAR §13-275-6, the portion of SIHP # -30187 in the current project area is assessed as significant under Criterion a for its association with events that have made an important contribution to the development of transportation routes on Hawaii Island, and under Criterion d for having yielded information about historic transportation in the project area.

8.1.3 SIHP # 50-10-74-30929

SIHP # -30929 (pre-Contact activity area and historic ranching complex) is in overall fair condition, based on some areas of minor collapse and tree-related disturbance. The site retains integrity of location, design, setting, materials, and workmanship. The prior assessment of significance by Gastilo and Clark (2018) was not available. Based on the current findings it is assessed as significant under Criterion d for the information it has provided about traditional and historic land use in the project area.

8.1.4 SIHP # 50-10-74-30930

SIHP # -30930 (historic ranch wall) is in overall fair condition with continued maintenance and use. Despite its intermittent breaches and repurposing of component material elsewhere, the site retains integrity of location, design, setting, materials, workmanship, feeling, and association. The prior assessment of significance by Gastilo and Clark (2018) was not available. Based on the current findings it is assessed as significant under Criterion d for the information it has provided about historic ranching activity in the project area

8.1.5 SIHP # 50-10-74-31268

SIHP # -31268 (historic earthen drainage ditch) is in good condition and continues to function to channel storm water. The site retains integrity of location, design, setting, materials, workmanship, feeling, and association. It is assessed as significant under Criterion d for the information it has provided about historic water control activity in the project area.

8.1.6 SIHP # 50-10-74-31269

SIHP # -31269 (historic ranching complex) is in overall good, maintained condition. The site exhibits evidence of repurposing of materials throughout. The presence of cattle at the site indicates it is still in active use to some extent. Despite continued maintenance and incorporation of repurposed and modern material in places, the site retains integrity of location, design, setting, materials, workmanship, feeling, and association. It is assessed as significant under Criterion d for the information it has provided about historic land ranching activity the project area.

8.1.7 SIHP # 50-10-74-31270

SIHP # -31270 (historic jeep road) is in good condition with continued maintenance and use. The site retains integrity of location, design, setting, materials, workmanship, feeling, and association. It is assessed as significant under Criterion d for the information it has provided about historic transportation in the project area.

8.1.8 SIHP # 50-10-74-31271

SIHP # -31271 (historic Nā‘ālehu Spur Road) is in fair to good condition with continued maintenance and use. The site retains integrity of location, design, setting, materials, workmanship, feeling, and association. It is assessed as significant under Criterion d for the information it has provided about historic transportation in the project area.

8.1.9 SIHP # 50-10-74-31272

SIHP # -31272 (historic Ka‘ala‘iki Road) is in fair to good condition with continued maintenance and use. The site retains integrity of location, design, setting, materials, workmanship, feeling, and association. It is assessed as significant under Criterion d for the information it has provided about historic transportation in the project.

8.1.10 SIHP # 50-10-74-31273

SIHP # -31273 (historic water control complex) is in overall good condition with continued maintenance and use. The site retains integrity of location, design, setting, materials, workmanship, feeling, and association. It is assessed as significant under Criterion d for the information it has provided about historic water control activity in the project area.

8.1.11 SIHP # 50-10-74-31274

Despite its poor condition, SIHP # -31274 (historic boundary wall) retains integrity of location, design, setting, materials, and workmanship. It is assessed as significant under Criterion d for the information it has provided about historic land use in the project area.

8.2 National Register Eligibility Determinations

Under Section 106, historic property significance is evaluated as eligibility for listing on the National Register of Historic Places (“National Register”) pursuant to 36 CFR 60.4. To be considered eligible for listing on the National Register, a historic property should possess integrity as described in Section 8.1 above, and meet one or more of the following broad significance criteria:

A That are associated with events that have made a significant contribution to the broad patterns of our history;

B That are associated with the lives of persons significant in our past;

C That embody the distinctive characteristics of a type, period, or method of construction, or that represent that work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction;

D That have yielded, or may be likely to yield, information important in prehistory or history.

8.2.1 SIHP # 50-10-74-29507

As noted in Section 8.1.1, SIHP # -29507 (historic ranching complex) is in remnant to good condition and retains integrity of location, design, setting, materials, workmanship, feeling, and association. The available records suggest SIHP # -29507 has not been previously evaluated for

eligibility to be listed on the National Register. Based on the findings of the current AIS the site is evaluated as not eligible for listing on the National Register. Its information content has been adequately documented, and the site is recommended for no further work.

8.2.2 SIHP # 50-10-47-30187

As noted in Section 8.1.2, the 15-m (50-ft) section of SIHP # -30187 (Māmalahoa Highway) in the project area retains integrity of location only as all of the constructed elements of the original Māmalahoa Highway are no longer evident today. SIHP # -30187 was previously evaluated as eligible for inclusion in the National Register (per 36 CFR 60.4) by Belluomini and Hammatt (2017:62) under Criterion A (for its association with events that have made a significant contribution to the broad patterns of our history) and Criterion D (that having yielded, or being likely to yield, information important in history). This evaluation of eligibility is based on the site’s association with “important late nineteenth and early twentieth events in establishing a regional transportation network that has its roots in antiquity” (Clark et al. 2014:81). The findings of the current AIS support these this prior evaluation of eligibility. While the project will affect the modern roadway elements, these elements will be replaced following construction, and the integrity and significance of the highway will not be diminished. Therefore, the project will have no adverse effect on SIHP # -30187 and no further work is recommended.

8.2.3 SIHP # 50-10-74-30929

As noted in Section 8.1.3 SIHP # -30929 (pre-Contact activity area and historic ranching complex) is in overall fair condition, based on some areas of minor collapse and tree-related disturbance. The site retains integrity of location, design, setting, materials, and workmanship. The available records suggest SIHP # -30929 has not been previously evaluated for eligibility to be listed on the National Register. Based on the findings of the current AIS the site is evaluated as not eligible for listing on the National Register. Its information content has been adequately documented, and the site is recommended for no further work.

8.2.4 SIHP # 50-10-74-30930

As noted in Section 8.1.4, SIHP # -30930 (historic ranch wall) is in overall fair condition with continued maintenance and use. Despite its intermittent breaches and repurposing of component material elsewhere, the site retains integrity of location, design, setting, materials, workmanship, feeling, and association. The available records suggest SIHP # -30930 has not been previously evaluated for eligibility to be listed on the National Register. Based on the findings of the current AIS the site is evaluated as not eligible for listing on the National Register. Its information content has been adequately documented, and the site is recommended for no further work.

8.2.5 SIHP # 50-10-74-31268

As noted in Section 8.1.5, SIHP # -31268 (historic earthen drainage ditch) is in good condition and continues to function to channel storm water. The site retains integrity of location, design, setting, materials, workmanship, feeling, and association. SIHP # -31268 is evaluated as not eligible for listing on the National Register. Its information content has been adequately documented, and it is recommended for no further work.

8.2.6 SIHP # 50-10-74-31269

As noted in Section 8.1.6, SIHP # -31269 (historic ranching complex) is in overall good, maintained condition. The site exhibits evidence of repurposing of materials throughout. The presence of cattle at the site indicates it is still in active use to some extent. Despite continued maintenance and incorporation of repurposed and modern material in places, the site retains integrity of location, design, setting, materials, workmanship, feeling, and association. SIHP # -31269 is evaluated as not eligible for listing on the National Register. Its information content has been adequately documented, and it is recommended for no further work.

8.2.7 SIHP # 50-10-74-31270

As noted in Section 8.1.7, SIHP # -31270 (historic jeep road) is in good condition with continued maintenance and use and retains integrity of location, design, setting, materials, workmanship, feeling, and association. SIHP # -31270 is evaluated as not eligible for listing on the National Register. Its information content has been adequately documented, and it is recommended for no further work.

8.2.8 SIHP # 50-10-74-31271

As noted in Section 8.1.8, SIHP # -31271 (historic Nā'ālehu Spur Road) is in fair to good condition with continued maintenance and use. The site retains integrity of location, design, setting, materials, workmanship, feeling, and association. SIHP # -31271 is evaluated as not eligible for listing on the National Register. Its information content has been adequately documented, and it is recommended for no further work.

8.2.9 SIHP # 50-10-74-31272

As noted in Section 8.1.9, SIHP # -31272 (historic Ka'ala'iki Road) is in fair to good condition with continued maintenance and use. The site retains integrity of location, design, setting, materials, workmanship, feeling, and association. SIHP # -31272 is evaluated as not eligible for listing on the National Register. Its information content has been adequately documented, and it is recommended for no further work.

8.2.10 SIHP # 50-10-74-31273

As noted in Section 8.1.10, SIHP # -31273 (historic water control complex) is in overall good condition with continued maintenance and use. The site retains integrity of location, design, setting, materials, workmanship, feeling, and association. SIHP # -31273 is evaluated as not eligible for listing on the National Register. Its information content has been adequately documented, and it is recommended for no further work.

8.2.11 SIHP # 50-10-74-31274

As noted in Section 8.1.11, despite its poor condition, SIHP # -31274 (historic boundary wall) retains integrity of location, design, setting, materials, and workmanship. SIHP # -31274 is evaluated as not eligible for listing on the National Register. Its information content has been adequately documented, and it is recommended for no further work.

Section 9 Project Effect and Mitigation Recommendations

9.1 Project Effect

In accordance with federal regulations (36 CFR 800.5), the AIS results support the determination made by the Hawai'i State DOH on behalf of the EPA of "no adverse effect." In accordance with HAR §13-275-7, the Hawai'i State DOH and COH-DEM have determined the project effect is "effect, with proposed mitigation commitments." The project proponents request SHPD concurrence with these determinations.

One historic property on the project area has been evaluated as eligible for inclusion on the National Register: SIHP # 50-10-47-30187 (Māmalahoa Highway). The 15-m (50-ft) portion of this historic property within the project area retains integrity of location only, as all the constructed elements of the original Māmalahoa Highway are no longer evident today. While the project will affect the modern roadway elements, these elements will be replaced following construction, and the integrity and significance of the highway will not be diminished. Therefore, the project will have no adverse effect on SIHP # -30187. This site is assessed as significant under Criterion a of the State of Hawai'i significance criteria for its association with events that have made an important contribution to the development of transportation routes on Hawaii Island, and under Criterion d for having yielded information about historic transportation in the project area. Documentation of SIHP # -30187 in this AIS has included historical research, GPS data collection, photographs, and written description. This AIS has adequately documented the location, extent, function, age, and construction methods of the portion of SIHP # -30187 in the project area, mitigating project-related impacts pursuant to HAR §13-275-8.

The remaining ten historic properties in the project area (SIHP #s 50-10-74-29507, -30929, -30930, -31268, -31269, -31270, -31271, -31272, -31273, and -31274) may also be impacted by project development. These historic properties have been evaluated as not eligible for inclusion on the National Register. These sites are assessed as significant under Criterion d of the State of Hawai'i significance criteria because they have yielded information important for research on history. Documentation of these historic properties in this AIS has included historical research, GPS data collection, photographs, plan view maps, and written descriptions. This AIS has adequately documented the location, extent, function, age, and construction methods of these ten historic properties, mitigating project-related impacts pursuant to HAR §13-284-8.

9.2 Mitigation Recommendations

The single historic property evaluated as eligible for listing on the National Register (SIHP # 50-10-47-30187, Māmalahoa Highway), will not be adversely impacted by the project as its integrity and significance will not be diminished. This AIS has adequately documented the location, extent, function, age, and construction methods of the 11 historic properties within the project area, mitigating any project-related impacts pursuant to HAR §13-284-8. No further work is recommended for these 11 historic properties.

Archaeological monitoring is recommended during all project ground-disturbing activities to facilitate historic property identification for information purposes, especially of any subsurface lava tubes that may contain historic properties. Archaeological monitoring will proceed under an archaeological monitoring plan that meets the requirements of HAR §13-279-4, which will be submitted to the SHPD for review and acceptance prior to project initiation.

Section 10 References Cited

Belluomini, Scott A. and Hallett H. Hammatt

2017 *Archaeological Inventory Survey Report for the Hīlea Bridge Replacement Project, Hīlea Ahupua‘a, Ka‘ū District, Hawai‘i Island, Federal Highway Administration/Central Federal Lands Highway Division (FHWA/CFLHD) contract DTFH68-13-R-00027 TMKs: (3) 9-5-017:007 por., 008 por., and 9-5-017 Hawai‘i Belt Road/Māmalahoa Highway Right-of-Way.* Cultural Surveys Hawai‘i, Inc. Kailua, Hawai‘i.

Bishop Museum

2021 Aheahea. *Hawaiian Ethnobotany Online Database*. Available online at http://data.bishopmuseum.org/ethnobotanydb/ethnobotany.php?b=d&ID=aheahea

Clark, Matthew R., Herbert Poepoe, and Robert B. Rechtman

2008 *An Archaeological Inventory Survey of TMKs: 3-9-5-021:015 and 3-9-5-022:001, Kāhilipali Nui and Kāwala Ahupua‘a, Ka‘ū District, Island of Hawai‘i.* Rechtman Consulting, Hilo, Hawai‘i.

Clark, Matthew R., J. David Nelson, Amy L. Ketner, Ashton Dircks Ah Sam, Lauryl K. Zenobi, and Robert B. Rechtman

2013 *An Archaeological Inventory Survey of TMK: 3-9-5-010:001, Kāwala Ahupua‘a, Ka‘ū District, Island of Hawai‘i.* Rechtman Consulting, Hilo, Hawai‘i.

Clark, Matthew R., J. David Nelson and Robert B. Rechtman

2014 *An Archaeological Inventory Survey of Sections of the Māmalahoa Highway and Nāpo‘opo‘o Road Rights-of-Way (and Portions of Adjacent Parcels) for the Construction of the Proposed Māmalahoa Bypass Interchange Portions of TMKs: (3) 8-1-06: 062, 074, 188; 8-1-08: 003, 004, 005, 020, 021; and 8-1-09: 006, 007, 010, 011, 012, 013, 050, 057, 999, Ka‘awaloa Ahupua‘a, South Kona District, Island of Hawai‘i.* Rechtman Consulting, LLC, Kea‘au, Hawai‘i.

Coulter, John Wesley

1931 *Population and Utilization of Land and Sea in Hawaii, 1853*. Bishop Museum Bulletin 88. Bishop Museum Press, Honolulu.

Donn, John M.

1906 Hawaii Territory Survey map of Hawaii Island (colorized). Registered Map 2060. Hawai‘i Land Survey Division, Department of Accounting and General Services, Honolulu.

Dorrance, William H. and Francis S. Morgan

2000 *Sugar Islands: The 165-Year Story of Sugar in Hawai‘i.* Mutual Publishing, Honolulu.

Ellis, William

1963 *Journal of William Ellis: Narrative of a Tour of Hawai‘i with Remarks on the History and Traditions.* Advertising Publishing Company, Honolulu.

Elwell, Marge, and Dennis Elwell
2005 *Historic Na'alehu: Hawaii's Deep South.* The Paragon Agency, Orange, California.

2015 *Images of America Kau District.* Arcadia Publishing, Charleston, South Carolina.

ESRI
2015 World Imagery. Esri, Redlands, California. Available online at www.arcgisonline.com/maps/World_Imagery.

Giambelluca, T.W., Q. Chen, A.G. Frazier, J.P. Price, Y.-L. Chen, P.-S. Chu, J.K. Eischeid, and D.M. Delparte
2013 Online Rainfall Atlas of Hawai'i. *Bulletin of the American Meteorological Society volume 94, pp. 313-316, doi: 10.1175/BAMS-D-11-00228.1.* Electronic document, http://rainfall.geography.hawaii.edu.

Hammatt, Hallett H. and David W. Shideler
2006 *Archaeological Literature Review and Field Check Study of Two DOE Schools, Ka'ū District, Island of Hawai'i, Hawai'i Inter-Island DOE Cesspool Project, TMK: (3) 9-6-005:008, 039; 95-009:006, 015.* Cultural Surveys Hawai'i, Inc., Kailua, Hawai'i.

Handy, E.S. Craighill and Elizabeth G. Handy
1972 *Native Planters in Old Hawaii: Their Life, Lore, and Environment.* Bishop Museum Bulletin 233. Bishop Museum Press, Honolulu.

Hansen, Violet, and Marion Kelly
1972 *Cultural and Historical Survey of Ka'alu'alu, District of Ka'u, Island of Hawaii.* Bernice P. Bishop Museum Department of Anthropology, Honolulu.

Haun, Alan E. and Dave Henry
2005 *Archaeological Inventory Survey, TMK: 9-5-5:017, 018 and 9-6-6:004, Lands of Kaunamano, Ka'u District, Island of Hawai'i.* Haun & Associates, Kea'au, Hawai'i.

Hawaiian Sugar Planters' Association
1990 Hawaiian Sugar Planters Association, Plantation Archives, Kau Sugar Company (Hutchinson Sugar Plantation Company) Naalehu, Hawaii 1870-1951. Accession: 84-07.

Hawai'i TMK Service
2014 Tax Map Key: (3) 9-5-007, 008, 024, 025, and 026. Hawai'i TMK Service, Honolulu.

Kelly, Marion
1980 *Majestic Ka'u: Mo'olelo of Nine Ahupua'a*. Bernice P. Bishop Museum Department of Anthropology, Honolulu.

Kahn, Jennifer G., Steven P. Lundblad, Peter R. Mills, Yvonne Chan, Ken Longdecker, Yosihiko Sinoto
2016 Settlement Chronologies and Shifting Resource Exploitation in Ka'ū District, Hawaiian Islands. *Asian Perspectives*, Volume 55, Number 2, 2016, pp. 184-207. University of Hawai'i Press, Honolulu.

King, James
1784 *A Voyage of the Pacific Ocean*. G. Nicol and T. Cadell, London.

LaChance, Fred, Sarah Wilkinson, and Hallett H. Hammatt
2017 *Archaeological Inventory Survey for the Māmalahoa Highway (Route 19) Widening Project, Waikoloa Ahupua'a, South Kohala District, Island of Hawai'i, TMK: (3) 6-4.* Cultural Surveys Hawai'i, Inc. Kailua, Hawai'i

McCoy, Mark D., Peter R. Mills, Steven Lundblad, Tim Rieth, Jennifer G. Kahn, and Rowan Gard
2011 A Cost Surface Model of Volcanic Glass Quarrying and Exchange in Hawai'i. *Journal of Archaeological Science* 38:2547–2560.

Menzies, Archibald
1920 *Hawai'i Nei 128 Years Ago*. W.F. Wilson, editor. New Freedom Press, Honolulu.

Mills, Peter M., Steven P. Lundblad, Ken Hon, Jadelyn J. Moniz Nakamura, Elizabeth L. Kahahane, Arian Drake-Raue, Tanya M. Souza, and Richard Weil
2011 Reappraising Craft Specialisation and Exchange in Pre-Contact Hawai'i through Non-destructive Sourcing of Basalt Adze Debitage. *Journal of Pacific Archaeology*, Volume 2, Number 2, 2001, pp. 79-92. New Zealand Archaeological Association, University of Otago, New Zealand.

Monsarrat, M.S.
1887 Map of Kau from Kiolakaa to Punaluu. Registered Map 1455. Hawai'i Land Survey Division, State of Hawai'i, Department of Accounting and General Services, Honolulu. Available online at http://dags.Hawai'i.gov/survey/search.php.

Murakami, Gail M.
2020 *Analysis of Charcoal from Cultural Surveys Hawaii PUAA 5 Project, North Kona, Hawai'i (TMK (3)7-5-014:001 por.).* Wood Identification Laboratory, International Archaeological Research Institute, Inc., Honolulu.

Pukui, Mary Kawena, Samuel H. Elbert, and Esther T. Mookini
1974 *Place Names of Hawaii*. Revised and expanded edition. University of Hawaii Press, Honolulu.

Rechtman, Robert B.
2011 *An Archaeological Survey of TMK:3-9-5-09:003 in Compliance with Section 106 of the National Historic Preservation Act, Kāwala Ahupua'a, Ka'ū District, Island of Hawai'i.* Rechtman Consulting, Hilo, Hawai'i.

Sato, H., Warren Ikeda, Robert Paeth, Richard Smythe, and Minoru Takehiro, Jr.
1973 *Soil Survey of the Island of Hawaii, State of Hawaii.* U.S. Department of Agriculture, Washington, D.C.

USDA (U.S. Department of Agriculture)
2001 Soil Survey Geographic (SSURGO) database. U.S. Department of Agriculture, Natural Resources Conservation Service. Fort Worth, Texas. http://www.ncgc.nrcs.usda.gov/products/datasets/ssurgo/.

USGS (U.S. Geological Survey)

1921 Naalehu USGS 7.5-minute series topographic quadrangle. USGS Information Services, Denver, Colorado.

1962 Naalehu USGS 7.5-minute series topographic quadrangle. USGS Information Services, Denver, Colorado.

1978 USGS Orthophotoquad (Aerial photograph), Pahala Quadrangle. USGS Information Services, Denver, Colorado.

1995 Naalehu, USGS 7.5-minute series topographic quadrangle. USGS Information Services, Denver, Colorado.

Yucha, Trevor and Hallett H. Hammatt

2017 *Archaeological Inventory Survey Report for the Nīnole Bridge Replacement Project, Nīnole Ahupua'a, Ka'ū District, Hawai'i Island, Federal Highway Administration/Central Federal Lands Highway Division (FHWA/CFLHD) Contract DTFH68-13-R-00027 TMKs: (3) 9-5-019:011, 016, 024, 035 por., 9-5-027:020 por., and 9-5-019, 9-5-027 Hawai'i Belt Road/Māmalahoa Highway Right-of-Way*. Cultural Surveys Hawai'i, Inc. Kailua Hawai'i.

Waihona 'Aina

2020 *The Māhele Database*. Electronic document, http://waihona.com.

Appendix A Project Area Land Jurisdiction

Project TMK: (3)	Owner	Parcel Acreage	Acreage Portion in Project Area
9-5-007:016	Ala Kahakai Trail Association	2,317.844*	30.805**
9-5-008:033	County of Hawai'i	2.28	1.136
9-5-008:045	DWD & THD Family Trust	37.555	0.487
9-5-008:048	Kuahiwi Contractors Inc.	12.266	2.019
9-5-010:001	Kuahiwi Contractors Inc.	204.13	1.424
9-5-010:030	Kuahiwi Contractors Inc.	1.30	0.08
9-5-021	Road (State)	-	0.067
9-5-021:015	TOT Trust	15.97	1.37
9-5-021:020	State	-	0.014
9-5-022:001	Kau Valley LLC	26.46	3.601
9-5-024	Road (County)	-	3.882
9-5-024:001	Jerry Yukio Egami	0.30	0.301
9-5-024:009	Mildred Andrade	0.291	0.068
9-5-024:010	Tina Edmunds	0.33	0.333
9-5-024:011	County of Hawai'i,	0.24	0.238
9-5-024:069	Kuahiwi Contractors Inc.	0.128	0.124
9-5-024:076	Richard Oba	0.423	0.077
9-5-024:077	James Manoha	0.398	0.071
9-5-025	Road (County)	-	0.718
9-5-025:002	County of Hawai'i,	3.09	0.24
9-5-025:039	La'i LLC	0.88	0.329
9-5-026	Road (County)	-	2.248

*Parcel acreage as listed in the County of Hawai'i Real Property Tax records, and as shown in the executed Grant of Conservation Easement between Ala Kahakai Trails Association and the County dated 16 December 2019

**For the purpose of this archaeological study, this acreage is slightly larger than the approximately 29 acres excluded from the conservation easement for the Nā'ālehu treatment and disposal facility due to project boundary smoothing in GIS

Appendix B EPA Section 106 Authorization

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

OCT 1 9 2015

Alan Downer
Administrator, Hawaii State Historic Preservation Office
Kakuhihewa Building
601 Kamokila Blvd., Suite 555
Kapolei, Hawaii 96707

Re: U.S. Environmental Protection Agency Region 9 authorization to allow the Hawaii State Department of Health to initiate consultation with the State Historic Preservation Officer and Native Hawaiian organizations for projects funded under the Drinking Water State Revolving Fund Program

Dear Mr. Downer:

The U.S. Environmental Protection Agency Region 9 (EPA) administers the Drinking Water State Revolving Fund (DWSRF) Program, which authorizes capitalization grants to state Agencies in Region 9, including the Hawaii State Department of Health (DOH). In turn, DOH provides assistance to public and private community water systems as well as nonprofit non-community water systems for DWSRF projects.

Projects carried out with EPA assistance under the DWSRF may have effects on properties included in, or eligible for inclusion in, the National Register of Historic Properties. The National Historic Preservation Act (NHPA), 54 U.S.C. §300101 *et seq.*, and its implementing regulations, 36 CFR Part 800, require federal agencies to consider the effects of their undertakings on historic properties.

Pursuant to 36 CFR §800.2(c)(4), a federal agency may authorize an applicant for federal assistance to initiate consultation with the State Historic Preservation Officer (SHPO) or Native Hawaiian organizations and others, provided that: (1) the Federal agency remains legally responsible for all findings and determinations charged to the agency official; and (2) the federal agency notifies the SHPO or Native Hawaiian organizations when an applicant is so authorized.

In accordance with 36 CFR §800.2(c)(4), EPA hereby authorizes DOH to act on EPA's behalf when initiating the NHPA consultation process in connection with DWSRF assistance to public and private community water systems and nonprofit non-community water systems. Effective immediately, DOH may consult with the SHPO and Native Hawaiian

organizations in the State of Hawaii and other relevant parties to initiate the review process established under 36 CFR Part 800 including identifying and evaluating historic properties, assessing effects, and proposing mitigation measures where necessary. However, EPA Region 9 will remain responsible for participating in the consultation process when:

- DOH determines that the "Criteria of Adverse Effect" under 36 CFR §800.5 applies to an undertaking;
- there is disagreement between DOH and the SHPO or Native Hawaiian organizations regarding the scope of the area of potential effects, identification of historic properties, or evaluation of effects; or
- there is an objection from consulting parties or the public regarding findings or determinations or the implementation of agreed provisions; or
- there is potential for a foreclosure situation or intentional adverse effects as described under 36 CFR §800.9(b) and (c).

In accordance with 36 CFR §800.2(c)(2), EPA Region 9 shall ensure that all consultations with Native Hawaiian organizations are conducted in a sensitive manner concerning the needs of such organizations.

If you have any questions, please contact Susan Polanco in the Infrastructure Section, at (808) 541-2722 or via email at polanco.susan @epa.gov.

Sincerely,

Michael Montgomery
Acting Division Director
Water Division

Cc:
Joanna Seto, P.E.
Chief, Safe Drinking Water Branch
Environmental Management Division
Hawaii Department of Health
919 Ala Moana Blvd., Room 308
Honolulu, Hawaii 96814-4920

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Appendix C SHPD Correspondence

DAVID Y. IGE
GOVERNOR OF
HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING
601 KAMOKILA BLVD, STE 555
KAPOLEI, HAWAII 96707

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR – WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PAR

December 1, 2020

IN REPLY REFER TO:
Log No. 2020.02555
Doc. No. 2012NM01
Archaeology

William A. Kucharski, Director
Department of Environmental Management
County of Hawai‘i
345 Kekūanāo‘a Street, Suite 41
Hilo, Hawai‘i, 96720
c/o codem@hawaiicounty.gov

Dear William Kucharski:

SUBJECT: **Chapter 6E-8 Historic Preservation Review –**
Initiation of Consultation and Request for Concurrence
Nā‘ālehu Large Capacity Cesspools Replacement Project
Kāhilipalinui and Kāwala Ahupua‘a, Ka‘ū District, Island of Hawai‘i
TMK: (3) 9-5-007:016; (3) 9-5-008:033, 045, and 048; (3) 9-5-010:001, 030; 9-5-021:015, 020; (3) 9-5-022:001; (3) 9-5-024:001, 009, 010, 011, 069, 076, 077; (3) 9-5-025:002, 039, 999 ROW; and (3) 9-5-026:999 ROW

This letter provides the State Historic Preservation Division's (SHPD's) review of the subject County of Hawai‘i Department of Environmental Management (DEM) Nā‘ālehu Large Capacity Cesspools Replacement proposed project. The SHPD received the submittal on October 22, 2020. The submittal included a SHPD HRS 6E Submittal Form, a County of Hawai‘i letter requesting initiation of consultation and concurrence, a map packet, a 6E Filing Fee Form, a proposed AIS strategy, and a literature review. The County of Hawai‘i letter indicates that TMK: (3) 9- 5- 025:041 was part of the project area although it was not included in the 6E Submittal Form. However, subsequent phone communication on December 4, 2020 clarified that parcel is not part of the current project (Sarah Wilkinson [Cultural Surveys Hawai‘i Inc.] and Nicole Mello [SHPD]). The original submittal received by SHPD on July 10, 2019 did not contain sufficient information for SHPD to comment (Log No. 2019.01550, Doc. No. 2001SN20).

Approximately 49.62 acres is under consideration for the proposed project although the project is expected to consist of less area. The project includes a new wastewater collection system, closure of three existing Large Capacity Cesspools (LCCs), construction of a transmission system, and a disposal and treatment facility for Nā‘ālehu. The system will collect wastewater to a secondary facility for processing and disposal. The project will occur within exsiting roadways, developed Nā‘ālehu parcels, and undeveloped ranching lands *mauka* of the highway. The project is in response to meeting the U.S. Environmental Protection Agency (EPA) to remedy ongoing violations of the Federal Safe Drinking Water Act. Ground disturbance will include site clearing, grading, subsurface soil testing including seismic, borings and percolation tests, piping excavation, wet wells, manholes, channels, lagoons, disposal grooves, and structure foundations. The project may receive funding from the Clean Water State Revolving Fund, which includes state and federal funds, and thus the project will be an undertaking requiring compliance with Section 106 of the National Historic Preservation Act (NHPA). The letter indicates this will be addressed in separate correspondence should the project use those funds.

Relevant Correspondence
In a letter dated January 21, 2020 (Log No. 2019.01550, Doc. No. 2001SN20), SHPD responded to the original submittal indicating the submission did not provide enough information for the SHPD to make a meaningful response. SHPD requested the following information be submitted by the agency:

William Kucharski
December 1, 2020
Page 2

1. A cover letter providing a detailed project scope of work, project location (ahupua‘a, district, all TMK parcels), project area acreage, and all the information stipulated in HAR §13-275-3 for obtaining a determination letter:
2. Per §13-275-3(b), the requested letter shall include the following:
   (1) Identification and inventory, to determine if historic properties are present in the project's area and, if so, to identify and document (inventory) them;
   (2) Evaluation of significance [of any historic properties];
   (3) Effect (impact) determination;
   (4) Mitigation commitments, committing to acceptable forms of mitigation in order to properly handle or minimize impacts to significant historic properties; and
   (5) Detailed mitigation plan, scope of work to properly carry out the general mitigation commitments; and
   (6) Verification of completion of detailed mitigation plan.
3. Information regarding any federal component, such as US EPA funding or approval.

A literature review titled *Archaeological Literature Review Report for the Nā‘ālehu Large Capacity Cesspools Replacement Project, Kāhilipalinui and Kāwala Ahupua‘a, Ka‘ū District, Hawai‘i Island TMKs: multiple* (Purdy et al. August 2020) was completed for the project's Environmental Assessment (EA) portion of the project. The literature review indicates undocumented historic properties may be present within the project area, including a segment of the Māmalahoa Highway (SIHP # 50-10-47-30187) and a portion of a historic concrete flood channel.

The current submittal includes an AIS strategy plan for the proposed project. The AIS will follow the standards according to HAR §13-276. The project will include a 100% surface survey with site documentation, mapping and photographs. Mechanical excavation is proposed for 14 exploratory trenches that will span approximately 5.0 meters by 0.6 to 1.0 meters and excavated to bedrock or the physical limits of the backhoe. Additional manual excavations will occur based on the findings of historic properties during the AIS.

The County of Hawai‘i DEM requests the SHPD concurrence with the determination "of the need for an AIS for the project." Additionally, the County is requesting concurrence with the proposed testing strategey and an archaeological permit for the work. **SHPD stipulates** the AIS must be conducted by a firm permitted to conduct archaeological work in the State of Hawai‘i; see SHPD's website for a list of permitted firms.

Due to the potential for historic properties located within the current project area, SHPD requests that an AIS be conducted in the project area. Additionally, SHPD indicates that current proposed AIS testing strategy appears sufficient in identifying historic properties within the current project area and determining the potential impacts to those sites should the AIS identify any. The current submittal addresses the first (1) request made by SHPD in previous correspondance (Log No. 2019.01550, Doc. No. 2001SN20). The remaining (2) and (3) need to be addressed prior to receiving a determination letter. The next step in the review process is conducting an AIS as per HAR §13-275-5(5)(A).

SHPD looks forward to receiving an AIS that meets the requirements of HAR §13-276 for review.

SHPD shall notify the County when the AIS, and any additional documentation if needed (e.g., archaeological monitoring plan) has been accepted and the permit issuance process may proceed.

Please contact Nicole A. Mello, Hawai‘i Island Historic Preservation IV, at Nicole.Mello@hawaii.gov, for matters regarding archaeological resources or this letter.

Aloha,

Alan Downer

Alan S. Downer, PhD
Administrator, State Historic Preservation Division
Deputy State Historic Preservation Officer

cc: Sarah Wilkinson, CSH, swilkinson@culturalsurveys.com
William Folk, CSH, WFolk@culturalsurveys.com
Jay Hopfensperger, CSH, jhopfensperger@culturalsurveys.com
Craig Lekven, Brown and Caldwell, clekven@brwncald.com
John Sakaguchi, jsakaguchi@wilsonokamoto.com

Appendix D EDXRF Analysis Report

EDXRF Analysis Report

UH Hilo Geoarchaeology Lab

Sample List: CSH Kahilipalinui 3
Analysis Technique: Linear
Method File: C:\...\Documents\Methods\2-21 Methods\2-21-Ka'u misc.mth

Analyzed: 03/16/21 13:07:17
Last Calibrated: 03/16/21 13:07:02
Software version: 7.2 (Build 134)

Conditions

High Zb

Voltage	50 kV	Current	Auto
Livetime	250 seconds	Counts Limit	0
Filter	Cu Thick	Atmosphere	Vacuum
Maximum Energy	40 keV	Count Rate	Medium
Warmup time	0 seconds		

Mid Za

Voltage	16 kV	Current	Auto
Livetime	200 seconds	Counts Limit	0
Filter	Pd Thin	Atmosphere	Vacuum
Maximum Energy	20 keV	Count Rate	Medium
Warmup time	0 seconds		

Mid Zc

Voltage	28 kV	Current	Auto
Livetime	250 seconds	Counts Limit	0
Filter	Pd Thick	Atmosphere	Vacuum
Maximum Energy	40 keV	Count Rate	Medium
Warmup time	0 seconds		

Low Za

Voltage	6 kV	Current	Auto
Livetime	200 seconds	Counts Limit	0
Filter	No Filter	Atmosphere	Vacuum
Maximum Energy	10 keV	Count Rate	Medium
Warmup time	0 seconds		

Results

Element	Concentration	Peak (cps/mA)	Background (cps/mA)
Kahilipalinui 3 Acc 1 TU1 CSH-3 fea b adze fragment 111.1g			
Na2O	2 %	-24	186
MgO	8.563 %	2852	332
Al2O3	13.075 %	22650	-1056
SiO2	47.577 %	129793	-7139
P2O5	0.5230 %	4312	-667
S	0 %	-442	3350
K2O	0.3206 %	101	45
CaO	10.357 %	3905	-162
TiO2	2.3315 %	1536	87
V	316.7 ppm	75	275
Cr	441.2 ppm	123	85
MnO	1911.1 ppm	543	108
Fe	8.656 %	40204	739
Ni	140.7 ppm	133	17
Cu	47.3 ppm	17	24
Zn	119.5 ppm	52	13
Rb	8.24 ppm	8	75
Sr	314.6 ppm	969	53
Y	26.48 ppm	42	169
Zr	138.3 ppm	468	352
Nb	11.38 ppm	36	363
Mo	[1.4] ppm	5	604
Ba	105.3 ppm	57	258
La	28 ppm	10	344
Ce	48 ppm	12	407

Pb	[0.39] ppm	0	19
BHVO-2 slab 2-11-21			
Na2O	2 %	-24	190
MgO	7.795 %	2569	394
Al2O3	12.511 %	20906	-843
SiO2	47.654 %	128732	-6770
P2O5	0.1885 %	2294	44
S	0 %	-119	1917
K2O	0.3958 %	120	43
CaO	11.433 %	4105	-176
TiO2	2.7614 %	1725	72
V	368.0 ppm	83	299
Cr	271.1 ppm	71	85
MnO	1623.9 ppm	440	98
Fe	8.525 %	37593	654
Ni	98.9 ppm	91	17
Cu	131.9 ppm	43	28
Zn	115.0 ppm	49	17
Rb	10.44 ppm	10	75
Sr	384.8 ppm	1164	50
Y	26.52 ppm	42	171
Zr	180.1 ppm	609	379
Nb	17.63 ppm	56	356
Mo	3.7 ppm	12	604
Ba	134.0 ppm	69	245
La	[22] ppm	7	324
Ce	66 ppm	16	371
Pb	1.49 ppm	1	19

Appendix E Radiocarbon Analysis Report

Beta Analytic, Inc.
4985 SW 74th Court
Miami, FL 33155 USA
Tel: 305-667-5167
Fax: 305-663-0964
info@betalabservices.com

ISO/IEC 17025:2017-Accredited Testing Laboratory

May 27, 2021

Mr. Olivier Bautista
Cultural Surveys Hawaii
399 Hualani St.
Suite 124
Hilo, Hawaii 96720
United States

RE: Radiocarbon Dating Results

Dear Mr. Bautista,

Enclosed are the radiocarbon dating results for two samples recently sent to us. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable. The Conventional Radiocarbon Ages have all been corrected for total fractionation effects and where applicable, calibration was performed using 2020 calibration databases (cited on the graph pages).

The web directory containing the table of results and PDF download also contains pictures, a cvs spreadsheet download option and a quality assurance report containing expected vs. measured values for 3-5 working standards analyzed simultaneously with your samples.

Reported results are accredited to ISO/IEC 17025:2017 Testing Accreditation PJLA #59423 standards and all chemistry was performed here in our laboratory and counted in our own accelerators here. Since Beta is not a teaching laboratory, only graduates trained to strict protocols of the ISO/IEC 17025:2017 Testing Accreditation PJLA #59423 program participated in the analyses.

As always Conventional Radiocarbon Ages and sigmas are rounded to the nearest 10 years per the conventions of the 1977 International Radiocarbon Conference. When counting statistics produce sigmas lower than +/- 30 years, a conservative +/- 30 BP is cited for the result unless otherwise requested. The reported d13C values were measured separately in an IRMS (isotope ratio mass spectrometer). They are NOT the AMS d13C which would include fractionation effects from natural, chemistry and AMS induced sources.

When interpreting the results, please consider any communications you may have had with us regarding the samples.

The cost of analysis was previously invoiced. As always, if you have any questions or would like to discuss the results, don't hesitate to contact us.

Sincerely,

Chris Patrick
Digital signature on file

Chris Patrick
Vice President of Laboratory Operations

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Beta Analytic, Inc.
4985 SW 74th Court
Miami, FL 33155 USA
Tel: 305-667-5167
Fax: 305-663-0964
info@betalabservices.com

ISO/IEC 17025:2017-Accredited Testing Laboratory

REPORT OF RADIOCARBON DATING ANALYSES

Olivier Bautista	Report Date: May 27, 2021
Cultural Surveys Hawaii	Material Received: May 20, 2021

Laboratory Number	Sample Code Number	Conventional Radiocarbon Age (BP) or Percent Modern Carbon (pMC) & Stable Isotopes	
Beta - 592957	**2a**	**180 +/- 30 BP**	IRMS δ13C: -8.8 o/oo

(49.9%)	**1722 - 1814 cal AD**	**(228 - 136 cal BP)**
(19.2%)	**1656 - 1698 cal AD**	**(294 - 252 cal BP)**
(19.0%)	**1910 - Post AD 1950**	**(40 - Post BP 0)**
(7.3%)	**1836 - 1880 cal AD**	**(114 - 70 cal BP)**

Submitter Material: Charcoal
Pretreatment: (charred material) acid/alkali/acid
Analyzed Material: Charred material
Analysis Service: AMS-Standard delivery
Percent Modern Carbon: 97.78 +/- 0.37 pMC
Fraction Modern Carbon: 0.9778 +/- 0.0037
D14C: -22.16 +/- 3.65 o/oo
Δ14C: -30.52 +/- 3.65 o/oo (1950:2021)
Measured Radiocarbon Age: (without d13C correction): 101.06 +/- 0.37 pMC
Calibration: BetaCal4.20: HPD method: INTCAL20

Results are ISO/IEC-17025:2017 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta in 4 in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half-life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable. The Age is rounded to the nearest 10 years and is reported as radiocarbon years before present (BP), "present" = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the 14C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1 sigma counting statistics. Calculated sigmas less than 30 BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. d13C values are on the material itself (not the AMS d13C). d13C and d15N values are relative to VPDB-1. References for calendar calibrations are cited at the bottom of calibration graph pages.

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Beta Analytic TESTING LABORATORY

Beta Analytic, Inc.
4985 SW 74th Court
Miami, FL 33155 USA
Tel: 305-667-5167
Fax: 305-663-0964
info@betalabservices.com

ISO/IEC 17025:2017-Accredited Testing Laboratory

REPORT OF RADIOCARBON DATING ANALYSES

Olivier Bautista — Report Date: May 27, 2021

Cultural Surveys Hawaii — Material Received: May 20, 2021

Laboratory Number	Sample Code Number	Conventional Radiocarbon Age (BP) or Percent Modern Carbon (pMC) & Stable Isotopes	
Beta - 592958	2b	150 +/- 30 BP	IRMS δ13C: -25.2 o/oo

(42.8%)	1666 - 1783 cal AD	(284 - 167 cal BP)
(33.8%)	1796 - 1894 cal AD	(154 - 56 cal BP)
(18.8%)	1903 - Post AD 1950	(47 - Post BP 0)

Submitter Material: Charcoal
Pretreatment: (charred material) acid/alkali/acid
Analyzed Material: Charred material
Analysis Service: AMS-Standard delivery
Percent Modern Carbon: 98.15 +/- 0.37 pMC
Fraction Modern Carbon: 0.9815 +/- 0.0037
D14C: -18.50 +/- 3.67 o/oo
Δ14C: -26.89 +/- 3.67 o/oo (1950:2021)
Measured Radiocarbon Age: (without d13C correction): 150 +/- 30 BP
Calibration: BetaCal4.20: HPD method: INTCAL20

Results are ISO/IEC-17025:2017 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta in 4 in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half-life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable. The Age is rounded to the nearest 10 years and is reported as radiocarbon years before present (BP), "present" = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the 14C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1 sigma counting statistics. Calculated sigmas less than 30 BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. d13C values are on the material itself (not the AMS d13C). d13C and d15N values are relative to VPDB-1. References for calendar calibrations are cited at the bottom of calibration graph pages.

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BetaCal 4.20

Calibration of Radiocarbon Age to Calendar Years

(High Probability Density Range Method (HPD): INTCAL20)

(Variables: d13C = -8.8 o/oo)

Laboratory number **Beta-592957**

Conventional radiocarbon age **180 ± 30 BP**

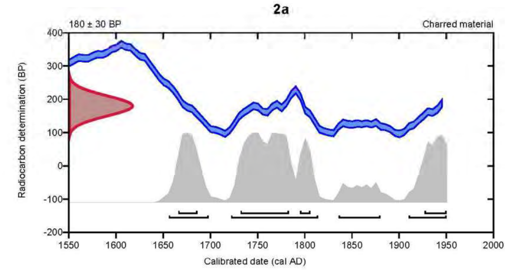
95.4% probability

(49.9%)	1722 - 1814 cal AD	(228 - 136 cal BP)
(19.2%)	1656 - 1698 cal AD	(294 - 252 cal BP)
(19%)	1910 - Post cal AD 1950	(40 - Post cal BP 0)
(7.3%)	1836 - 1880 cal AD	(114 - 70 cal BP)

68.2% probability

(34.3%)	1732 - 1783 cal AD	(218 - 167 cal BP)
(14.6%)	1927 - Post cal AD 1950	(23 - Post cal BP 0)
(13.1%)	1666 - 1686 cal AD	(284 - 264 cal BP)
(6.2%)	1795 - 1806 cal AD	(155 - 144 cal BP)

2a



Database used
INTCAL20

References
References to Probability Method
Bronk Ramsey, C. (2009). Bayesian analysis of radiocarbon dates. Radiocarbon, 51(1), 337-360.
References to Database INTCAL20
Reimer, et al., 2020, Radiocarbon 62(4):725-757.

Beta Analytic Radiocarbon Dating Laboratory
4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • Email: beta@radiocarbon.com

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BetaCal 4.20

Calibration of Radiocarbon Age to Calendar Years

(High Probability Density Range Method (HPD): INTCAL20)

(Variables: d13C = -25.2 o/oo)

Laboratory number **Beta-592958**

Conventional radiocarbon age **150 ± 30 BP**

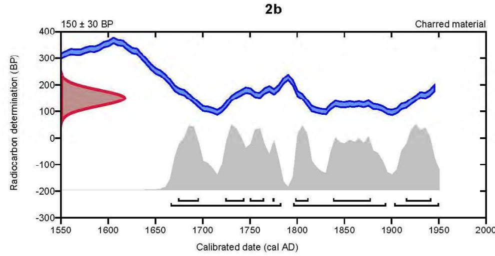
95.4% probability

(42.8%)	1666 - 1783 cal AD	(284 - 167 cal BP)
(33.8%)	1796 - 1894 cal AD	(154 - 56 cal BP)
(18.8%)	1903 - Post cal AD 1950	(47 - Post cal BP 0)

68.2% probability

(17.8%)	1838 - 1878 cal AD	(112 - 72 cal BP)
(14.2%)	1915 - 1942 cal AD	(35 - 8 cal BP)
(10.6%)	1674 - 1696 cal AD	(276 - 254 cal BP)
(10%)	1724 - 1744 cal AD	(226 - 206 cal BP)
(7.5%)	1750 - 1765 cal AD	(200 - 185 cal BP)
(7%)	1798 - 1812 cal AD	(152 - 138 cal BP)
(1.1%)	1774 - 1776 cal AD	(176 - 174 cal BP)

2b



Database used
INTCAL20

References

References to Probability Method
Bronk Ramsey, C. (2009). Bayesian analysis of radiocarbon dates. Radiocarbon, 51(1), 337-360.
References to Database INTCAL20
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Beta Analytic Radiocarbon Dating Laboratory
4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • Email: beta@radiocarbon.com
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Appendix F Site Descriptions from Previous Archaeological Studies

SIHP # 50-10-74-29507 (Clark et al. 2013:184–207)

SIHP Site 29507

Site 29507 is a complex of old ranch buildings located in the northwestern corner of the project area near the junction of the Site 29505 and Site 29506 walls (see Figure 46). The complex includes three main buildings (Features A, B, and D), an old piece of machinery from the Nā'ālehu Sugar Mill on a stone platform (Feature C), and several associated features (i.e. fence lines, water lines, rock walls, gates, a water trough, a small shed, a kennel, a recent *imu* pit, a wooden corral, hitching posts, a gravel parking area, modern farm equipment, trash, etc.) within a roughly 100 meter by 100 meter area (Figure 118). The complex is located at the gated outlet of Nā'ālehu Spur Road in the northwestern corner of the study parcel. The gate is used almost exclusively to access the adjoining parcel to the west (TMK:3-9-5-07:016), as vehicular access is not possible from this gate to the remainder of the current project area located on the eastern side of Site 29506. Only one of the buildings (Feature B) is situated wholly within the boundaries of the current study parcel, the other two are situated partially within the study parcel, and partially on the neighboring parcel to the west. A map of the entire site (prepared by Rechtman Consulting, LLC during fieldwork conducted on the neighboring parcel in 2007) is presented below, but only the site's features that occur within the current study parcel were assigned feature designations and recorded in detail. Some photographs of the features taken by Rechtman Consulting, LLC in 2007 are also reproduced below.

The features of Site 29507 (Figure 119) include a long metal and wood structure on a concrete slab located at the southern end of the complex (Feature A), a small wooden building (Feature B) located at the southwestern end of Site 29505, a large wooden building at the northern extent of the complex next to the gravel parking area (Feature C), and an old piece of machinery from the original Nā'ālehu sugar mill that has been set up on a cobble platform (Feature C) at the intersection of Sites 29505 and 29506. All of the buildings are in various states of disrepair, and they do not appear to have been used (except for storage purposes) for a number of years. Features A, B, C, and D of Site 29507, which are all at least partially located within the boundaries of the current project area, are described in detail below. Their locations relative to the project area boundaries, Sites 29505 and 29506, and the other features of Site 29507 that are situated on the neighboring parcel to the west are depicted in Figure 118.

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RC-0719

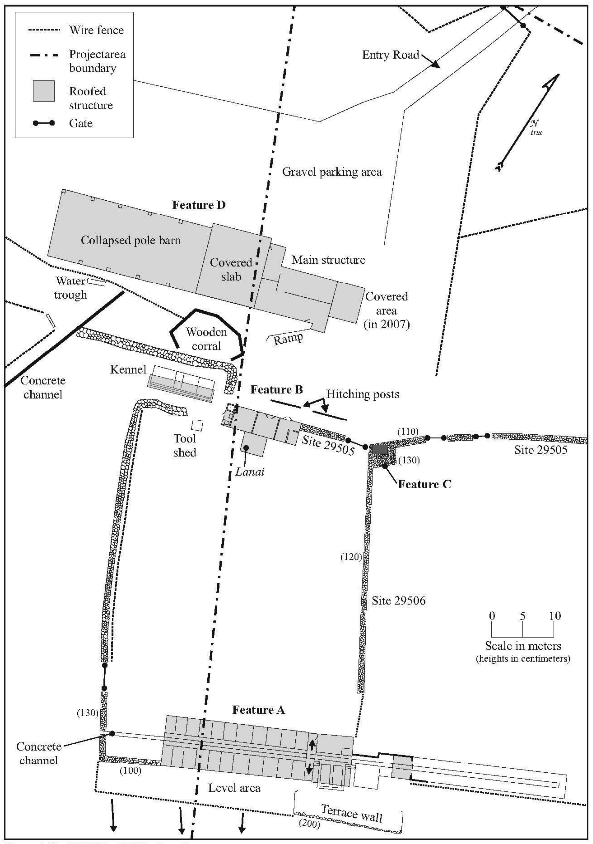

Figure 118. SIHP Site 29507 plan view.

185

RC-0719

Figure 119. SIHP Site 29507, ranch building complex, view to the southwest.

Feature A

Feature A is a dilapidated, metal and wood structure on a concrete slab that is located at the southeastern extent of Site 29507 (see Figure 118). The structure itself measures 30 meters long (northeast/southwest) by 8 meters wide, but a 3.7 meter wide concrete slab protrudes from the northeastern end of the building for an additional 30 meters. The metal superstructure includes two distinct constructions; a lower, longer structure at the western end, and a taller, shorter structure at the eastern end (Figure 120). A trough in the concrete slab with a rounded base (70 centimeters wide) extends centrally down the entire length Feature A and continues to the southwest of the building for 10.5 meters. The trough is designed to carry waste water away from building when cleaning the structure, and therefore slopes gently to the southwest. It has steel small gauge rail tracks along either lip that may have once allowed a cart to roll on top of the trough for the length of the building. The framework of an old wooden shed roof that once extended over the trough is also present at Feature A, roughly 6.5 meters northeast of the eastern portion of the building. The building is situated along the edge of a natural flow contour that drops off fairly steeply to the south. A cobble retaining wall has been constructed along a portion of this contour to create a level surface for the construction of Feature A.

The western end of Feature A consists of a long, low gable roofed pole structure that measures 23 meters long by 8 meters wide. The roof is constructed of wooden trusses and purlins that are supported by steel poles (former small gauge railroad track) and covered with corrugated metal sheets. The western portion of the Feature A structure contains twenty-one stalls for livestock that open on to a long central hallway where aforementioned trough in the concrete slab extends (Figure 121). Eleven of the stalls are situated along the south side of the hallway, and ten stalls are situated along the north side. The former entrance to this portion of Feature A is centrally located along the north edge (Figure 122), which is why there is one less stall on that side. A gated entryway is also centrally located in the southwestern end of the structure, and at the northeastern end an opening leads to the eastern portion of Feature A. All of the stalls are a uniform depth (2.9 meters deep), but the six stalls to the west of the entryway and the eight stalls opposite them are much more narrow (2 meters wide) then the four stalls to the east of the entryway and the five stalls opposite them (3.4 meters wide).

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RC-0719

Figure 120. SIHP Site 29507 Feature A, view to the southeast along the Site 29506 wall through a gate in the Site 29505 wall.

The walls of each stall are formed by concrete that stands 60 centimeter tall and is 12 centimeters thick. Steel poles (former small gauge railroad track) extend to the ceiling from the corners of each of the stalls. Above the concrete, attached to these poles and horizontal sections of old track that run between them, are 50 centimeter tall sheets of corrugated metal and pieces of lumber. Each stall has a 50 centimeter wide latching door of welded galvanized pipe that is flush with the top of the walls. Every stall also has a small trough centrally formed into the top of the concrete wall that can be filled with food or water from the hallway (Figure 123). The date "4/21/44" was inscribed into the concrete along the lip of one of these troughs when it was formed. The floor of each stall slopes slightly toward the door, where a channel in the concrete (50 centimeter wide by 30 centimeter deep) leads to the central trough that extends the length of the slab. This channel would have allowed waste to flow from the stall into the central trough when it was being cleaned.

The taller eastern portion of the Feature A superstructure measures 7.7 meters long (northeast/southwest) by 6.2 meters wide. It consists of a framework of welded steel beams and poles (old narrow gauge railroad tracks) with a gable roof. In 2007 some of the walls were covered by corrugated metal sheets (Figure 124), but most of the sheets had fallen off by the time of the current fieldwork (Figure 125). It appears as though the entire eastern portion of the Feature A structure was once covered by a roof of corrugated metal sheets, but that only the northern portion was enclosed by walls. The eastern portion of Feature A shares the same concrete slab foundation as the western portion. The two sections of the superstructure are separated by a 1.2 meter wide ramped breezeway that runs across the slab and is covered by the roof of the western part of the structure (Figure 126). An opening in the center of the northeastern end of the western portion of the structure leads to eastern portion of the structure. This end of the structure is dived into two distinct areas, with one enclosed room to the north of the long trough that extends the length of the feature, and the other side covered by a roof, but open to the air (Figure 127). The north room, which in 2007 was mostly enclosed by metal sheeting, measures 5.9 meters long (northeast/southwest) by 2.9 meters wide. This room is accessed through a standard size doorway in the center of the north wall. The south wall of the room has a large sliding barn door made of metal that opens to the center of the building. In the southeast corner of the room is a formed concrete tub that measures 1.9 meters (east/west) by 1.3 meters (north/south) and stands approximately 50 centimeters tall.

RC-0719

Figure 121. SIHP Site 29507, stalls and central hallway of Feature A, view to the southwest.

Figure 122. SIHP Site 29507 Feature A, former entryway in the northern side to the western portion of the building, view to the southeast.

RC-0719

Figure 123. SIHP Site 29507 Feature A, small trough typical of each stall, view to the north.

The southern side of the eastern portion of Feature A, on the opposite side of the central trough, has a rectangular red and yellow fire brick feature that measures 4.4 meters long (northeast/southwest) by 3.8 meters wide and stands approximately 1.25 meters tall. Set into, and flush with, the top of the brick edges are two side by side tubs made from a riveted steel tank that has been cut in half (Figure 128). Each tub measures 2.9 meters long (southeast/northwest) by 1.5 meters wide and has a depth of 0.9 meters. At the base of the southern edge of the brick construction, beneath each tub, are two square openings (50 x 50 centimeters) that support metal doors. These openings are designed to allow access to the interior of the brick construction, where it appears that fires would have been burned under the metal tubs to boil water within them. At the northern end of the construction adjacent to the tubs are the remnants of a metal chimney that must have vented through the roof at one time. A section of metal chimney pipe that is still present at the feature measures 40 centimeters in diameter. On both the east and west sides of the brick construction are 80 centimeter wide corridors on the ground surface that access stairways with three steps each that lead up to the north to the central trough area (Figure 129). A metal gate is present on top of the trough in the center of the northeastern end of the eastern portion of Feature A. Beyond the gate the concrete slab measures 4.5 meters wide for a distance of 3.8 meters. In this area it is off-set to the southern side of the building and is not covered. In this area it is evident in the south wall of the slab that the concrete is poured on top of stacked cobbles. The central trough continues to the northeast across the north edge of this area.

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RC-0719

Figure 124. SIHP Site 29507 Feature A, eastern end of the building in 2007, view to the east.

Figure 125. SIHP Site 29507 Feature A, eastern end, view to the southwest.

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RC-0719

Figure 126. SIHP Site 29507, ramp in the breezeway (in 2007) between the eastern and western sections of the building, view to the northwest.

Figure 127. SIHP Site 29507 Feature A, room along the north edge of the eastern portion of the building, view to the southwest.

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RC-0719

Figure 128. SIHP Site 29507 Feature A, southeast corner of the red and yellow fire brick construction, view to the west.

Figure 129. SIHP Site 29507, steel tubs on top of the brick construction, view to the east.

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After the wider section of the concrete foundation, 3.8 meters northeast of the building, the concrete slab narrows to 3.7 meters and continues for an additional 26 meters. In this area the slab consists of two 1.5 meter sections of concrete on either side of the central trough (Figure 130). An old shed-roofed pole structure with wooden rafters that measures 3.7 meters by 3.2 meters is present on this portion of the slab 6.5 meters from the northeastern end of the building (Figure 131). Thick gauge steel fence panels line the north edge of the concrete slab for 10 meters east of the superstructure. The fencing then turns south at the northeastern corner of the shed-roofed pole structure and crosses the slab to the opposite corner. A gate was once present in the northeastern side of the open structure, but it has been replaced by hog wire. The fence then continues along the south side of the slab an additional 3 meters. Fence post remnants on each side of this narrow slab indicate that similar fencing once lined both of its edges for its entire length. Where the trough in the center of concrete terminates, one meter shy of the northeastern end of the slab, the opening of a large diameter pipe is evident (Figure 132). This pipe undoubtedly released water into the trough to flush it out. An earthen ramp slopes gently up to the slab from the northeast at its northeastern end. The ramp seems to have been constructed to allow for vehicular access to the slab.

A large amount of site work must have been conducted to prepare the ground surface for the construction of Feature A. To the south of the feature, adjacent to a steep south sloping natural contour, is a level area that measures 5 meters wide (north/south) by 50 meters long. At the east end of this level area, adjacent to the taller eastern portion of the building, the natural contour has been augmented with a stacked cobble retaining wall that stands 2 meters tall by 17 meters long (Figure 133). The southwestern end of Feature A extends out of the project area, but rock wall on the adjacent property terminates at its southwestern corner. The wall is core-filled (1 meter tall by 1 meter wide) and consists of stacked medium to large cobbles that stand. The wall extends in a southwesterly direction a from Feature A for 10 meters before turning to the northwest and creating an enclosure to the west of Site 29506 along with Site 29505 and Feature B of Site 29507. The wall is breeched by the concrete waste water channel that extends southwest from the southwestern end of Feature A. The formal attributes of Feature A suggest that it was the location of the ranch's piggery, with the western portion of the structure serving as the furrowing pens and the eastern end serving as the slaughterhouse for the pigs.

Figure 130. SIHP Site 29507 Feature A, northeastern end of the concrete slab, view to the southwest.

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Figure 131. SIHP Site 29507 Feature A, shed-roofed pole structure, view to the southwest.

Figure 132. SIHP Site 29507 Feature A, large diameter pipe at the northeastern end of the concrete trough, view to the northeast.

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Figure 133. SIHP Site 29507 Feature A, stacked retaining wall to the south of the structure's eastern end, view to the northwest.

Feature B

Feature B is a small wooden building with a metal roof located approximately 45 meters north of Feature A (see Figure 118). The building is situated adjacent to the northwestern end of the recorded portion of Site 29505 in the approximate northwestern corner of the current project area. It measures 12.3 meters long (northeast/southwest) by 3.5 meters wide, and is one story with a gable style metal roof and a *lānai* built off its southern side (Figure 134). The wooden structure sits on a concrete slab with a 30 centimeter tall sill along the edges. The exterior walls consist of vertical wooden planks (12 centimeters wide by 2.5 centimeters thick) that cover a milled lumber post and beam framework. Four doors and an opening on the *lānai* allow access to the interior of the structure. Two sets of double doors are located in the northern wall of Feature B (Figure 135), and two single doors are located in the western wall (Figure 136). The double doors in the north wall swing out away from the building. They access the two main rooms of the structure, and the other two doors access a wash room with a shower and a toilet. On the exterior of the north side of the building to the right of the doors is a glass covered bulletin board that has a sign over it reading "BULLETIN BOARD # 2." Two sets of metal hitching posts are located near the northeastern corner of Feature B. The hitching posts each consist of two vertical posts set into the ground holding up a horizontal bar that horses were tied to. They are constructed of welded 15 centimeter diameter steel pipe. One measures 4.7 meters long by 1 meter tall, and the other 5.8 meters long by 1.1 meters tall.

The eastern most door in the north wall of the Feature B leads to a room that measures 3.5 meters by 3.5 meters with a small closet partitioned off in its southeastern corner. A concrete step outside the door reads, "ONIPA'A RANCH," with the ranch's brand symbol next to it (Figure 137). The upper edge of the south wall, and the north wall on either side of the doorway, are open allowing light into the room. All four walls are set on the raised sills of concrete (even the interior wall). There is no other interior door leading to the adjoining room to the west. The concrete floor slopes gently down to a circular drainage hole that runs through the base of the concrete sill wall in the room's southwest corner. The room contains some old tack and other miscellaneous items.

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Figure 134. SIHP Site 29507 Feature B, south side of the building, view to the north.

Figure 135. SIHP Site 29507 Feature B, north side of the building, view to the southwest.

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Figure 136. SIHP Site 29507 Feature B, west side of the building, view to the northeast.

Figure 137. SIHP Site 29507 Feature B, concrete step with the inscription "ONIPA'A RANCH," overview to the southeast.

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The central room, which is accessed through the other set of double doors in the north wall of Feature B, measures 7.2 meters long (northeast/southwest) by 3.5 meters wide. This room is empty and has no interior modifications except for a shelf. A *lānai* covered by a shed roof extends out from the south wall of this room. It is accessed through a 1.8 meter wide opening with no doors. The *lānai*, which appears to be a recent addition to Feature B, measures 3.5 meters long (northeast/southwest) by 3 meters wide. The floor of the *lānai* is even with the top of the 30 centimeter tall sill that surrounds the concrete slab. Light comes into the room from the *lānai* opening and the upper portion of the south wall, which is unfinished.

This central room appears to have been two rooms at one point in time. Running north/south across the room is the outline of a former raised concrete sill that has been knocked down. This sill would have divided the room into two equal 3.5 x 3.5 meter sections. Each section of concrete floor, on either side of the removed sill, is sloped to a drain hole through the base of the concrete sill wall on the south side of the structure. In the northern wall of the room at its western end a frame for a second set of double doors is present, but the doors have been removed and walled off.

A lavatory that measures 3.5 meters long (north/south) by 1.2 meters wide (east/west) is constructed off the west end of Feature B. This construction is not part of the original structure (as evidenced by the inconsistent concrete floor), but has been built so that the roofline and width that match those of the original structure. The lavatory contains a toilet, sink, and concrete shower stall with a floor drain. Both doors in the western wall of Feature B lead to the lavatory. The formal attributes of Feature B suggest that it was originally a three stall stable (likely for horses), but that it was later converted to a bunk house (likely during the tenure of Onipa'a Ranch on the property)

Feature C

Feature C is an old piece of sugar mill equipment that has been placed on a cobble foundation at the junction of the Site 29505 and 29506 walls, roughly twelve meters northeast of Feature B (see Figure 118). The item is a box made of 3-centimeter thick iron panels that is bolted together at the corners and along the bottom edges, and open at the top. The box measures 2.6 meters long (east/west) by 1.4 meters wide and it stands 92 centimeters tall. On the exterior panels of Feature C are the inscriptions "W. & A. McONIE GLASGOW 1871." in the center of each of the long sides (Figure 138) and "500 GALLs" in the center of the east facing end. Both inscriptions appear on the western end panel where there are also three holes in the iron for pipe fittings (Figure 139). The inscription indicates that Feature C was manufactured by W. A. McOnie of Glasgow, Scotland in 1871. At the eastern end of the two long side panels at the base of the box are two circular plates that are bolted in place. The interior of the box contains trash, barbed wire, a cow skull, and cut pieces of wood. The box sits on a cobble foundation (stone platform) with stacked edges and a fairly level top surface that is constructed against the interior edges (south and east) of the Site 29505 and 29506 walls where they meet. The cobble foundation measures 4.1 meters long by 2.6 meters wide and stands 0.6 to stands 1.4 meters tall (Figure 140). The edges are fairly intact, except for the northwestern corner where the two aforementioned wall edges have collapsed outward.

Feature D

Feature D is a large wooden structure with a metal roof that is located 15 meters northwest of Feature B at the northwestern extent of the Site 29507 complex (see Figure 118). In 2007 when this structure was first recorded by Rechtman Consulting, LLC it had four adjoining roofed sections that formed a building with the overall dimensions of 52 meters long by 23 meters wide (Figure 141). The sections at Feature D included (1) a main three room structure on a concrete slab, (2) a small, gable roof covered area attached to the exterior eastern wall of the main structure, (3) a gable roof covered concrete slab that extended off the western edge of the main structure, and (4) a collapsed pole barn over a cinder graded area to the west of that. As of the current writing, however, the small, gable roof covered area to the east of the main structure has fallen down, and the collapsed pole barn structure at the western end of the feature has further deteriorated, leaving it nearly unrecognizable as a former structure (Figure 142). The condition of the two remaining sections of Feature D (the main structure and the covered slab) have also deteriorated in the intervening time period, having lost much of their roofing material, but they are still standing. For the purposes of the current study, to present a more complete picture of what Feature D actually looked like in the past, all four sections of the building that were extant in 2007 are described below and photographs taken in that year are also presented (photographs taken in 2007 are noted in the caption).

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Figure 138. SIHP Site 29507 Feature C, north side panel, view to the south.


Figure 139. SIHP Site 29507 Feature C, west end panel, view to the east.

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Figure 140 SIHP Site 29507 Feature C, view to the northwest.


Figure 141. SIHP Site 29507 Feature D, 2007 photograph, view to the southwest.

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Figure 142. SIHP Site 29507 Feature D, 2012 photograph, view to the southwest.

The main section of the Feature D building is a wooden post and beam structure on a concrete slab foundation that has vertical wooden planks for siding and a gable roof of corrugated metal. This three-roomed structure, which was once painted white with green trim, measures roughly 12 meters long by 10 to 12 meters wide. The concrete slab on which this section of the building sits is taller at the eastern end, standing nearly 1-meter above ground surface along that edge, than at the western end where it is nearly level with the ground surface. A cinder block sill wall is present on top of the foundation slab in the northeastern corner of the building and along a portion of the northern edge (Figure 143). The western end of the Feature D main structure, to the west of the cinder block wall, projects further to the north to then the eastern portion, and may represent an addition to the original structure. This fully enclosed section of Feature D has three access points; (1) a small door and (2) a sliding door in the western wall that connect to the covered slab (Figure 144), and (3) a concrete ramp that leads to a door in the south wall (Figure 145). The east end of this main section of Feature D also has (1) a pair of tall, narrow doors, (2) a short, narrow door, and (3) a wide, sliding door that are situated roughly 1 meter above the exterior ground surface along that edge of the building beneath the covered area (Figure 146). These doors appear to have been designed for access from the interior of the building, but not the exterior.

The three rooms within the main portion of the Feature D structure include a large room that occupies the southern half of the building, a smaller room in the northeastern portion of the building, and a smallest room in the northwestern corner of the building that may be part of a later addition to the original building. The largest room is accessed through the door in the southern side of the structure, or through the sliding door along the western side. The short narrow door, and the sliding door in the eastern wall of the building are situated at the eastern end of this room, which has unfinished interior walls and a concrete floor (Figure 147). A ladder against the southern wall leads up to an unfinished loft above the three rooms and a door in the northern wall leads to the room in the northeast corner of the building. The two smaller rooms have wood paneling on their interior walls and ceilings and vinyl tile floors. The paneling and tiles appear to be a more recent addition to this section of Feature D, as the paneling in the northeastern room has covered over the pair of tall narrow doors that are present in the exterior eastern wall of the building at its northern end. The cinder block sill wall noted on the exterior of the building also forms the base of the interior walls of the northeastern room. The door in the western wall of the main structure leads to the smallest room in the northwestern corner of the building, and an interior door connects to the room in the northeastern corner, which in turn has a door that connects to the largest room. The rooms are all fairly empty, but contain some modern trash, rickety shelves, old fluorescent light fixtures, and discarded tires.

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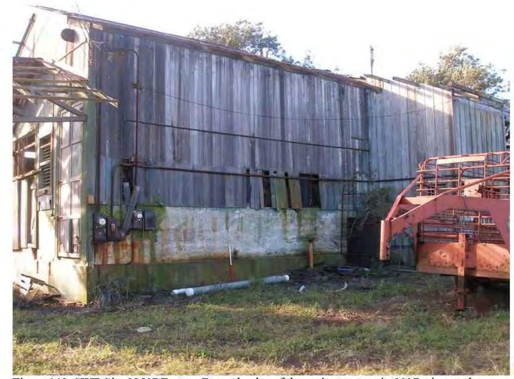

Figure 143. SIHP Site 29507 Feature D, north edge of the main structure in 2007, view to the southwest.

Figure 144. SIHP Site 29507 Feature D, door in north end of the west wall of the main structure, view to the southeast.

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Figure 145. SIHP Site 29507 Feature D, concrete ramp leading to a door in south side of the main structure, view to the northeast.

Figure 146. SIHP Site 29507 Feature D, eastern edge of the main structure, view to the west.

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Figure 147. SIHP Site 29507 Feature D, largest interior room occupying the southern half of the building, view to the east.

The gable roof that extended from the eastern edge of the main structure in 2007, which has since fallen down, covered an area measuring 6 meters (north/south) by 4.7 meters (east/west). The roof was attached to the eastern exterior wall of the building and held up by two wooden poles at its eastern end (Figure 148). The area between the two poles was covered with vertical wooden planks that did not reach all the way to the ground, and the northern and southern sides were open to the air. In the rafters of the gable roof structure (and attached to the eastern exterior edge of the main structure as well as the eastern exterior edge of the roof structure) were a system of large pulleys (Figure 149) that appear to have been designed for hoisting heavy objects up to and into the main structure through the doors in the eastern wall. The gable roof has now collapsed and the wood materials are piled next to the eastern edge of the main structure (see Figure 146).

Adjacent to the west wall of the main structure is a covered concrete slab that measures 10 meters by 11 meters (see Figure 118). The covered slab, and probably the western portion of the main structure, both seem to be an addition to the original structure at Feature D. An old roof line, evidenced by two different paint colors in the largest interior room of the main structure (see Figure 147), indicates that a lower roofed structure may have been replaced by the covered slab structure at some point in time. In 2007 the covered slab was still used as a parking area for ranch equipment, and most of the corrugated metal roofing was still present, but since that time the roofing has fallen off and the structure looks as though it is nearing collapse (Figure 150).

West of the covered concrete slab, in 2007, was a collapsed pole barn that covered a level area of cinder and asphalt measuring roughly 25 meters long by 10 meters wide (Figure 151). The pole barn had a gable roof of corrugated metal that was a continuation of the roof line over the concrete slab. The roof trusses were held aloft by poles attached to concrete pier blocks at their base. The pole barn has now completely collapsed and is no longer recognizable as a former structure (see Figure 142). Feature D seems to have served as the ranch's slaughterhouse until the mid-1950s, when it was closed and later converted into an office building (ranch headquarters) and equipment storage area. The main structure at the eastern end of Feature D was likely the original slaughterhouse, and the western end was a later addition to the structure, added after the closure of the slaughterhouse.

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Figure 148. SIHP Site 29507 Feature D, 2007 photograph of the covered area attached to the eastern end of the main structure, view to the northwest.

Figure 149. SIHP Site 29507 Feature D, pulley system in the rafters of the gable roof structure attached to the eastern edge of the main building, view to the north.

Figure 150. SIHP Site 29507 Feature D, covered slab area to the west of the main structure, view to the northeast.

Figure 151. SIHP Site 29507 Feature D, collapsed pole barn in 2007, view to the south.

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The Site 29507 ranch building complex appears to have been built during the early twentieth century, by the ranching subsidiary of the Hutchinson Sugar Plantation (Ka'alu'alu Ranch/Nā'ālehu Ranch and Dairy, Inc.). The formal attributes of the building suggest their functions, and a review of the Hutchinson Sugar Plantation Company Annual Reports for the years 1903 to 1969 (available at the University of Hawai'i at Hilo Mookini Library) provides additional information relating to the construction and use of the buildings. Feature A functioned as a piggery with an attached slaughterhouse for pigs; Feature B was constructed as a small stable with three stalls, but was later turned into a bunk house; and Feature D was the slaughterhouse for cattle, but was converted to a ranch headquarters and equipment storage area when the slaughterhouse shut down in the mid-1950s. Feature C, which is not a building, seems to be a piece of equipment removed from the original Nā'ālehu Sugar Mill and placed on top of a cobble foundation at the junction of the Site 29505 and Site 29506 ranch walls. The specific use of Feature C at Site 29507 is not clear; it may have been purely a decorative addition to the ranching complex

The first mention of Site 29507 in the Hutchinson Sugar Plantation Company Annual Reports occurs in 1918 when it was reported by the plantation manager that 108 cattle were slaughtered at the company's own slaughterhouse (Feature D). Henke (1929) also mentions that the ranch had its own slaughterhouse, at which roughly 100 head of cattle were slaughtered annually. The location of the slaughterhouse is shown on a March 1931 map of the Nā'ālehu Ranch and Dairy, Inc. lands in the northwestern corner of the project area adjacent to Dairy Paddock # 8 (see Figure 38) and the Site 29505 and Site 29506 ranch walls. Feature A is specifically mentioned in the annual report for 1944 (H. P. S. C. 1944), when Manager J. S. Beatty reported on the expenses incurred by additions to buildings at the piggery. A 1944 date inscribed in concrete of the furrowing pens at the western end of the Feature A structure confirms the additions occurred in that year. No specific mention of Features B and C was found in the annual reports. The writing on Feature C, however, indicates that the machinery was produced in 1871 by W. A. McOnie Company of Scotland Street Engine works, Glasgow, Scotland (founded in 1840), who were the manufacturer's of sugar mills and engines that were shipped all over the world (Grace's Guide 2007). The year written on Feature C corresponds to the date the Nā'ālehu Sugar Mill was erected, and the machinery was likely moved to the location of Site 29507 after the mill was dismantled in ca. 1910.

The Nā'ālehu slaughterhouse closed in the mid-1950s, and the ranch's beef was then marketed through the Hilo Meat Co. (The Gilmore Hawaii Sugar Manual 1954:46). After the closure of the slaughterhouse the Feature D building was converted to serve as an office building (ranch headquarters), workshop and equipment storage area. It is likely around this time that the covered structures attached to its western end were added. Feature D is known to have served as the headquarters several ranches that ran cattle on the project area lands during the second half of the twentieth century, including the Hawaiian Ranch Co. (Ka'alu'alu Ranch; ca. 1967), Parker Ranch (ca. 1978), Kawaihae Ranch (ca. 1987), and Onipa'a Ranch (unknown date). The stable (Feature B) was converted to a bunkhouse at this time as well (probably by Onipa'a Ranch, which is inscribed in the concrete at Feature B). When Feature A ceased to be used as a piggery is unknown.

SIHP # 50-10-47-30187 (Clark et al. 2014:52–58)

SIHP Site 30187

Site 30187 consists of the features Māmalahoa Highway (its past and current alignments) located within the current project area (see Figure 16). As stated in the Culture-Historical Context section of this report, this roadway has developed from what was once a footpath (Kealaehu; Maly and Maly 2001), into its current Highway 11 form through incremental improvements over more than a century. The improvements come in the form of straightening, widening, grade changes, and enhanced storm water drainage systems that are upgraded routinely, but especially during large scale construction projects. The first large scale endeavor that transformed this roadway from a footpath/mule trail into one that automobiles could negotiate was the Kona to Ka'ū portion of the upper Government Road, which was conducted in the late 1800s to early 1900s. By 1933 the Māmalahoa Highway (the Hawai'i Belt Road) was constructed over the same general corridor as the older Government Road, but advances in earth moving technology enabled engineers to cut and fill the sloping land more efficiently, and thus were able to create a more direct, less curvy route. Within the current study area, along the edges of the existing Māmalahoa Highway alignment, one stone revetment (Feature A), two stone retaining walls (Features B, and C), one abandoned segment of roadway (Feature D), and one concrete culvert (Feature E) were recorded, and are described in detail below.

Feature A

Feature A is a sloped revetment consisting of large cobbles and small boulders located along the *makai* side of an elevated portion of the Highway, in the southeastern portion of the study corridor (see Figure 16). Feature A extends 60 meters and is sloped away from the road surface at a roughly 40 degree angle. The lowest point of the adjacent ground surface is at the northwestern end where the base of the revetment measures 3.6 meters below the road surface, and tapers up at the southeast end where the base measures 0.4 meters below the road surface. Between the cobbles and boulders, underlying dark brown soil was observed. At its southeast end, Feature A terminates at Site 23218, a stacked wall that runs along the *makai* side of the highway to the southeast (Figure 35). Near its northwestern end is Site 23219, a boundary wall constructed between TMK: (3) 8-1-09:011 and 057 that terminates two meters *makai* of the base of Feature A (Figure 36). The sloped revetment stands up to 2.4 meters tall at the location of its junction with Site 23219. The revetment was likely constructed as an erosion control device (as opposed to a structural retaining wall) to armor the slope and prevent the loss of fill material during storm events.

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Figure 35. SIHP Site 30187 Feature A, southeast end of wall at its junction with Site 23218, view to the northwest.

Figure 36. SIHP Site 30187 Feature A, intersection with Site 23219, the view to the northeast.

Feature B

Feature B is a sloped retaining wall that forms the *makai* edge of Māmalahoa Highway. The wall, which is located approximately 195 meters northwest of Feature A (see Figure 16), measures approximately 37 meters long, stands 0.5 to 0.7 meters tall, and consists of stacked small to large cobbles and a few small boulders. The wall functions to retain fill material within the road base, which is slightly elevated at this location. The sloped face of the wall, which angles away from the road, provides more retaining strength, and less chance of collapse (Figure 37). The shoulder width from the edge of the retaining wall to the edge of Highway 11 pavement varies from 1.4 to 2 meters. Feature B also defines the *mauka* edge of TMK: (3) 8-1-09:010, a residential property. A hedge of ti have been planted along the retaining wall in front of the house (Figure 38). Amid the ti plants is a small gap where a set of two poured in place concrete steps (SIHP Site 30192). The steps, which are no longer used, descend from the elevated Highway edge to a concrete path that extends across the lower yard surface to the front entrance of the house on TMK: (3) 8-1-09:010 that was built in 1931. The age of Feature B is not clear, although given its conformity to present roadway layout, it may have been constructed during the last phase of Māmalahoa Highway improvements

Figure 37. SIHP Site 30187 Feature B, retaining wall, view to the northwest.

Feature C

Feature C is a two-tiered retaining wall located along the *makai* side of Māmalahoa Highway, 32 meters northwest of Feature B (see Figure 16). The upper section of retaining wall that retains the existing road bed measures roughly 22 meters long, stands up to 1.3 meters tall, and is constructed of small to large cobbles (Figure 39). This wall was built to retain fill material within the road base, which is elevated and curved in its vicinity. The sloped face of the upper tier wall angles away from the road and provides more retaining strength, with less chance of collapse. At its southeastern end, Feature C stands 40 centimeters tall above a level constructed cobble surface, or lower tier of the wall (Figure 40), but steadily increases in height to a maximum of 1.3 meters tall at its northwestern end. The top of the wall face measures, on average, 60 centimeters from the edge of the Highway pavement, and a guardrail has been installed within the narrow shoulder. The lower tier, which extends 1 to 1.5 meters beyond the base of the upper tier, measures 7 meters long and stands roughly 0.6 meters tall along its southwestern (*makai*) edge. The northwestern end of the lower tier terminates at bulldozed rubble near the *mauka/makai* portion of Site 25522 Feature 4, a previously recorded wall (see Clark and Gosser 2006 and see Figure 14) that extends along the northwestern boundary of TMK:(3) 8-1-09:008. It is not clear if both tiers of the Feature retaining wall were constructed during the same episode, or if the lower tier represents an earlier construction, perhaps associated with an older alignment of the road.

Figure 38. SIHP Site 30187 Feature B, retaining wall along TMK (3) 8-1-09:010, view to the southeast.

Figure 39. SIHP Site 30187 Feature C, upper retaining wall along the *makai* edge of Māmalahoa Highway, view to the northwest.

Figure 40. SIHP Site 30187 Feature C, top surface of the lower retaining wall, view to the southeast.

Feature D

Feature D is a section of former roadway located adjacent to the *mauka* ede of Māmalahoa Highway, opposite from Feature B, immediately northwest of Sites 30189 and 30190, and approximately 165 meters southeast of the Napo'opo'o Road intersection (see Figure 16). Feature E fronts a vacant house (built in 1929), which is the lower of two structures on TMK: (3) 8-1-08:003. The abandoned section of road is covered in tall Guinea grass and planted trees line the *makai*, or highway side of Feature D (Figure 41). The old road bed is level and is elevated approximately 1 meter above the current highway surface. It measures 22 meters long by roughly 4 meters wide (Figure 42). Along the *makai* edge, at the southeastern end of the section of old road is a 3 meter long remnant of sloped retaining wall (Figure 43). The wall stands 0.9 meters tall and is built of medium to large cobbles and small boulders. It is likely that this retaining wall continued along the former road's edge to the northwest before it was destroyed during the construction of the more recent alignment of the adjacent roadway. The cut into the former roadway reveals construction fill consisting of small to large cobbles and a small amount of soil. At the *makai* edge of the abandoned road, one section of 10 centimeter thick asphalt pavement was observed on the surface of the former road section in a cut created to accommodate the current highway alignment. The land located northwest of the elevated old road segment has been bulldozed level to the newer highway surface.

This old section of road is believed to be an older segment of road that was abandoned after the more recent alignment of the Māmalahoa Highway was completed in the early 1930s. A 1964 map submitted with Hawai'i Land Court Application No. 1860 (Map 1; see Figure 12) labels the location of Feature E, "Road Remnant", and lists the State of Hawai'i as the owner. It appears that after the Feature E roadway segment was abandoned it was then utilized as a driveway accessing the adjacent house structure built in 1929.

Figure 41. SIHP Site 30187 Feature D, southeastern end of the old road segment with the roof of the vacant structure built in 1929 visible in the background, view to the east.

Figure 42. SIHP Site 30187 Feature D, abandoned road section, view to the northwest.

Figure 43. SIHP Site 30187 Feature D, section of retaining wall at the southeastern end of abandoned road segment, view to the northeast.

Feature E

Feature E is a 12 meter long concrete culvert that extends beneath Māmalahoa Highway (Figure 44) approximately 60 meters northwest of Feature C (see Figure 16). The inlet on the *mauka* side of the road is sunken below road level and is fed by a paved swale that collects runoff from both the southwest and northwest directions. The inlet is situated beneath a steep road cut, and a steel plate has been placed over a portion of the catch pit to prevent loose soil and cobbles from tumbling in to it from the steep slope. At the inlet is a 0.5 meter wide catch pit that is crudely lined with large cobbles (Figure 45), and extends the length of the concrete culvert headwall, which measures 1.8 meters long. The concrete headwall measures 0.28 meters thick, and its flat upper surface is level to the pavement, and set back 0.7 meters from the edge of the driving surface. The headwall and culvert were poured in place, with 6-inch and 12-inch planks used to form the face of the wall, and 3-inch slats used to form the circular culvert portion. The culvert diameter measures 0.95 meters, and is partially filled in at the bottom with sediment.

The outlet end of Feature E extends 3 meters (10 feet) beyond the *makai* edge of the paved road surface (Figure 46). The top of the outlet headwall is roughly 1.3 meters below pavement level, amid a steep slope that is partially reinforced by a dry stacked retaining wall above the southeastern side of the culvert (Figure 47). The retaining wall section is slightly sloped, constructed of large cobbles, and measures approximately 3 meters long by 1 meter tall (Figure 48). The headwall is dimensionally identical to the inlet side. Large cobbles have been stacked, one to two high, on the upper surface of the headwall to retain sloped gravel road fill. From the outlet of Feature E, an excavated channel curves to the northwest and extends for 12 meters, and curves again to the west where it leads to the inlet of a culvert beneath Nāpo'opo'o Road (Site 25522 Feature 2a).

Figure 44. SIHP Site 30187 Feature E, culvert location along Māmalahoa Highway near the Nāpoʻopoʻo Road junction, view to the northwest.

Figure 45. SIHP Site 30187 Feature E, catch pit and headwall at the inlet of the culvert, view to the northwest.

Figure 46. SIHP Site 30187 Feature E, outlet of culvert, view to the north.

Figure 47. SIHP Site 30187 Feature E, retaining wall adjacent to culvert, view to the northeast.

SIHP # 50-10-74-30929 (Gastilo and Clark 2018:145–149; Draft)

Site 50-10-74-30929

Site 30929 consists of an enclosure, an L-shaped pavement, and a pathway (Figure 92) that are located approximately 150 meters northeast of Site 30933 in the northern portion of the current study area (see Figures 46). The terrain surrounding Site 30929 consists of undulating *pāhoehoe* bedrock, numerous bedrock outcrops, and some areas of soil accumulation. To the immediate south of Site 30929 is a large section of the current study area that has been heavily impacted by bulldozing activities over the past several decades. These activities have occurred as recently as 2015. Vegetation in the area consists of *koa haole*, Christmas-berry, lantana, Java plum, and Guinea grass. Site 30929 is described in detail below. Based on its formal attributes, Site 30929 was likely used for Precontact habitation and storage purposes, as well as for Historic ranching purposes.

The enclosure is located to the immediate southwest of the L-shaped pavement and is constructed of small to large *pāhoehoe* cobbles (Figure 93). The northern, eastern, and southern edges of the enclosure form a semi-circle while its western edge is formed by a pile of large cobbles. It measures roughly three meters long by three meters wide, and ranges between 0.2 to 0.6 meters tall. The interior of the enclosure contains a thin layer of soil on top of bedrock, loose cobbles, and *koa haole*. Noted along the northwestern corner of the enclosure are two flat-laid slabs that appear to be covering a sub-surface void that is approximately 0.3 meters deep (Figure 94).

AIS of TMK: (3) 9-5-007:016, Kāhilipali Nui, Kāhilipali Iki, and Kahaea, Ka'ū, Hawai'i 145

4. Fieldwork

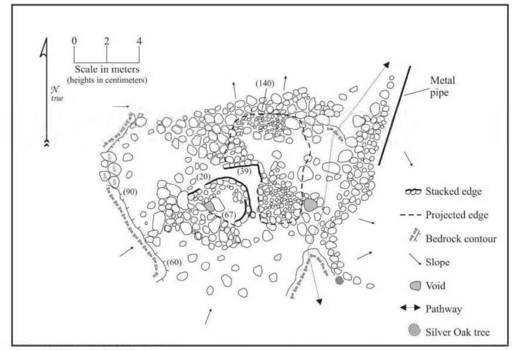


Figure 92. Site 30929 plan view.

Figure 93. Site 30929, semi-circular enclosure, view to the south.

146 AIS of TMK: (3) 9-5-007:016, Kāhilipali Nui, Kāhilipali Iki, and Kahaea, Ka'ū, Hawai'i

Figure 94. Site 30929, void within the enclosure, view to the west.

The L-shaped pavement is located roughly one to 1.5 meters northeast of the enclosure and is constructed of small to large cobbles and slabs (Figure 95). In total, the pavement measures 11.1 meters long by 2.3 to 3.8 meters wide, and ranges between 0.2 to 1.4 meters tall. However, the northern edge of the western pavement terminates at a steep cobble slope which elevates the pavement up to 1.4 meters above the adjacent ground surface to the north. These cobbles were likely never stacked and may be naturally occurring.

Noted to the east of the pavement is what appears to be a possible pathway. It extends to the north and south across a shallow portion of the surrounding depression and along the level area on which the pavement is constructed. The pathway measures roughly 1.5 meters wide, extends an unknown distance to the north and south, and consists of soil, loose cobbles, and exposed bedrock. In some sections the pathway is lined with loosely piled cobbles (Figure 96). Noted between the pavement and the pathway is a subsurface void that measures approximately 0.2 meters deep. To the east of the pathway is a 6.2-meter-long section of a galvanized metal pipe that measures approximately 3.8 centimeters in diameter (Figure 97). No other cultural materials were noted at Site 30929. Based on its formal attributes, Site 30929 was likely used for Precontact and Historic habitation and ranching purposes however, the voids may have been utilized for storage or burial purposes. The pathway and the galvanized metal pipe suggest that the area was modified for ranching purposes.

Figure 95. Site 30929, L-shaped pavement, view to the northeast.

Figure 96. Site 30929, pathway, view to the south.

4. Fieldwork

Figure 97. Site 30929, pathway and galvanized metal pipe, view to the southeast.

SIHP # 50-10-74-30930 (Gastilo and Clark 2018:149–150; Draft)

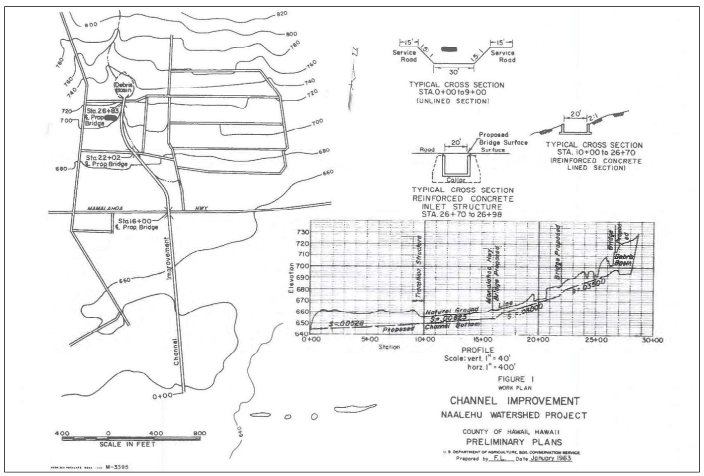
Site 50-10-74-30930

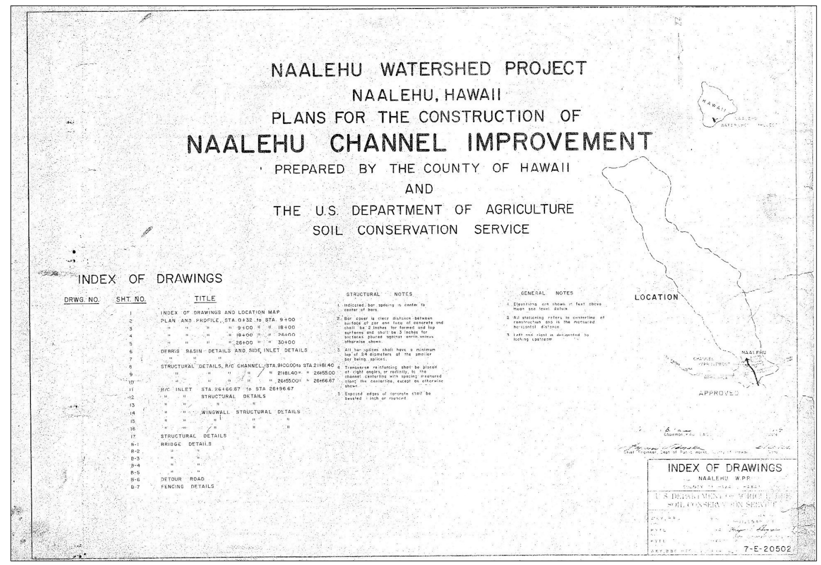
Site 30930 is a core-filled wall that is located near a bulldozed pasture in the northern section of the current study area (see Figure 46). The wall is constructed of large stacked *pāhoehoe* cobbles and extends 920 meters to the east/west (Figure 98). It measures 1.1 meters wide and up to 1.2 meters tall. The western end of the wall intersects with Site 26410 while its eastern termination adjoins Site 29507. The wall is collapsed in some areas and is interrupted by a metal gate in an area that is north of Site 30929. Based on its formal attributes, Site 30930 was likely used for ranching purposes during the first part of the 20th century.

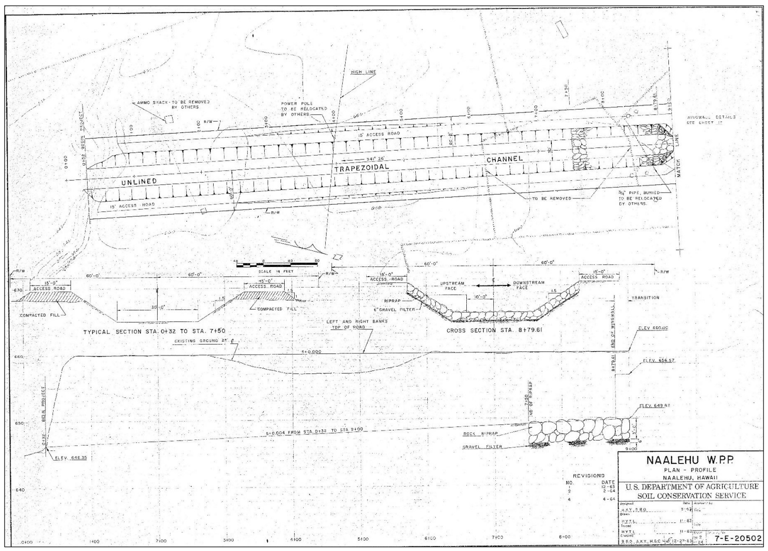
4. Fieldwork

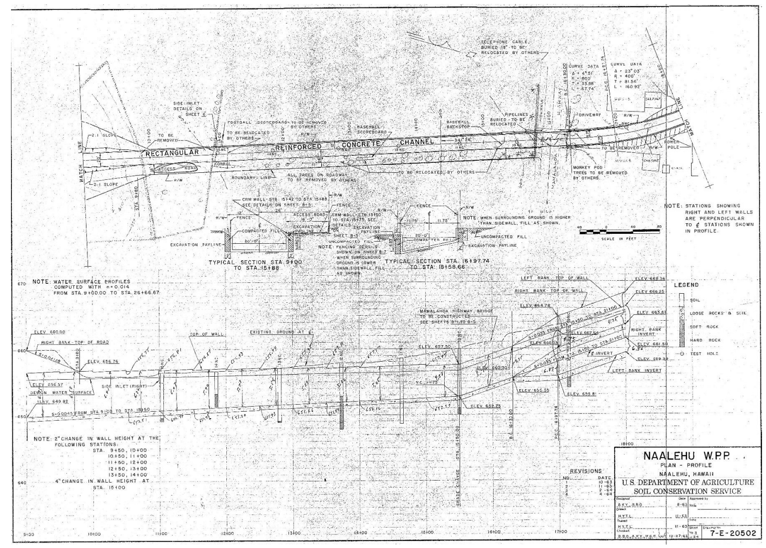
Figure 98. Site 30930, intact section of the wall, view to the north.

Appendix G Select Channel Improvements Plans (SIHP # 50-10-74-31273)






NAALEHU W.P.P.
PLAN - PROFILE
NAALEHU, HAWAII
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
7-E-20502
UNLINED
TRAPEZOIDAL
CHANNEL
TYPICAL SECTION STA. 0+32 TO STA. 7+50
CROSS SECTION STA. 8+79.61
REVISIONS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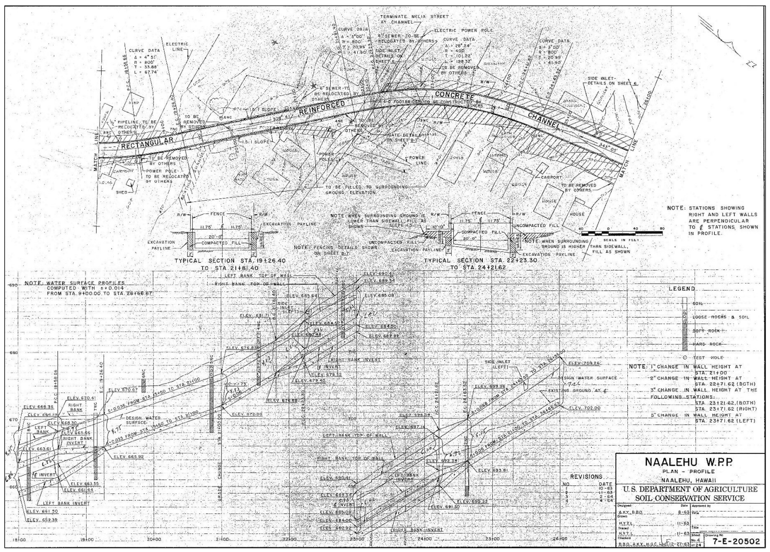
PLAN - PROFILE
NAALEHU, HAWAII
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
7-E-20502
RECTANGULAR
REINFORCED
CONCRETE
CHANNEL
LEGEND
REVISIONS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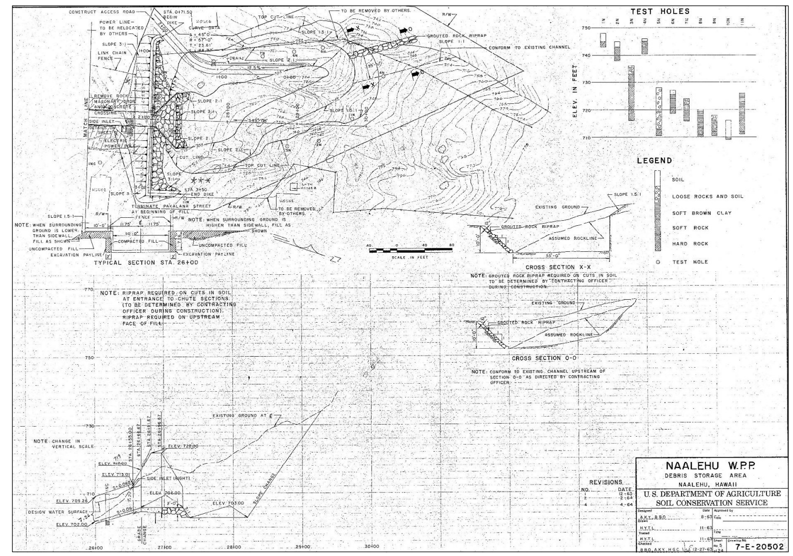
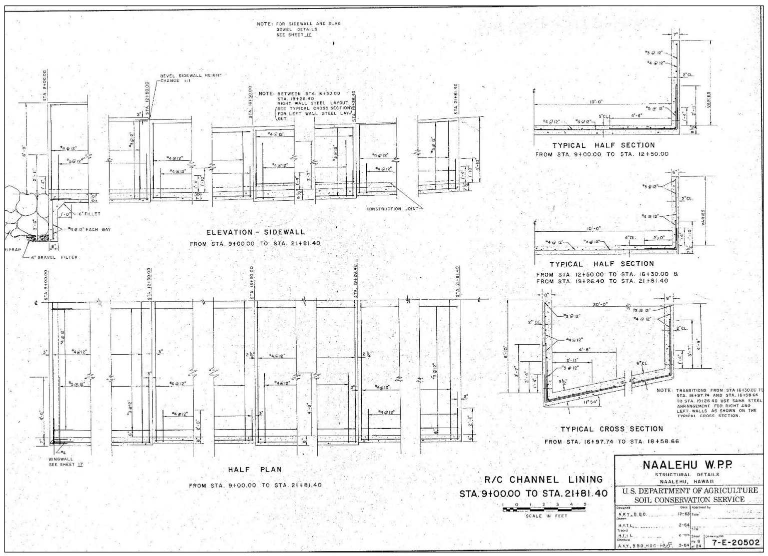
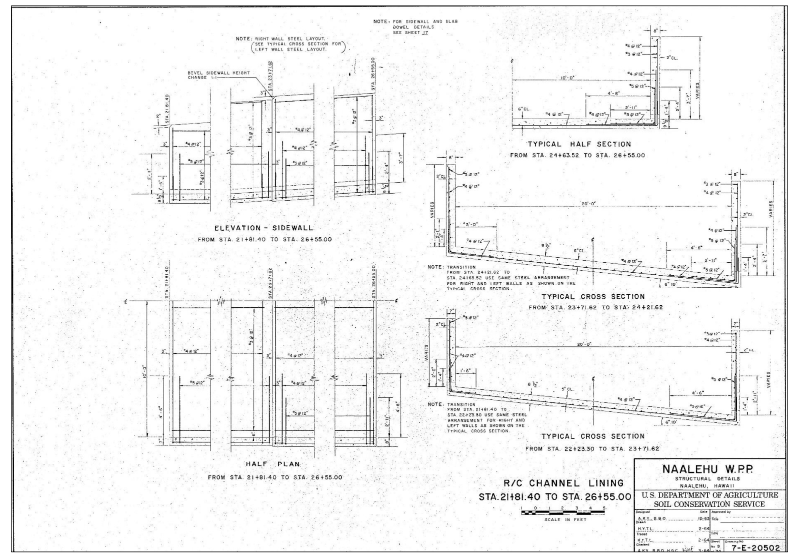
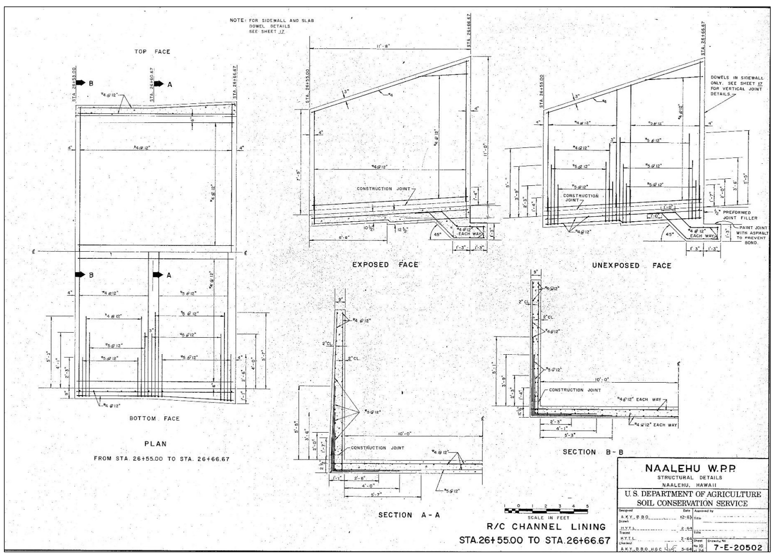
PLAN – PROFILE
NAALEHU, HAWAII
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
7-E-20502
RECTANGULAR
REINFORCED
CONCRETE
CHANNEL
TYPICAL SECTION STA. 19+26.40 TO STA. 21+61.40
TYPICAL SECTION STA. 22+23.30 TO STA. 24+21.62
LEGEND
REVISIONS


TEST HOLES
ELEV. IN FEET
LEGEND
SOIL
LOOSE ROCKS AND SOIL
SOFT BROWN CLAY
SOFT ROCK
HARD ROCK
TEST HOLE
TYPICAL SECTION STA. 26+00
CROSS SECTION X-X
CROSS SECTION O-O
NAALEHU W.P.P.
DEBRIS STORAGE AREA
NAALEHU, HAWAII
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
7-E-20502
REVISIONS


ELEVATION - SIDEWALL
FROM STA. 9+00.00 TO STA. 21+81.40
HALF PLAN
FROM STA. 9+00.00 TO STA. 21+81.40
TYPICAL HALF SECTION
FROM STA. 9+00.00 TO STA. 12+50.00
TYPICAL HALF SECTION
FROM STA. 12+50.00 TO STA. 16+30.00 &
FROM STA. 19+26.40 TO STA. 21+81.40
TYPICAL CROSS SECTION
FROM STA. 16+97.74 TO STA. 18+58.66
R/C CHANNEL LINING
STA. 9+00.00 TO STA. 21+81.40
NAALEHU W.P.P.
STRUCTURAL DETAILS
NAALEHU, HAWAII
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
7-E-20502


ELEVATION - SIDEWALL
FROM STA. 21+81.40 TO STA. 26+55.00
HALF PLAN
FROM STA. 21+81.40 TO STA. 26+55.00
TYPICAL HALF SECTION
FROM STA. 24+63.52 TO STA. 26+55.00
TYPICAL CROSS SECTION
FROM STA. 23+71.62 TO STA. 24+21.62
TYPICAL CROSS SECTION
FROM STA. 22+23.30 TO STA. 23+71.62
R/C CHANNEL LINING
STA. 21+81.40 TO STA. 26+55.00
NAALEHU W.P.P.
STRUCTURAL DETAILS
NAALEHU, HAWAII
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
7-E-20502


NOTE: FOR SIDEWALL AND SLAB DOWEL DETAILS SEE SHEET 17
TOP FACE
BOTTOM FACE
PLAN
FROM STA. 26+55.00 TO STA. 26+66.67
EXPOSED FACE
UNEXPOSED FACE
CONSTRUCTION JOINT
DOWELS IN SIDEWALL ONLY. SEE SHEET 17 FOR VERTICAL JOINT DETAILS
PREFORMED JOINT FILLER
PAINT JOINT WITH ASPHALT TO PREVENT BOND
SECTION A - A
SECTION B - B
SCALE IN FEET
R/C CHANNEL LINING
STA.26+55.00 TO STA.26+66.67
NAALEHU W.P.P.
STRUCTURAL DETAILS
NAALEHU, HAWAII
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
7-E-20502

APPENDIX F:

Section 106 Consultation

Initiation Letter

Overview of the Undertaking

In June 2017 the EPA and the COH-DEM voluntarily entered an Administrative Order on Consent (AOC) to close three County-owned large-capacity cesspools (LCCs) in the town of Nāʻālehu. The original proposed project to close the LCCs included the construction of a new wastewater collection and transmission system to convey wastewater to a new wastewater treatment facility for processing and disposal to a land application system planted with native trees, to be established on the project site for that purpose. The construction of the wastewater treatment plant also included a 1,500-foot (ft) extension of an existing drainage channel.

Effective as of August 22, 2022, the EPA and COH-DEM voluntarily entered a Revised AOC, which identified four project alternatives for evaluation:

- Alternative #1: Package Wastewater Treatment Plant and new collection system
- Alternative #2: Package Wastewater Treatment Plant Plants connected to the existing collection system
- Alternative #3: Individual Wastewater System (IWS) – Maintenance program model
- Alternative #4: Individual Wastewater System IWS – Operating program model

COH-DEM Wastewater Division (WWD) has evaluated the four treatment alternative options, considering the technical, environmental impact, public input, legal challenges, cost, and assorted factors for the selection of a treatment option. As a result, COH-DEM and WWD have selected Alternative 1 as the preferred option.

Under Alternative 1, the County would construct a new sewer collection system in the Nāʻālehu community to replace the existing system of gravity lines that convey sewage to the three LCCs and connect it to the proposed wastewater treatment and disposal facility (*Attachment A, Figure 1)*. The WWTP would serve the former Brewer lots as well as newly accessible parcels for future connection to the WWTP (*Attachment A, Figure 2*). The potential connection of additional parcels may be further assessed by the County in the future.

During construction, the County shall ensure that residential units can maintain access to the sewer system at all times. Alternative 1 involves utilizing the existing collection system within the Brewer Company house lots and constructing new gravity sewers, wastewater pump station (WWPS), and force main to transport sewage from the LCCs to the new WWTP. Alternative 1 also involves the installation of gravity sewers to replace the existing collection.

Under this alternative, the County would perform the following actions:

1. Construct a new gravity sewer on Kaʻalaʻiki Road and Nāʻālehu Spur Road to the WWTP located on a portion of Tax Map Key (TMK) (3) 9-5-007:016.
2. Implement drainage improvements within the vicinity of the WWTP within TMKs (3) 9-5-007:016, (3) 9-5-022:001 and (3) 9-5-021:015.
3. Construct a new pump station located on a portion of TMK: (3) 9-5-008:048, and construct a new force main, which crosses an existing storm drainage channel at Melia Street, to connect to the Kaʻalaʻiki Road gravity sewer.
4. Construct a new gravity sewer on Opukea Street and Ohai Road to intercept existing flow entering the LCCs and divert sewage to the WWPS and transport flows to the gravity sewer along Kaʻalaʻiki Road.

5. Install gravity sewers within the streets to replace the existing collection system.
6. Close and abandon the three LCCs.
7. Accommodate future expansion of subsurface effluent disposal located within a portion of TMK: (3) 9-5-022:001.

The newly accessible and potentially newly accessible lots shown in *Attachment A, Figure 2* are not considered part of the undertaking nor the APE, as the respective lot owners would be responsible for the design and completion of these connections and for the proper closure of their individual wastewater systems with their respective private properties.

Area of Potential Effect (APE) and Archaeological Inventory Survey (AIS) Project Area

The APE for the Nāʻālehu LCCs replacement project is approximately 80.4 acres. The APE, which is depicted on a 2022 aerial map (*Attachment A, Figure 3*), includes:

- The proposed treatment plant and disposal facility which will be located makai (seaward) of the Māmalahoa Highway at TMKs: (3) 9-5-007:016 and (3) 9-5-022:001. An associated drainage channel may be located on a portion of TMK: (3) 9-5-021:015;
- The location(s) of proposed pump station(s);
- The proposed collection system primarily in the County streets of Nāʻālehu;
- The locations of three LCCs which will be decommissioned; and
- Community parcels currently connected to the existing County system.

The AIS for the project area comprises a 49.62-acre portion of the overall APE (*Attachment A, Figure 3*). The AIS project area includes all the components of the APE listed above except for the currently connected community parcels. All project staging will be confined within the AIS project area limits at the proposed treatment plant and sewer pump station site(s).

Archaeological Background

Six archaeological studies predating the current undertaking have been identified within or in the immediate vicinity of the APE. These studies are depicted in relation to the project area in *Attachment A, Figure 4* and summarized in *Attachment B, Table 1*. Twenty-six historic properties documented during three of these prior studies are within 1 km of the current APE; these sites are shown in *Attachment A, Figure 4* and summarized in *Attachment B, Table 2*.

In 2005 Haun and Associates conducted an AIS of an approximately 1.0-acre area located southeast of the current APE (Haun and Henry 2005). Extensive prior impacts by historic and modern ranching activity were observed. No archaeological features were documented, and no further work was recommended. Based on the lack of findings the study was termed an "archaeological assessment" pursuant to HAR §13-284-5(5[A]).

In 2006 Cultural Surveys Hawaiʻi (CSH) undertook a literature review and field inspection (LRFI) for two Kaʻū District schools as part of a state-wide Department of Education (DOE) wastewater systems improvement project. One of the two schools was Nāʻālehu Elementary and Intermediate School, located across the Māmalahoa Highway from the southeastern portion of the current APE (Hammatt and Shideler 2006). The LRFI included data for Land Commission Awards in the vicinity of the school and noted that Nāʻālehu Elementary School is listed on the Hawaiʻi Register of Historic Places. An on-site archaeological monitoring program was recommended. In 2009 CSH undertook archaeological monitoring for the project (Wilkinson et al. 2009); no cultural materials were exposed during project excavations.

In 2008 Rechtman Consulting conducted an AIS of 42.5 acres overlapping the western portion of the current APE (Clark et al. 2008). The study documented three newly identified historic properties associated with historic-era ranching and sugar plantation activities: SIHP #s 50-10-74-26408 (complex of stone and concrete-lined trenches representing possible latrines), -26409 (concrete water trough), and -26410 (core-filled boundary wall). No further work was recommended for these sites. Of the documented sites, SIHP # -26409 (a concrete trough) is closest to the current APE but does not overlap it (*Attachment A, Figure 4*).

In 2011 Rechtman Consulting completed an AIS of 2.24 acres located across the Māmalahoa Highway from LCCs 3 and 4 in the current APE (Rechtman 2011). The study documented six newly identified historic properties associated with historic land use, shown in *Attachment A, Figure 4*: SIHP #s 50-10-74-28925 (post-1938 residential complex); -28926, -28927, and -28990 (three discrete mid-nineteenth century stone walls); -28928 (core-fill-walled enclosure); and -28929 (complex of historic rock clearing mounds). Archaeological monitoring was recommended for the initial project ground disturbance.

In 2013 Rechtman Consulting completed an AIS of 1,044 acres at TMK: (3) 9-5-010:001, east of the proposed treatment plant facility portion of the current APE (Clark et al. 2013). The survey, which extended down to the coast, documented 204 historic properties, including 12 previously documented sites and 192 newly documented sites. Sites documented within 1 km of the current APE are shown in *Attachment A, Figure 4*. A wide array of pre-Contact and historic era features were recorded for habitation, windbreaks and shelters, burials, ceremonies, petroglyphs, papamū, agriculture, transportation, and ranching. The northwestern corner of the 2013 study abuts the current APE along the proposed gravity sewer corridor near the WWTP plant site. A historic ranch complex (SIHP # 50-10-74-29507) was documented overlapping with parcel 016 just downslope; a portion of this site is situated within the northeastern corner of the proposed drainage channel modification area (*Attachment A, Figure 4)*. A historic ranch wall (SIHP # 50-10-74-29505) was also recorded in the vicinity. All other sites that Clark et al. (2013) recorded are well away from the current APE.

CSH completed a literature review analysis for the current undertaking (Purdy et al. 2020) to determine the likelihood that historic properties may be affected by the project and, based on findings, consider cultural resource management recommendations to facilitate project planning and support the project's historic preservation and environmental review compliance. The literature review determined the project area extends along or crosses at least two significant historic roadway alignments, including an undocumented segment of Māmalahoa Highway (SIHP # 50-10-47-30187) and Ka'ala'iki Road, also known as the "Cane Haul Road." The concrete flood drainage channel crossed by the project area between Ka'ala'iki Road and Maile Street was built in 1965 and is therefore a historic property. Other constructions within the project area may also be greater than 50 years old. Purdy et al. (2020) also noted the site of the WWTP has not been subjected to prior archaeological survey and may contain remnants of ranching activities or other historic land use, or pre-Contact features located within lava tubes or other areas not disturbed by historic activities. The results of the literature review indicate additional archaeological work is warranted for the Nā'ālehu LCC replacement project; this assessment is in accord with the SHPD 21 January 2020 §6E-8 Historic Preservation Review letter (Log. No.: 2019.01550; Doc. No.: 2001SN20) requesting additional information about the

project. An AIS will be completed to fulfill SHPD's request to identify and inventory historic properties within the project area.

Consultations

Section 106 consultation letters have also been sent to Native Hawaiian organizations, consulting parties, and/or interested persons that might attach significance to this area and have invited them to participate in the process. The mailing list is provided in *Attachment C*.

We welcome any comments that you may have on this project's proposed improvements.

We are particularly interested in any information you may have on the historic and cultural sites that have been recorded in the area. In addition, if you are acquainted with any persons or organizations that are knowledgeable about the proposed project area or any descendants with ancestral, lineal, or cultural ties to, cultural knowledge or concerns for, and/or cultural or religious attachment to the proposed project area, then we would appreciate receiving their names and contact information.

We would appreciate a written response within thirty (30) calendar days from receipt of this letter. Please address any written comments to email: Chane.Hayashida@doh.hawaii.gov or the following address:

Attn: Chane Hayashida
Department of Health, Wastewater Branch
2827 Waimano Home Road, Room 207
Pearl City, HI 96782

Should you have any questions, please contact Chane Hayashida at (808) 586-4294.

Sincerely,

JONATHAN NAGATO, P.E., ACTING CHIEF
Wastewater Branch

Attachments

CH:jn

c: Ramzi Mansour (via email at Ramzi.Mansour@hawaiicounty.gov)
Chris Sparber (via email at Chris.Sparber@hawaiicounty.gov)
Mark Grant (via email at MarkJ.Grant@hawaiicounty.gov)

ATTACHMENT A

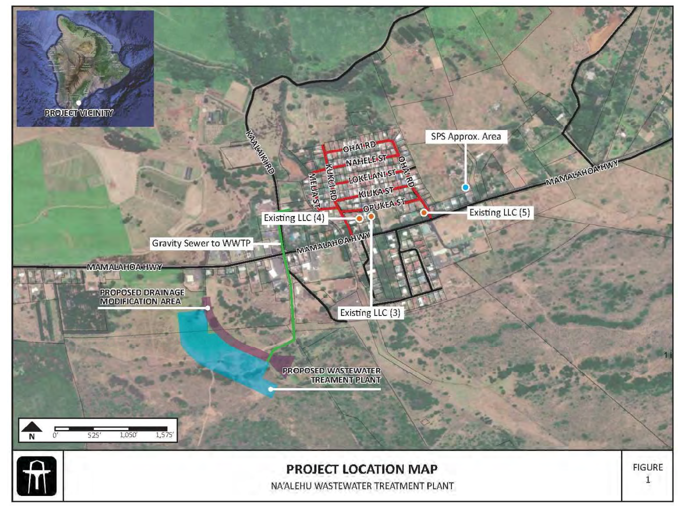


Figure 1. Project location map showing the existing LCCs scheduled for closure, and other project components (courtesy Wilson Okamoto Corp.)

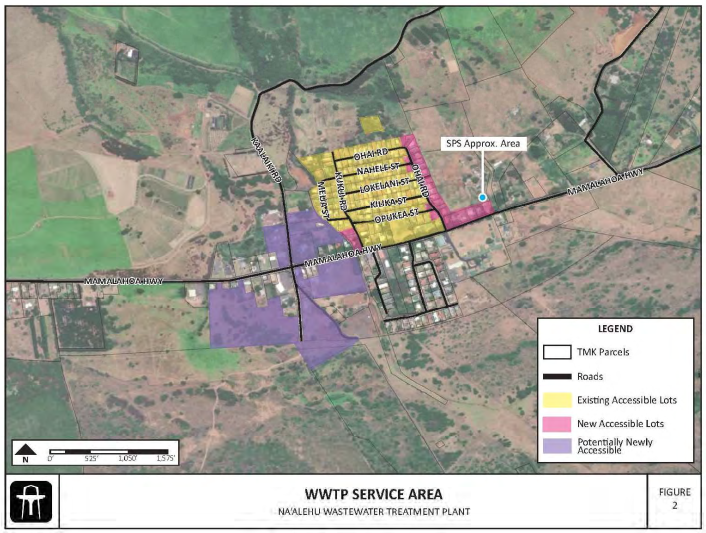


Figure 2. Map showing the proposed WWTP service area (courtesy Wilson Okamoto Corp.)

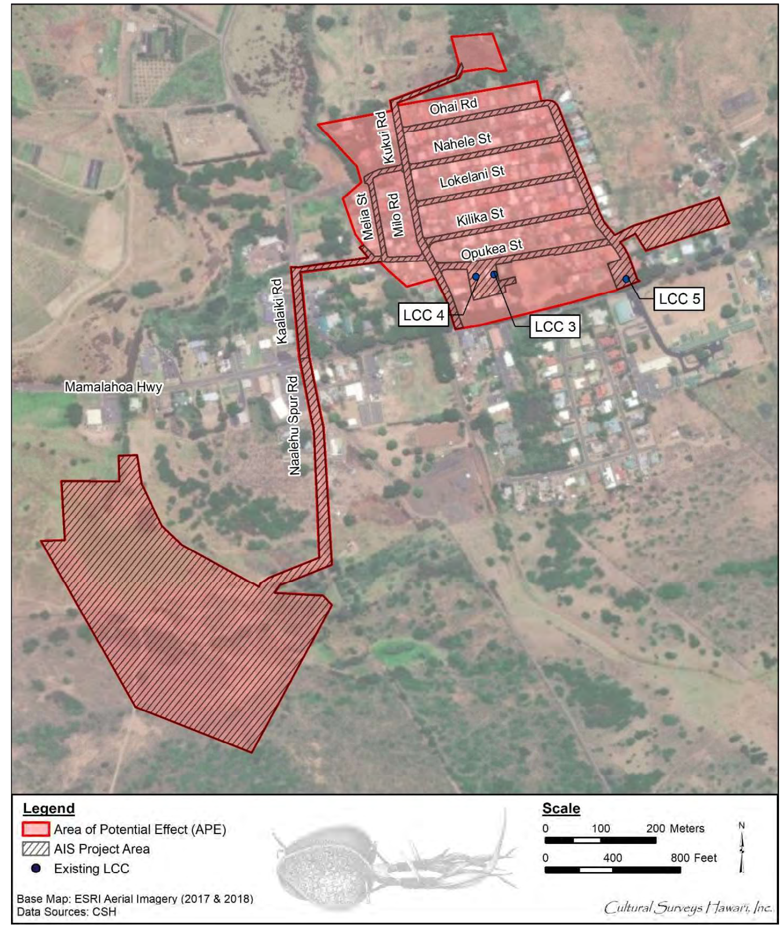


Figure 3. Aerial photograph (ESRI 2022) showing the locations of the Area of Potential Effect (APE), AIS project area, and existing Large Capacity Cesspools (LCCs)

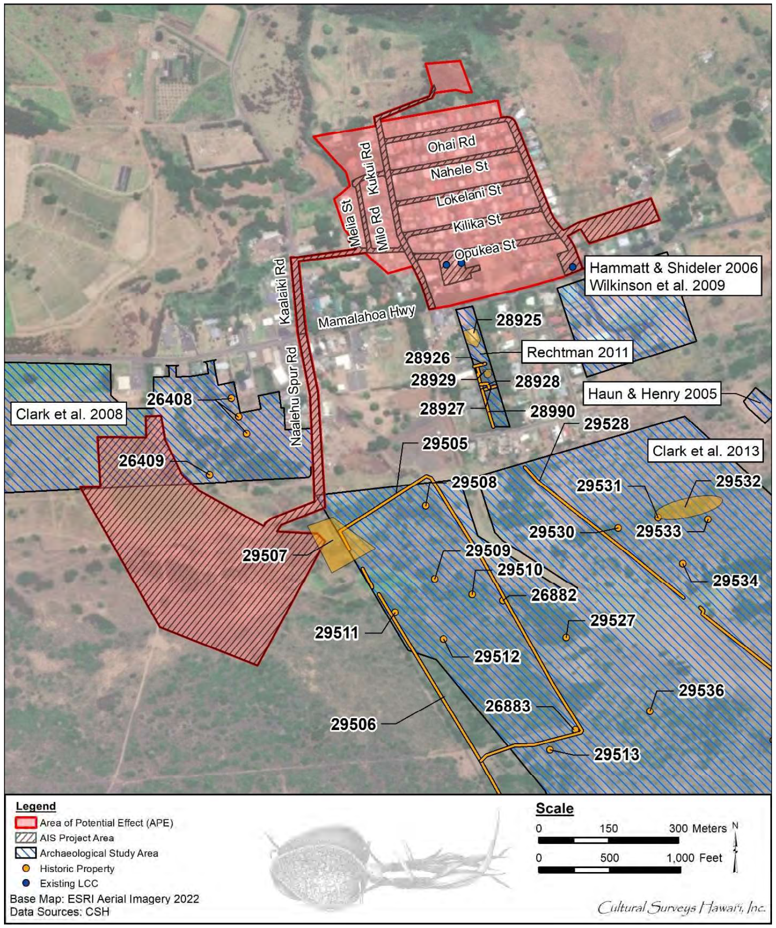


Figure 4. Aerial photograph (ESRI 2022) showing previous archaeological studies and historic properties documented 1 km of the APE

ATTACHMENT B

Table 1. Previous archaeological studies in the vicinity of the APE

Reference	Type of Study	Location	Results
Haun and Henry 2005	Archaeological inventory survey	1 acre in Kaunāmano Ahupua‘a; TMK: (3) 9-5-011:001 por.	No historic properties identified; noted extensive prior impacts throughout project area
Hammatt and Shideler 2006	Archaeological literature review and field inspection	Nā‘ālehu Elementary School; TMKs: (3) 9-5-009:006, 015	Recommended on-site archaeological monitoring
Clark et al. 2008	Archaeological inventory survey	42.5 acres in Kāhilipalinui and Kāwala Ahupua‘a; TMKs: (3) 9-5-021:015 and (3) 9-5-022:001	Documented three newly identified historic properties: SIHP #s 50-10-74-26408, -26409, and -26410, all associated with historic period land use; none of these historic properties appear to be located within the current project area
Wilkinson et al. 2009	Archaeological monitoring	Nā‘ālehu Elementary School; TMKs: (3) 9-5-009:006, 015	No significant resources documented during monitoring
Rechtman 2011	Archaeological inventory survey	2.24 acres in Kāwala Ahupua‘a; TMK: (3) 9-5-009:003	Documented six newly identified historic properties: SIHP #s 50-10-74-28925, -28926, -28927, -28928 and -28990
Clark et al. 2013	Archaeological inventory survey	1,044 acres in Kāhilipalinui and Kāwala Ahupua‘a; TMK: (3) 9-5-010:001	Documented 204 historic properties of which 12 were previously documented and 192 were newly recorded; sites comprised a wide array of pre-Contact and historic era features used for including habitation, windbreaks and shelters, burials, ceremony, petroglyph, papamū, agriculture, transportation, and ranching; in closest proximity to current project area are SIHP #s 50-10-74-29505, historic wall, and -29507, historic ranching complex

Table 2. Historic properties previously documented within 1 km of the current APE

SIHP # (50-10-74-)	Formal Type	# of Features	Function	Age	Reference
26408	Concrete trenches	3	Ranching	Historic	Clark et al. 2008
26409	Concrete trough	1	Ranching	Historic	Clark et al. 2008
26882	Enclosure	1	Habitation	Precontact	Clark et al. 2013
26883	Platform	1	Marker	Historic	Clark et al. 2013
28925	Residential complex	8	Habitation	Historic	Rechtman 2011
28926	Wall	1	Former enclosure	Historic/modern	Rechtman 2011
28927	Wall	1	Former enclosure	Historic/modern	Rechtman 2011
28928	Wall	1	Enclosure	Historic/modern	Rechtman 2011
28929	Rock piles	4	Clearing	Historic	Rechtman 2011
28990	Wall	1	Boundary	Historic/modern	Rechtman 2011
29505	Core-filled wall	1	Ranching/boundary	Historic	Clark et al. 2013
29506	Core-filled wall	1	Ranching/boundary	Historic	Clark et al. 2013
29507	Complex	7	Ranching	Historic	Clark et al. 2013
29508	Concrete trough	1	Ranching	Historic	Clark et al. 2013
29509	Modified outcrop	3	Habitation	Precontact	Clark et al. 2013
25910	Lava tube	1	Habitation	Precontact	Clark et al. 2013
29511	Terrance remnant	1	Indeterminate	Unknown	Clark et al. 2013
29512	Wall remnant	1	Indeterminate	Unknown	Clark et al. 2013
29513	Pavement remnant wall/modified outcrop	1	Habitation	Precontact	Clark et al. 2013
29527	Wall remnant	1	Boundary	Historic	Clark et al. 2013
29528	Core-filled wall	1	Ranching/boundary	Historic	Clark et al. 2013
29530	Modified sink	1	Possible burial	Precontact	Clark et al. 2013
29531	Enclosure remnant	1	Habitation	Precontact	Clark et al. 2013
29532	Modified sink	1	Agriculture	Precontact/historic	Clark et al. 2013
29533	Modified sink/lava tube	1	Habitation	Precontact	Clark et al. 2013
29534	Enclosure	1	Ceremonial	Precontact	Clark et al. 2013
29536	Enclosure/enclosure remnant	2	Habitation	Precontact/historic	Clark et al. 2013

ATTACHMENT C

Native Hawaiian Organizations (NHOs) and Other Consulted Parties

Contact	Affiliation	Contact Info
SHPO		
Dr. Downer, Alan	SHPO Administrator	Kakuhihewa Building 601 Kamokila Blvd., Suite 555 Kapolei, HI 96707 Phone: 808-692-8015 Fax: 808-692-8020 E-mail: alan.s.downer@hawaii.gov
NHOs and Individuals		
Akana, Paula	Executive Director, Friends of ‘Iolani Palace	PO Box 2259 Honolulu, HI 96804-2259 (808) 522-0822 info@iolanipalace.org
Andrade, Lehua	Executive Director, Hui Mālama Ola Nā ‘Ōiwi	1438 Kilauea Avenue Hilo, HI 96720 (808) 969-9220 lehua@hmono.org
Ayau, E. Halealoha	Kumu, Hui Iwi Kuamo‘o	144 Kulana Street Hilo, HI 96720 (808) 646-9015 halealohahapai64@gmail.com
Brown, Samson L.	President, Au Puni o Hawaii	21 Pohai Street Hilo, HI 96720 apohi21@gmail.com (808) 315-2141
Crysdale, Shaylan	*Kama‘āina* of Ka‘ū, worked for The Nature Conservancy in Ka‘ū	scrysdale@TNC.org
Cypher, Mahealani	Secretary, Ko‘olau Foundation	Po Box 4749 Kaneohe, HI 96744 (808) 226-4195 malamapono744@aol.com
Dr. Kana‘iaupuni, Shawn	President and CEO, Partners in Development Foundation	2040 Bachelot Street Honolulu, HI 96817 (808) 595-2752 pid@pidfoundation.org
Faulkner, Kiersten	Executive Director, Historic Hawai‘i Foundation	680 Iwilei Road, Suite 690 Honolulu, HI 96817 (808) 523-2900 preservation@historichawaii.org
Fergerstrom, Hanalei	Spokesperson, Na Kupuna Moku O Keawe	P.O. Box 951 Kurtistown, HI 96760 (808) 938-9994 hankhawaiian@yahoo.com
Fontes, Ann	President, Friends of Ka‘ū Libraries	PO Box 400 Pahala, HI 96777 (808) 987-7748 afontes@hawaiiantel.net
Hong, Lea	Hawai‘i Island Director, The Trust for Public Land	1003 Bishop Street Pauahi Tower, Suite 740 Honolulu, Hawaii 96813 (808) 524-8560

Contact	Affiliation	Contact Info
Hopoi, M. Tonga	Manager of Government Relations, Kamehameha Schools	567 South King Street Honolulu, HI 96813 (808) 523-6368 mihopoi@ksbe.edu
Dr. Iaukea, Lesley K.	Acting History & Culture Branch Chief, SHPD	(808) 692-8023 lesley.iaukea@hawaii.gov
Ferreira, Stacy Kealohalani Cc: Kamakana Ferreira (Lead Compliance Specialist), Lauren Morawski (Compliance Archaeologist), Shane Nelson (Community Outreach Advocate)	CEO, Office of Hawaiian Affairs	560 N. Nimitz Highway, Ste 200 Honolulu, HI 96718 (808) 594-1835 kamakanaf@oha.org laurenm@oha.org shanen@oha.org
Jackson, Anela	President, ʻAha Mālama, Corp.	91-200 Leimao Place Kapolei, HI 96707 (808) 694-9232 ahamalama.anela@gmail.com
Kaʻawa, Nohea	*Kamaʻāina* of Kaʻū and works for the DLNR	kaawa.nohea@gmail.com
Scott Mahoney c/o Jordan Calpito and Christian Omerod, SHPD Burial Sites Specialists Cc: Desmon Haumea (Kaʻū Rep)	Chair, Hawaiʻi Island Burial Council	SHPD Hilo Office 40 Poʻokela Street Hilo, HI 96720 jordan.v.calpito@hawaii.gov christian.omerod@hawaii.gov
Kalili, Dre	President, Association of Hawaiian Civic Clubs	P.O. Box 1135 Honolulu, HI 96807 ahcc.nuhou@gmail.com
Kawachi, Wayne	*Kamaʻāina* of Kaʻū and President of ʻO Kaʻū Kākou organization	ʻO Kaʻū Kākou PO Box 365 Pahala, HI 96777 okaukakou.org@gmail.com
Kuluwaimaka, Elizabeth	Aha Moku Council, Kaʻū Representative	(808) 990-9327 nawai1040@aol.com
Makuakane, Paul	Aha Moku Council, Kaʻū Representative	pmaku808@yahoo.com
Paik, Linda Kaleo	Secretary, Ala Kahakai Trail Association	Ala Kahakai Trail Association P.O. Box 2338 Kamuela, HI 96743 (808) 354-7765 kaleopaik@yahoo.com
Penn, David	Program Specialist, DLNR Legacy Land Conservation Program	1151 Punchbowl Street, Room 325 Honolulu, HI 96813 (808) 586-0921
Ragsdale, Dennis W.	Advocate General, Order of Kamehameha I	1777 Ala Moana Blvd, #142-102 Honolulu, HI 96815-1603 (808) 235-2425 order@kamehameha-1.org
Steiner, William W. Moekahi	Pacific Agricultural Land Management Systems	PO Box 4565 Hilo, HI 96720 (808) 294-0750 wwmsteiner@gmail.com

Contact	Affiliation	Contact Info
Trask, Mililani	Convenor, Na Koa Ikaika Ka Lahui Hawaii	PO Box 6377 Hilo, HI 96720 (808) 961-4811 mililani.trask@icllchawaii.com
Vierra, Darlyne	Aha Moku Council, Kaʻū Representative	(808) 640-8740 dpvierra@yahoo.com
Wise, Taffi	Executive Director, Kanu o ka ʻĀina Learning ʻOhana	PO Box 6511 Kamuela, HI 96743 (808) 887-1117 taffi@kalo.org
Yokoyama Jr., Melvin K.	Chairman of the Board, Malama Kaʻu Foundation	P.O. Box 273 Pahala, HI 96777 (619) 855-5709 mel.yokoyama@akamai-intelligence.com
Yoshida, Berkeley	President, Hawaiian Civic Club of Kaʻū	hawaiicivicclubkau@gmail.com

ATTACHMENT D

Clark, Mathew R., Herbert Poepoe, and Robert B. Rechtman
2008 *An Archaeological Inventory Survey of TMKs: 3-9-5-021:015 and 3-9-5-022:001, Kāhilipali Nui and Kāwala ahupuaʻa, Kaʻū District, Island of Hawaiʻi.* Rechtman Consulting, Hilo, Hawaiʻi.

Clark, Matthew R., J. David Nelson, Amy L. Ketner, Ashton Dircks Ah Sam, Lauryl K. Zenobi, and Robert B. Rechtman
2013 *An Archaeological Inventory Survey of TMK: 3-9-5-010:001, Kāwala Ahupuaʻa, Kaʻū District, Island of Hawaiʻi.* Rechtman Consulting, Hilo, Hawaiʻi.

ESRI
2022 World Imagery. Esri, Redlands, California. Available online at www.arcgisonline.com/maps/World_Imagery.

Hammatt, Hallett H. and David W. Shideler
2006 *Archaeological Literature Review and Field Check Study of Two DOE Schools, Kaʻū District, Island of Hawaiʻi, Hawaiʻi Inter-Island DOE Cesspool Project, TMK: (3) 9-6-005:008, 039; 95-009:006, 015.* Cultural Surveys Hawaiʻi, Inc., Kailua, Hawaiʻi.

Haun, Alan E. and Dave Henry
2005 *Archaeological Inventory Survey, TMK: 9-5-5:017, 018 and 9-6-6:004, Lands of Kaunamano, Kaʻu District, Island of Hawaiʻi.* Haun & Associates, Keaʻau, Hawaiʻi.

Purdy, Samantha, Sarah Wilkinson, and Hallett H. Hammatt
2020 *Archaeological Literature Review Report for the Nāʻālehu Large Capacity Cesspools Replacement Project, Kāhilipalinui and Kāwala Ahupuaʻa, Kaʻū District, Hawaiʻi Island, TMKs: multiple.* Cultural Surveys Hawaiʻi, Inc., Kailua, Hawaiʻi.

Rechtman, Robert B.
2011 *An Archaeological Survey of TMK:3-9-5-09:003 in Compliance with Section 106 of the National Historic Preservation Act, Kāwala Ahupuaʻa, Kaʻū District, Island of Hawaiʻi.* Rechtman Consulting, Hilo, Hawaiʻi.

Wilkinson, Sarah, Rosanna Runyon, Aulii Mitchell, and Hallett H. Hammatt
2009 *Archaeological Monitoring Report for Naalehu Elementary and Intermediate School, Hawaiʻi Inter-Island DOE Cesspool Project, Kaunāmano Ahupuaʻa, Kaʻū District, Island of Hawaiʻi, TMK: [3] 9-5-006:015.* Cultural Surveys Hawaiʻi, Inc., Kailua, Hawaiʻi

APPENDIX G:

Early Consultation Package

Comment and Response Letters

JOSH GREEN, M.D.
GOVERNOR
KE KIAʻĀINA

KEITH A. REGAN
COMPTROLLER
KA LUNA HOʻOMALU HANA LAULĀ

MEOH-LENG SILLIMAN
DEPUTY COMPTROLLER
KA HOPE LUNA HOʻOMALU HANA LAULĀ

STATE OF HAWAIʻI | KA MOKUʻĀINA O HAWAIʻI
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES | KA ʻOIHANA LOIHELU A LAWELAWE LAULĀ
P.O. BOX 119, HONOLULU, HAWAII 96810-0119

(P)24.067

APR 12 2024

Keola Cheng
Wilson Okamoto Corporation
1907 South Beretania Street, Suite 400
Honolulu, Hawaii 96826

RECEIVED
APR 15 2024
WILSON OKAMOTO CORPORATION

Dear Keola Cheng:

Subject: Environmental Information Document and Environmental Assessment Consultation Package
Naalehu LCC Closure
Naalehu, Hawaii Island, Hawaii

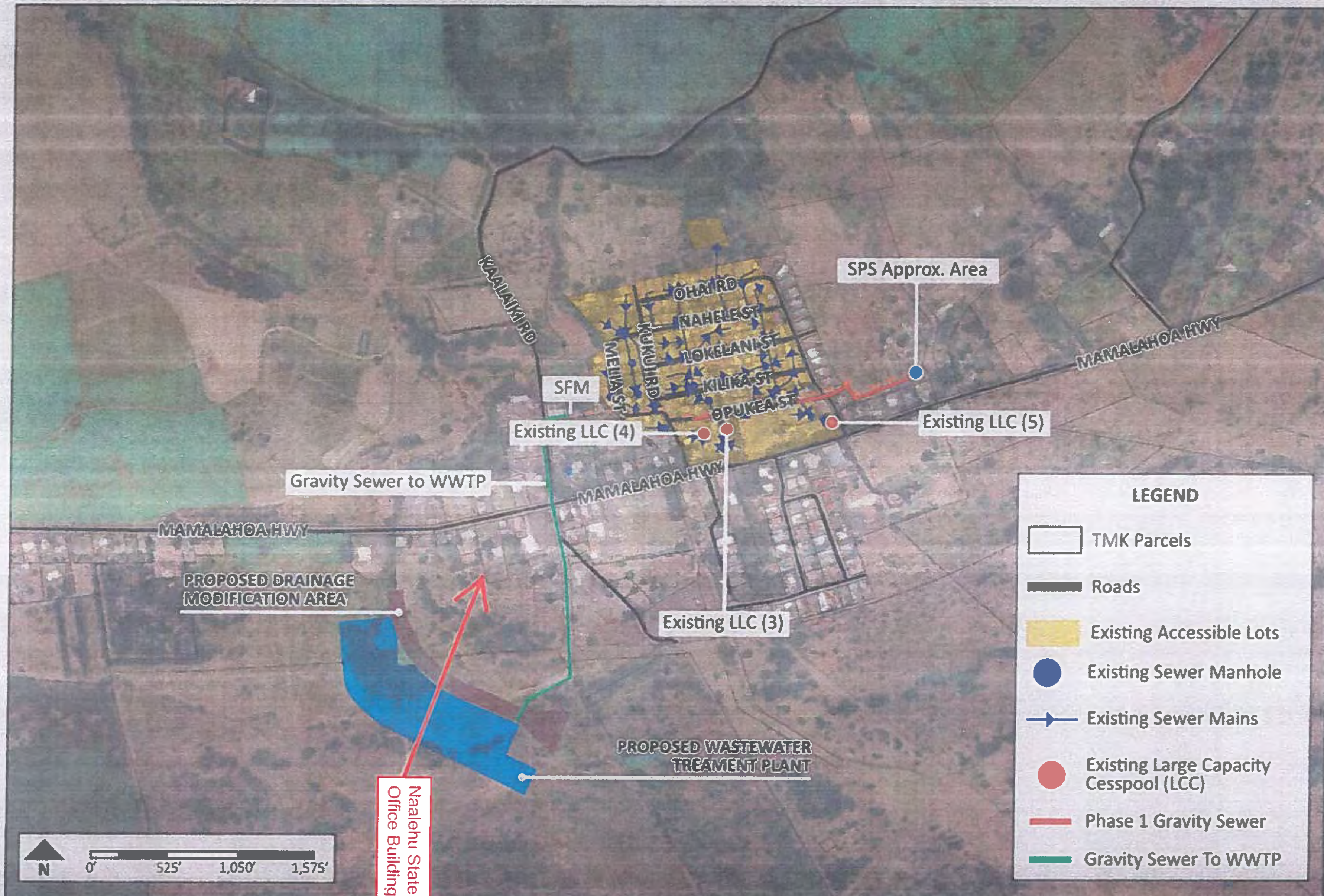
Thank you for the opportunity to provide comments on the subject project. The Department of Accounting and General Services has control and management of a property identified Tax Map Key (3) 9-5-021:010, which is in the general area of the proposed project. The Naalehu State Office Building as well as the Naalehu Public Library are located on this property. We have some concerns with Alternative 1 for potential odors given the proximity of the proposed location for the wastewater treatment plant to the Naalehu State Office Building and Public Library. We look forward to receiving additional details on the proposed project when it is available.

If you have any questions, your staff may call David DePonte of the Planning Branch at 586-0492, or email at david.c.deponte@hawaii.gov.

Sincerely,

GORDON S. WOOD
Acting Public Works Administrator

DD:mo
c: Roger Ross – DAGS Hawaii



NEW COLLECTION SYSTEM LAYOUT

NA'ALEHU WASTEWATER TREATMENT PLANT

FIGURE
3

WILSON OKAMOTO
CORPORATION
INNOVATORS • PLANNERS • ENGINEERS

10345-05
September 8, 2024

Mr. Gordan Wood
Department of Accounting and General Services
State of Hawaii
P.O. Box 119
Honolulu, HI 96810-0119

Subject: Environmental Assessment Early Consultation for the
Na'alehu Large Capacity Cesspools Closure
Nāʻālehu, Hawaiʻi Island, Hawaiʻi

Dear Mr. Wood:

Thank you for your letter dated April 12, 2024, regarding the regarding the subject Early Consultation Package for for the Na'alehu Large Capacity Cesspool Closure Project on the Island of Hawai'i. We acknowledge your comments and they have been considered in the preparation of the Draft EA with regard to meeting content requirements prescribed in Hawaiʻi Administrative Rules, Title 11, Chapter 200.1, Section 18. A record of your comments, along with this response, have been produced and are appended to the Draft EA in Appendix G.

We acknowledge your comments and note that the Proposed wastewater treatment measures shall include means and methods for odor control. As described in Section 2.1.1 of the Draft EA / EID, Alternative 1 shall include a preliminary treatment method which is intended to minimize potential orders as well as an odor control system which shall further filter odorous air.

Please note that the Draft EA has been published and made available for review and comment in the current issue of the State of Hawaiʻi's Environmental Review Program's (ERP) The Environmental Notice.

We appreciate your participation in the EA review process.

Sincerely,

Keola Cheng

Keola Cheng
Director - Planning

cc: Mr. Mark Grant, Wastewater Division Project Coordinator

JOSH GREEN, M.D.
GOVERNOR | KE KIAʻĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIAʻĀINA

DAWN N. S. CHANG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAIʻI | KA MOKUʻĀINA ʻO HAWAIʻI
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA ʻOIHANA KUMUWAIWAI ʻĀINA
LAND DIVISION

P.O. BOX 621
HONOLULU, HAWAII 96809

April 26, 2024

Wilson Okamoto Corporation
Attn: Mr. Keola Cheng
Director of Planning
1907 South Beretania Street, Suite 400
Honolulu, Hawaii 96826

via email: publiccomment@wilsonokamoto.com

Dear Mr. Cheng:

SUBJECT: Environmental Information Document and Environmental Assessment Consultation Package for the **Na'alehu Large Capacity Cesspool Closure** located at Na'alehu, Ka'u District, Island of Hawaii; Various TMKs, on behalf of County of Hawaii, Department of Environmental Management

Thank you for the opportunity to review and comment on the subject matter. The Land Division of the Department of Land and Natural Resources (DLNR) distributed or made available a copy of your request pertaining to the subject matter to DLNR's Divisions for their review and comments.

At this time, enclosed are comments from the Land Division-Hawaii District on the subject matter. Should you have any questions, please feel free to contact Darlene Nakamura at (808) 587-0417 or email: darlene.k.nakamura@hawaii.gov. Thank you.

Sincerely,

Russell Tsuji

Russell Y. Tsuji
Land Administrator

Enclosure
cc: Central Files

JOSH GREEN, M.D.
GOVERNOR | KE KIA'ĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIA'ĀINA

DAWN N. S. CHANG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAI'I | KA MOKU'ĀINA 'O HAWAI'I
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA 'OIHANA KUMUWAIWAI 'ĀINA
LAND DIVISION

P.O. BOX 621
HONOLULU, HAWAII 96809

April 2, 2024

MEMORANDUM

TO: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division (DLNR.ENGR@hawaii.gov)
X Div. of Forestry & Wildlife (rubyrosa.t.terrago@hawaii.gov)
__Div. of State Parks
X Commission on Water Resource Management (DLNR.CWRM@hawaii.gov)
__Office of Conservation & Coastal Lands
X Land Division – Hawaii District (gordon.c.heit@hawaii.gov)
X Aha Moku Advisory Committee (leimana.k.damate@hawaii.gov)

FROM: Russell Y. Tsuji, Land Administrator *Russell Tsuji*
SUBJECT: Environmental Information Document and Environmental Assessment Consultation Package for the **Na'alehu Large Capacity Cesspool Closure**
LOCATION: Na'alehu, Ka'u District, Island of Hawaii; Various TMKs
APPLICANT: Wilson Okamoto Corporation on behalf of County of Hawaii, Department of Environmental Management

Transmitted for your review and comment is information on the above-referenced subject matter. Please submit comments by **April 26, 2024.**

If no response is received by the above date, we will assume your agency has no comments. Should you have any questions about this request, please contact Darlene Nakamura at darlene.k.nakamura@hawaii.gov. Thank you.

BRIEF COMMENTS:

(✓) We have no objections.
( ) We have no comments.
( ) We have no additional comments.
( ) Comments are included/attached.

Signed: *Gordon Heit*
Print Name: Gordon Heit
Division: Land Division
Date: April 19, 2024

Attachments
cc: Central Files

WILSON OKAMOTO
CORPORATION
INNOVATORS • PLANNERS • ENGINEERS

10345-05
September 8, 2024

Mr. Gordan Heit
Department of Land and Natural Resources Land Division
State of Hawaii
P.O. Box 621
Honolulu, HI 96809

Subject: Environmental Assessment Early Consultation for the
Na'alehu Large Capacity Cesspools Closure
Nāʻālehu, Hawaiʻi Island, Hawaiʻi

Dear Mr. Heit:

Thank you for your letter dated April 2, 2024, regarding the regarding the subject Early Consultation Package for for the Na'alehu Large Capacity Cesspool Closure Project on the Island of Hawai'i. We acknowledge that the Department of Land and Natural Resources Land Division does not have any comments or objections. A record of your comments, along with this response, have been produced and are appended to the Draft EA in Appendix G.

Please note that the Draft EA has been published and made available for review and comment in the current issue of the State of Hawaiʻi's Environmental Review Program's (ERP) The Environmental Notice.

We appreciate your participation in the EA review process.

Sincerely,

Keola Cheng

Keola Cheng
Director - Planning

cc: Mr. Mark Grant, Wastewater Division Project Coordinator

1907 S. Beretania Street, Suite 400 • Honolulu, Hawaii • 96826 • (808) 946-2277

JOSH GREEN, M.D.
GOVERNOR | KE KIAʻĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIAʻĀINA

DAWN N. S. CHANG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAIʻI | KA MOKUʻĀINA ʻO HAWAIʻI
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA ʻOIHANA KUMUWAIWAI ʻĀINA
LAND DIVISION

P.O. BOX 621
HONOLULU, HAWAII 96809

May 13, 2024

Wilson Okamoto Corporation
Attn: Mr. Keola Cheng
Director of Planning
1907 South Beretania Street, Suite 400
Honolulu, Hawaii 96826

via email: publiccomment@wilsonokamoto.com

Dear Mr. Cheng:

SUBJECT: Environmental Information Document and Environmental Assessment Consultation Package for the **Na'alehu Large Capacity Cesspool Closure** located at Na'alehu, Ka'u District, Island of Hawaii; Various TMKs, on behalf of County of Hawaii, Department of Environmental Management

Thank you for the opportunity to review and comment on the subject matter. In addition to our previous comments dated April 26, 2024, enclosed are comments from the Division of Forestry & Wildlife on the subject matter. Should you have any questions, please feel free to contact Darlene Nakamura at (808) 587-0417 or email: darlene.k.nakamura@hawaii.gov. Thank you.

Sincerely,

Russell Tsuji

Russell Y. Tsuji
Land Administrator

Enclosure
cc: Central Files

JOSH GREEN, M.D.
GOVERNOR | KE KIAʻĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIAʻĀINA

DAWN N. S. CHANG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAIʻI | KA MOKUʻĀINA ʻO HAWAIʻI
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA ʻOIHANA KUMUWAIWAI ʻĀINA
LAND DIVISION

P.O. BOX 621
HONOLULU, HAWAII 96809

April 2, 2024

MEMORANDUM

FROM: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division (DLNR.ENGR@hawaii.gov)
X Div. of Forestry & Wildlife (rubyrosa.t.terrago@hawaii.gov)
__Div. of State Parks
X Commission on Water Resource Management (DLNR.CWRM@hawaii.gov)
__Office of Conservation & Coastal Lands
X Land Division – Hawaii District (gordon.c.heit@hawaii.gov)
X Aha Moku Advisory Committee (leimana.k.damate@hawaii.gov)

TO: Russell Y. Tsuji, Land Administrator *Russell Tsuji*
SUBJECT: Environmental Information Document and Environmental Assessment Consultation Package for the **Na'alehu Large Capacity Cesspool Closure**
LOCATION: Na'alehu, Ka'u District, Island of Hawaii; Various TMKs
APPLICANT: Wilson Okamoto Corporation on behalf of County of Hawaii, Department of Environmental Management

Transmitted for your review and comment is information on the above-referenced subject matter. Please submit comments by **April 26, 2024.**

If no response is received by the above date, we will assume your agency has no comments. Should you have any questions about this request, please contact Darlene Nakamura at darlene.k.nakamura@hawaii.gov. Thank you.

BRIEF COMMENTS:

( ) We have no objections.
( ) We have no comments.
( ) We have no additional comments.
(☑) Comments are included/attached.

Signed: *Lindsey Nietmann*
Print Name: Lindsey Nietmann, Acting Wildlife Prog. Mgr.
Division: Division of Forestry and Wildlife
Date: May 9, 2024

Attachments
cc: Central Files

JOSH GREEN, M.D.
GOVERNOR | KE KIAʻĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIAʻĀINA

DAWN N.S. CHANG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RYAN K.P. KANAKA'OLE
FIRST DEPUTY

DEAN D. UYENO
ACTING DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAIʻI | KA MOKUʻĀINA ʻO HAWAIʻI
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA ʻOIHANA KUMUWAIWAI ʻĀINA

DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813

May 8, 2024

Log no. 4502

MEMORANDUM

TO: RUSSEL Y. TSUJI, Administrator
Land Division

FROM: LINDSEY NIETMANN, Acting Wildlife Program Manager
Division of Forestry and Wildlife

SUBJECT: Environmental Information Document and Environmental Assessment Consultation Package for the Na'alehu Large Capacity Cesspool Closure on Hawai'i Island

The Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW) has received your request for consultation regarding the Environmental Information Document and Environmental Assessment Consultation Package for the Na'alehu Large Capacity Cesspool Closure in the Ka'u District on the Island of Hawai'i. The proposed project involves the construction of facilities which would allow the County to close the three Large Capacity Cesspools (LCC). The proposed project area includes approximately 204 discrete tax parcels (in whole or in part) and portions of multiple County of Hawai'i roadways in Na'alehu. The four alternatives include a package plant with a newly constructed sewer collection system in the Na'alehu community, a package plant utilizing the existing 80-year-old collection system, construction of an individual wastewater system (IWS) in which the county maintains the IWS, or construction of an IWS in which the individual homeowner maintains the IWS. By selecting one of these alternatives, it will allow the county to close the LCCs and provide a new SDWA compliant solution for handling wastewater generated by the Na'alehu Community.

The State listed ʻōpeʻapeʻa or Hawaiian Hoary Bat (*Lasiurus cinereus semotus*) could potentially occur at or in the vicinity of the project and may roost in nearby trees. Any required site clearing should be timed to avoid disturbance to bats during their birthing and pup rearing season (June 1 through September 15). During this period woody plants greater than 15 feet (4.6 meters) tall should not be disturbed, removed, or trimmed. Barbed wire should also be avoided in any construction as bats can become ensnared and killed by such fencing material during flight.

Artificial lighting can adversely impact seabirds that may pass through the area at night by causing them to become disoriented. This disorientation can result in their collision with manmade structures or the grounding of birds. For nighttime work that might be required, DOFAW recommends that all lights used be fully shielded to minimize the attraction of seabirds. Nighttime work that requires outdoor lighting should be avoided during the seabird fledging season, from September 15 through December 15, when young seabirds make their maiden voyage to sea.

If nighttime construction is required during the seabird fledgling season (September 15 to December 15), we recommend that a qualified biologist be present at the project site to monitor and assess the risk of seabirds being attracted or grounded due to the lighting. If seabirds are seen circling around the area, lights should then be turned off. If a downed seabird is detected, please follow DOFAW's recommended response protocol by visiting https://dlnr.hawaii.gov/wildlife/seabird-fallout-season/.

Permanent lighting also poses a risk of seabird attraction, and as such should be minimized or eliminated to protect seabird flyways and preserve the night sky. For illustrations and guidance related to seabird-friendly light styles that also protect seabirds and the dark starry skies of Hawai‘i please visit https://dlnr.hawaii.gov/wildlife/files/2016/03/DOC439.pdf.

State-listed waterbirds such as ae‘o or Hawaiian stilt (*Himantopus mexicanus knudseni*), ‘alae ke‘oke‘o or Hawaiian coot (*Fulica alai*), and nēnē or Hawaiian Goose (*Branta sandvicensis*) could potentially occur at or in the vicinity of the proposed project site. It is against State law to harm or harass these species. If any of these species are present during construction, all activities within 100 feet (30 meters) should cease and the bird or birds should not be approached. Work may continue after the bird or birds leave the area of their own accord. If a nest is discovered at any point, please contact the Hawai'i Branch DOFAW Office at (808) 974-4221 and establish a buffer zone around the nest.

DOFAW is concerned about the wastewater treatment facility attracting vulnerable birds to areas that may host nonnative predators such as cats, rodents, and mongooses. We therefore recommend taking action to minimize predator presence, i.e., remove cats, place bait stations for rodents and mongoose, and provide covered trash receptacles. Implementing additional

The endemic pueo or Hawaiian Short-Eared Owl (*Asio flammeus sandwichensis*) could potentially nest in the project area. Pueo nest on the ground and active nests have been found year-round. Before any potential vegetative alteration, especially ground-based disturbance, we recommend that line transect surveys are conducted during crepuscular hours through the project area. If a pueo nest is discovered, a minimum buffer distance of 100 meters from the nest should be established until chicks are capable of flight.

The State listed ʻio or Hawaiian Hawk (*Buteo solitarius*) may occur in the project vicinity. Prior to undertaking vegetation clearing, DOFAW recommends that pre-construction surveys of the area be conducted by a qualified biologist following appropriate survey methods (Gorressen et al., 2008) to ensure no Hawaiian Hawk nests are present, which may occur during the breeding season from March to September. The survey should be conducted at least 10 days prior to the start of construction. If an ʻio nest is detected, a buffer zone of 100 meters (330 feet) should be established around it where no construction shall occur until the chick or chicks have fledged, or the nest is abandoned and DOFAW staff should be immediately notified. If adult individuals are detected in the area during construction, all activities within 30 meters (100 feet) of the bird should cease. Work may continue when the bird has left the area on its own.

DOFAW recommends using native plant species for landscaping that are appropriate for the area; i.e., plants for which climate conditions are suitable for them to thrive, plants that historically occurred there, etc. Please do not plant invasive species. DOFAW also recommends referring to www.plantpono.org for guidance on the selection and evaluation of landscaping plants and to determine the potential invasiveness of plants proposed for use in the project.

DOFAW recommends minimizing the movement of plant or soil material between worksites. Soil and plant material may contain detrimental fungal pathogens (e.g., Rapid ʻŌhiʻa Death), vertebrate and invertebrate pests (e.g., Little Fire Ants, Coqui Frogs, etc.), or invasive plant parts (e.g., African Tulip, Octopus Tree, Trumpet Tree, etc.) that could harm our native species and ecosystems. We recommend consulting the Big Island Invasive Species Committee (BIISC) at (808) 933-3340 to help plan, design, and construct the project, learn of any high-risk invasive species in the area, and ways to mitigate their spread. All equipment, materials, and personnel should be cleaned of excess soil and debris to minimize the risk of spreading invasive species.

The invasive Coconut Rhinoceros Beetle (CRB) or Oryctes rhinoceros is found on the islands of Oʻahu, Hawaiʻi Island, Maui and Kauaʻi. On July 1, 2022, the Hawaiʻi Department of Agriculture (HDOA) approved Plant Quarantine Interim Rule 22-1. This rule restricts the movement of CRB-host material within or to and from the island of Oʻahu, which is defined as the Quarantine Area. Regulated material (host material or host plants) is considered a risk for potential CRB infestation. Host material for the beetle specifically includes a) entire dead trees, b) mulch, compost, trimmings, fruit and vegetative scraps, and c) decaying stumps. CRB host plants include the live palm plants in the following genera: Washingtonia, Livistona, and Pritchardia (all commonly known as fan palms), Cocos (coconut palms), Phoenix (date palms), and Roystonea (royal palms). When such material or these specific plants are moved there is a risk of spreading CRB because they may contain CRB in any life stage. For more information regarding CRB, please visit https://dlnr.hawaii.gov/hisc/info/invasive-species-profiles/coconut-rhinoceros-beetle/.

Gorresen, P. M., R. J. Camp, J. L. Klavitter, and T. K. Pratt. 2008. Abundance, distribution and population trend of the Hawaiian Hawk: 1998-2007. Hawai`i Cooperative Studies Unit Technical Report HCSU-009. University of Hawai`i at Hilo. 53 pp., incl. 8 figures, 3 tables & 1 appendix.

We recommend that Best Management Practices are employed during and after construction to contain any soils and sediment with the purpose of preventing damage to near-shore waters and marine ecosystems.

We appreciate your efforts to work with our office for the conservation of our native species. These comments are general guidelines and should not be considered comprehensive for this site or project. It is the responsibility of the applicant to do their own due diligence to avoid any negative environmental impacts. Should the scope of the project change significantly, or should it become apparent that threatened or endangered species may be impacted, please contact our staff as soon as possible. If you have any questions, please contact Katherine Cullison, Protected Species Habitat Conservation Planning Coordinator at katherine.cullison@hawaii.gov.

Sincerely,

Lindsey Nietmann

LINDSEY NIETMANN
Acting Wildlife Program Manager

WILSON OKAMOTO
CORPORATION
INNOVATORS • PLANNERS • ENGINEERS

10345-05
September 8, 2024

Ms. Lindsey Nietmann
Department of Land and Natural Resources Division of Forestry and Wildlife
State of Hawaii
1151 Punchbowl Street, Room 325
Honolulu, HI 96813

Subject: Environmental Assessment Early Consultation for the
Na'alehu Large Capacity Cesspools Closure
Nāʻālehu, Hawaiʻi Island, Hawaiʻi

Dear Ms. Nietmann:

Thank you for your letter dated May 8, 2024 regarding the Early Consultation Environmental Assessment for the Na'alehu Large Capacity Cesspool Closure Project on the Island of Hawai'i. We acknowledge your comments and they have been considered in the preparation of the Draft EA with regard to meeting content requirements prescribed in Hawaiʻi Administrative Rules, Title 11, Chapter 200.1, Section 18. A record of your comments, along with this response, have been produced and are appended to the Draft EA in Appendix G.

We acknowledge your comments and note that a Natural Resource Assessment has been completed for the project area. The results of the assessment and best management practices are described in Section 4.6 of the Draft EA.

Please note that the Draft EA has been published and made available for review, and comment in the current issue of the State of Hawaiʻi's Environmental Review Program's (ERP) The Environmental Notice. We appreciate your participation in the EA review process.

Sincerely,

Keola Cheng

Keola Cheng
Director - Planning

cc: Mr. Mark Grant, Wastewater Division Project Coordinator

CUST 3-3-1
H-W/G

April 11, 2024

Wilson Okamoto Corporation
1907 South Beretania Street, Suite 400
Honolulu, HI 96826
Attention: Mr. Keola Cheng

To Whom It May Concern:

SUBJECT: Draft Environmental Information Document (EID)/
Environmental Assessment (EA)
Nāʻālehu Large Capacity Cesspool (LCC)
Nāʻālehu, Hawaiʻi Island, Hawaiʻi
Tax Map Key: 9-5-xxx:various

Thank you for the opportunity to comment on the subject's Draft Environmental Information Document (EID) and Environmental Assessment (EA). Hawaiian Electric will be able to provide electrical service to the proposed development in Nāʻālehu. A detailed analysis will be performed after the receipt of the consultant's detailed design drawings and estimated load. The following is a summary of our comments:

1. Generation capacity – As of January 2024, Hawaiian Electric's current system peak load is 187.3MW-net and our total firm generation system capability is 261.4MW-net.

2. Electrical Substation - The area is served by our existing Punaluʻu and South Point Substations and a 12,470 volt overhead distribution along Mamalahoa Highway and in surroundings areas. The capacity of our existing substation may be adequate to serve the anticipated load.

3. Off-Site Electrical Distribution System – The existing off-site 12,470 volt distribution system may not be adequate to serve the some of the proposed alternatives for this project.

5. On-Site Electrical Distribution System – On-site distribution line extensions and easements may be required on the developer's property to serve the anticipated load.

After the development's detailed loading and civil plans are submitted, Hawaiian Electric will prepare a firm cost to provide electrical power to this development.

Hawaiian Electric recommends energy efficient and conservation measures to reduce the maximum electrical demand and energy consumption. The developer may call Hawaiʻi Energy at (808) 537-5577 for questions or details on available programs.

It is encouraged that the developer's electrical consultant open a pre-service request with Hawaiian Electric via our link to our Interconnection Tool as soon as practicable to ensure timely electrical facility installation. For more information and instructions here is the link to our website: Electrical Services > Builder, Developers & Contractors.

If you have any questions, please contact (808) 969-0311 or email us at CI@hawaiianelectric.com.

Me ke aloha pumehana,

Shelley Doctor
shelley.doctor@hawaiianelectric.com
Designer III
Transmission and Distribution Engineering

email: D. Demichelis

WILSON OKAMOTO
CORPORATION
INNOVATORS • PLANNERS • ENGINEERS

10345-05
September 8, 2024

Ms. Shelley Doctor
Planner III
Hawaiian Electric
74-5519 Kaiwi Street
Kailua-Kona, HI 96740

Subject: Environmental Assessment Early Consultation for the
Na'alehu Large Capacity Cesspools Closure
Nāʻālehu, Hawaiʻi Island, Hawaiʻi

Dear Ms. Doctor:

Thank you for your letter dated April 11, 2024, regarding the Early Consultation Environmental Assessment (EA) for the Nāʻālehu Large Capacity Cesspool (LCC) Closure Project on the Island of Hawaiʻi. We appreciate your input on the project's electrical service needs.

We acknowledge your comments and have carefully considered them in the preparation of the Draft Environmental Assessment (EA). A record of your comments, along with this response, have been produced and are appended to the Draft EA in Appendix G.

Please note that the Draft EA has been published and made available for review and comment in the current issue of the State of Hawaiʻi's Environmental Review Program's (ERP) The Environmental Notice.

We appreciate your participation in the EA review process.

Sincerely,

Keola Cheng

Keola Cheng
Director - Planning

cc: Mr. Mark Grant, Wastewater Division Project Coordinator

1907 S. Beretania Street, Suite 400 • Honolulu, Hawaii • 96826 • (808) 946-2277

Mitchell D. Roth
Mayor

Benjamin T. Moszkowicz
Police Chief

Reed K. Mahuna
Deputy Police Chief

County of Hawai`i

POLICE DEPARTMENT
349 Kapiʻolani Street • Hilo, Hawaiʻi 96720-3998
(808) 935-3311 • Fax (808) 961-2389

April 10, 2024

Mr. Keola Cheng
Planning Director
Wilson Okamoto Corporation
1907 South Beretania Street, Suite 400
Honolulu, HI 96826

RECEIVED
APR 15 2024
WILSON OKAMOTO CORPORATION

Dear Mr. Cheng:

SUBJECT: ENVIRONMENTAL INFORMATION DOCUMENT AND ENVIRONMENTAL ASSESSMENT CONSULTATION PACKAGE FOR
NĀʻĀLEHU LCC CLOSURE
NĀʻĀLEHU, HAWAIʻI ISLAND, HAWAIʻI

We appreciate you allowing us the opportunity to review and provide commentary on the proposed Nāʻālehu Large Capacity Cesspool (LLC) Closure project (Proposed Project) located in the Kaʻū District.

The Hawaiʻi Police Department has reviewed the proposal and does not have any comments or concerns at this time.

Should you have any questions or concerns, please contact Acting Captain Pernell Hanoa, Commander of our Kaʻū District, at phone number (808) 939-2520 or via email at Pernell.Hanoa@hawaiicounty.gov.

Sincerely,

BENJAMIN T. MOSZKOWICZ
POLICE CHIEF

#4

CHAD BASQUE
ASSISTANT POLICE CHIEF
AREA II OPERATIONS

PH/jaj
24HQ0392

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INNOVATORS • PLANNERS • ENGINEERS

10345-05
September 8, 2024

Mr. Benjamin Moszkowicz
Hawaii Police Department
State of Hawaii
349 Kapi'olani Street
Hilo, HI 96720-2389

Subject: Environmental Assessment Early Consultation for the
Na'alehu Large Capacity Cesspools Closure
Nāʻālehu, Hawaiʻi Island, Hawaiʻi

Dear Mr. Moszkowicz:

Thank you for your letter dated April 10, 2024, regarding the regarding the subject Early Consultation Package for the Na'alehu Large Capacity Cesspool Closure Project on the Island of Hawai'i. We acknowledge that the County of Hawaiʻi Police Department does not have any comments at this time. A record of your comments, along with this response, have been produced and are appended to the Draft EA in Appendix G.

Please note that the Draft EA has been published and made available for review and comment in the current issue of the State of Hawaiʻi's Environmental Review Program's (ERP) The Environmental Notice.

We appreciate your participation in the EA review process.

Sincerely,

Keola Cheng

Keola Cheng
Director - Planning

cc: Mr. Mark Grant, Wastewater Division Project Coordinator

1907 S. Beretania Street, Suite 400 • Honolulu, Hawaii • 96826 • (808) 946-2277

STATE OF HAWAIʻI
OFFICE OF PLANNING
& SUSTAINABLE DEVELOPMENT

JOSH GREEN, M.D.
GOVERNOR

SYLVIA LUKE
LT. GOVERNOR

MARY ALICE EVANS
DIRECTOR

235 South Beretania Street, 6th Floor, Honolulu, Hawaiʻi 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaiʻi 96804

Telephone: (808) 587-2846
Fax: (808) 587-2824
Web: https://planning.hawaii.gov/

Coastal Zone Management Program

Environmental Review Program

Land Use Commission

Land Use Division

Special Plans Branch

State Transit-Oriented Development

Statewide Geographic Information System

Statewide Sustainability Branch

DTS202404030917NA

April 24, 2024

Mr. Keola Cheng
Planning Director
Wilson Okamoto Corporation
1907 South Beretania Street, Suite 400
Honolulu, Hawaiʻi 96826

Dear Mr. Cheng:

Subject: Environmental Information Document and Environmental Assessment Early Consultation for Nāʻālehu Large Capacity Cesspool Closure Project, Nāʻālehu, Hawaiʻi Island, Hawaiʻi

The Office of Planning and Sustainable Development (OPSD) is in receipt of your early consultation request, received April 3, 2024, on the preparation of an Environmental Information Document (EID) and Environmental Assessment (EA), for the proposed Nāʻālehu Large Capacity Cesspool (LCC) Closure Project, located in the Kaʻū District on the island of Hawaiʻi.

According to the request, the community of Nāʻālehu is located approximately 64 miles southwest of Hilo in the Ka'ū District, and 2.06 miles from the shoreline. The proposed project consists of two parts: Nāʻālehu Large Capacity Cesspool Conversion and Nāʻālehu Wastewater Collection System. The project will construct facilities to allow the County of Hawaii to close the three LLCs in Nāʻālehu for the compliance requirements of the Amended Administrative Order on Consent (AOC) between the U.S. Environmental Protection Agency (EPA) and the County of Hawaii, and the applicable portions of the Clean Water Act. The recently Amended AOC, which took effect on August 22, 2022, requires the three LLCs to be closed no later than December 31, 2027. The Amended AOC 31.a. requires evaluation of following alternatives:

- *Alternative 1* - A package plant and new collection system. The County would construct a new sewer collection system to replace the existing system of gravity lines that convey sewage to the three LCCs, and connect to the proposed wastewater treatment and disposal facility.

- *Alternative 2* - A package plant connected to the existing collection system. The County would perform the same actions under Alternative 1. However, the new wastewater treatment and disposal facility and pump station would be connected to the existing 80-year-old collection system.

- *Alternative 3* - A maintenance contract model Individual Wastewater System (IWS) program. The County funds and manages project construction of the IWS. The maintenance program includes county personnel being responsible for necessary maintenance to the IWS such as pumping the septic tanks.

- *Alternative 4* - An operating permit model IWS program. The County is to fund design and construct new IWS systems and administer an operating permit program for the IWS systems to the homeowners. The homeowners would be responsible for maintenance scheduling, contracting and paying for a service provider to conduct maintenance and/or responding to trouble calls, monitoring and record keeping of maintenance.

- *Alternative 5* - No action. The EPA has determined that the County of Hawaii, as the current owner and/or operator of two LCCs that serve approximately 109 private residences in the community of Pahala and three LCCs that serve approximately 164 private residences in the community of Nā'ālehu, violated and continues to violate the Safe Drinking Water Act and its Underground Injection Control program requirements for existing LCCs.

The OPSD has reviewed the subject request, and has the following comments to offer:

1. The EA shall discuss the proposing agency or agencies, the requirements of the National Environmental Policy Act, and the triggers set forth in Hawaii Revised Statutes (HRS) Chapter 343, and list all required permits and approvals for the proposed Nāʻālehu LCC closure project.

2. The State of Hawaii Coastal Zone Management (CZM) Area encompasses the entire state. The Hawaii CZM Law, HRS Chapter 205A, requires all state and county agencies to enforce the CZM objectives and policies. The subject EA should include an assessment with mitigation measures, if needed, as to how the proposed development conforms to each of the CZM objectives and supporting policies set forth in HRS Chapter 205A-2, as amended.

3. Under Alternative 2, the new wastewater treatment and disposal facility and pump station would be connected to the existing 80-year-old collection system. The EA should evaluate the lifespan of the existing collection system, and assess whether such an old collection system will be compatible with new wastewater treatment and disposal facility as critical infrastructure.

4. OPSD recommends that preservation and burial treatment plans should be prepared for any identified archaeological features. Should any archaeological or cultural resources, or burials be discovered during ground excavation, all construction work shall be ceased immediately. Subsequent work shall proceed only upon an archaeological clearance from the State Historic Preservation Division, Department of Lands and Natural Resources.

5. Pursuant to Hawaii Administrative Rules (HAR) § 11-200.1-18(d), the EA needs to consider alternatives and assess their potential impacts. The OPSD recommends that the site-specific Best Management Practices shall be developed and implemented to prevent any runoff, sediment, soil and debris potentially resulting from associated construction activities from adversely impacting the coastal ecosystems and the State waters as specified in HAR Chapter 11-54.

6. The OPSD is the lead state agency with the authority to conduct CZM Act federal consistency reviews. If the proposed LCC closure project receives federal grants and assistance or requires federal permit or license approval the applicant should consult with the OPSD on the applicability of CZM Act federal consistency review.

If you respond to this comment letter, please include DTS202404030917NA in the subject line. For any questions regarding this letter, please contact Shichao Li of our office at (808) 587-2841 or by email at shichao.li@hawaii.gov.

Sincerely,

Mary Alice Evans

Mary Alice Evans
Director

WILSON OKAMOTO
CORPORATION
INNOVATORS • PLANNERS • ENGINEERS

10345-05
September 8, 2024

Ms. Mary Alice Evans
Office of Planning and Sustainable Development
State of Hawaii
P.O. Box 2359
Honolulu, HI 96804

Subject: Environmental Assessment Early Consultation for the
Na’alehu Large Capacity Cesspools Closure
Nāʻālehu, Hawaiʻi Island, Hawaiʻi
DTS202404030917NA

Dear Ms. Evans:

Thank you for your letter dated April 24, 2024 regarding the Early Consultation Environmental Assessment for the Na’alehu Large Capacity Cesspool Closure Project on the Island of Hawai’i. We appreciate your comments and concerns regarding potential impacts to sensitive wildlife species and habitats.

We acknowledge your comments and have carefully considered them in the preparation of the Draft Environmental Assessment (EA). A record of your comments, along with this response, have been produced and are appended to the Draft EA in Appendix G.

We appreciate your participation in the EA review process.

Sincerely,

Keola Cheng

Keola Cheng
Director - Planning

cc: Mr. Mark Grant, Wastewater Division Project Coordinator

1907 S. Beretania Street, Suite 400 • Honolulu, Hawaii • 96826 • (808) 946-2277

From:	Cole, Colleen
To:	Public Comment
Cc:	Asman, Lindsy; PIFWO_Admin, FW1
Subject:	Comments on EID/EA for Nā'ālehu Large Capacity Cesspool Closure, Ka'ū, Hawai'i
Date:	Friday, April 5, 2024 2:43:15 PM
Attachments:	IPaC Info Letter_Species List Instructions_PIFWO_20Apr2022_Final.pdf Plant Avoidance and Minimization Measures_FINAL_May 2023.docx Naalehu LCC_Animal Avoidance and Minimization Measures - FINAL May 2023.docx

Aloha Keola Cheng,

The Pacific Islands Fish and Wildlife Office received your request for comments on the proposed Nāʻālehu Large Capacity Cesspool Closure project located in the Kaʻū District on Hawaiʻi Island on April 2, 2024. We reviewed the proposed project summarized in the Environmental Information Document you provided. At this time, we recommend that the project planning for any of the four alternative actions include avoidance and minimization measures (AMMs) for endangered species that may be affected by project activities.

You can obtain an official species list in the Information for Planning and Consultation (IPaC) online tool. Please see the attached pdf with detailed directions on how you obtain an official species list in IPAC.

IPaC: Information for Planning and Consultation

IPaC is a project planning tool that streamlines the USFWS environmental review process.

ipac.ecosphere.fws.gov

Once you have entered basic project information, including a map of the project, IPaC will generate a species list comprised of all federally listed species that may occur in the project area. Each species includes a link in which you will find avoidance and minimization measures (AMMs) for that species.

Attached to this email are AMMs that you will likely encounter when you obtain an official species list for the project.

Please feel free to contact me if you need additional assistance.

Mahalo,

Colleen Cole
Biologist - Maui Nui & Hawaiʻi Island Team
Pacific Islands Fish and Wildlife Office
U.S. Fish and Wildlife Service

154 Waiānuenue Avenue Suite 103
PO Box 10225
Hilo, Hawai‘i 96720-2452

Cell Phone: 808-859-1002
Email: colleen_cole@fws.gov

FINAL Avoidance and Minimization Measures (AMMs)
Final revised May 2023

ESA Listed Species

Endangered ʻōpeʻapeʻa (Hawaiian hoary bat, *Lasiurus cinereus semotus*): The Hawaiian hoary bat roosts in woody vegetation across all islands and will leave their young unattended in trees and shrubs when they forage. If trees or shrubs 15 feet or taller are cleared during the pupping season, June 1 through September 15, there is a risk that young bats could inadvertently be harmed or killed, since they are too young to fly or move away from disturbance. Hawaiian hoary bats forage for insects from as low as 3 feet to higher than 500 feet above the ground and can become entangled in barbed wire used for fencing.

To avoid and minimize impacts to the endangered Hawaiian hoary bat we recommend you incorporate the following applicable measures into your project description:

- Do not disturb, remove, or trim woody plants greater than 15 feet tall during the bat birthing and pup rearing season (June 1 through September 15).
- Do not use barbed wire for fencing.

Endangered ʻuaʻu (Hawaiian petrel, *Pterodroma sandwichensis*), Threatened ʻaʻo, (Newell's shearwater, *Puffinus newelli*), and Endangered Hawaiʻi Distinct Population Segment of the ʻakēʻakē (band-rumped storm-petrel, *Hydrobates castro*):
Hawaiian seabirds may traverse the project area at night during the breeding, nesting and fledging seasons (March 1 to December 15). Outdoor lighting could result in seabird disorientation, fallout, and injury or mortality. Seabirds are attracted to lights and after circling the lights they may become exhausted and collide with nearby wires, buildings, or other structures or they may land on the ground. Downed seabirds are subject to increased mortality due to collision with automobiles, starvation, and predation by dogs, cats, and other predators. Young birds (fledglings) traversing the project area between September 15 and December 15, in their first flights from their mountain nests to the sea, are particularly vulnerable to light attraction.

To avoid and minimize potential project impacts to seabirds we recommend you incorporate the following measures into your project description:

- Fully shield all outdoor lights so the bulb can only be seen from below.
- Install automatic motion sensor switches and controls on all outdoor lights or turn off lights when human activity is not occurring in the lighted area.
- Avoid nighttime construction during the seabird fledging period, September 15 through December 15.

Threatened nēnē (Hawaiian goose, *Branta (Nesochen) sandvicensis*): Nēnē are found on the islands of Hawaiʻi, Maui, Molokaʻi, and Kauaʻi. They are observed in a variety of habitats, but prefer open areas, such as pastures, golf courses, wetlands, natural grasslands and shrublands, and lava flows. Threats to the species include introduced mammalian and avian predators, wind facilities, and vehicle strikes.

To avoid and minimize potential project impacts to nēnē we recommend you incorporate the following measures into your project description:

- Do not approach, feed, or disturb nēnē.
- If nēnē are observed loafing or foraging within the project area during the breeding season (September through April), have a biologist familiar with nēnē nesting behavior survey for nests in and around the project area prior to the resumption of any work. Repeat surveys after any subsequent delay of work of 3 or more days (during which the birds may attempt to nest).
- Cease all work immediately and contact the Service for further guidance if a nest is discovered within a radius of 150 feet of proposed project, or a previously undiscovered nest is found within the 150-foot radius after work begins.
- In areas where nēnē are known to be present, post and implement reduced speed limits, and inform project personnel and contractors about the presence of endangered species on-site.

A 4(d) rule was established at the time the nēnē was downlisted to threatened status. Under the 4(d) rule, the following actions are not prohibited under the Act, provided the additional measures described in the downlisting rule are adhered to:

- Take by landowners, or their agents, conducting intentional harassment in the form of hazing or other deterrent measures not likely to cause direct injury or mortality, or nēnē surveys.
- Take that is incidental to conducting lawful control of introduced predators or habitat management activities for nēnē.
- Take by authorized law enforcement officers for the purpose of aiding or euthanizing sick, injured, or orphaned nēnē; disposing of dead specimens; and salvaging a dead specimen that may be used for scientific study.

Endangered Hawaiian waterbirds (ae‘o, Hawaiian stilt, *Himantopus mexicanus knudseni*; ‘alae ke‘oke‘o, Hawaiian coot, *Fulica alai*, koloa maoli, Hawaiian duck, *Anas wyvilliana*): Hawaiian waterbirds are currently found in a variety of wetland habitats including freshwater marshes and ponds, coastal estuaries and ponds, artificial reservoirs, kalo or taro (*Colocasia esculenta*) lo‘i or patches, irrigation ditches, sewage treatment ponds, and in the case of the Hawaiian duck, montane streams and marshlands. Hawaiian stilts may also be found wherever ephemeral or persistent standing water may occur. Threats to these species include non-native predators, habitat loss, and habitat degradation. Hawaiian ducks are also subject to threats from hybridization with introduced mallards.

Based on the project details provided, your project may result in the creation of standing water or open water that could attract Hawaiian waterbirds to the project site. In particular, the Hawaiian stilt is known to nest in sub-optimal locations (e.g., any ponding water), if water is present. Hawaiian waterbirds attracted to sub-optimal habitat may suffer adverse impacts, such as predation and reduced reproductive success, and thus the project may create an attractive nuisance. Therefore, we recommend you work with our office during project planning so that we may assist you in developing measures to avoid impacts to listed species (e.g., fencing, vegetation control, predator management).

To avoid and minimize potential project impacts to Hawaiian waterbirds we recommend you incorporate the following measures into your project description:

- In areas where waterbirds are known to be present, post and implement reduced speed limits, and inform project personnel and contractors about the presence of endangered species on-site.
- If water resources are located within or adjacent to the project site, incorporate applicable best management practices regarding work in aquatic environments into the project design (see enclosure).
- Have a biological monitor that is familiar with the species' biology conduct Hawaiian waterbird nest surveys where appropriate habitat occurs within the vicinity of the proposed project site prior to project initiation. Repeat surveys again within 3 days of project initiation and after any subsequent delay of work of 3 or more days (during which the birds may attempt to nest). If a nest or active brood is found:
    - Contact the Service within 48 hours for further guidance.
    - Establish and maintain a 100-foot buffer around all active nests and/or broods until the chicks/ducklings have fledged. Do not conduct potentially disruptive activities or habitat alteration within this buffer.
    - Have a biological monitor that is familiar with the species' biology present on the project site during all construction or earth moving activities until the chicks/ducklings fledge to ensure that Hawaiian waterbirds and nests are not adversely impacted.

Endangered Blackburn's sphinx moth (*Manduca blackburni*):

The adult Blackburn's sphinx moth feeds on nectar from native plants, including beach morning glory (*Ipomoea pes-caprae*), ‘ilie‘e (*Plumbago zeylanica*), maiapilo (*Capparis sandwichiana*), and others. Blackburn's sphinx moth larvae feed on non-native tree tobacco (*Nicotiana glauca*) and native ‘aiea (*Nothocestrum* spp.). To pupate, the larvae burrow into the soil and can remain in a state of torpor for a year or more before emerging from the soil. Soil disturbance can result in death of the pupae.

We offer the following survey recommendations to assess whether the Blackburn's sphinx moth occurs within the project area:

- A biologist familiar with the species should survey areas of proposed activities for Blackburn's sphinx moth and its larval host plants prior to work initiation.
    - Surveys should be conducted during the wettest portion of the year (usually November-April or several weeks after a significant rain) and within 4-6 weeks prior to construction.
    - Surveys should include searches for adults, eggs, larvae, and signs of larval feeding (chewed stems, frass, or leaf damage).
    - If moths, eggs, larvae, or native ‘aiea or tree tobacco over 3 feet tall, are found during the survey, please contact the Service for additional guidance to avoid impacts to this species.

If no Blackburn's sphinx moth, ‘aiea, or tree tobacco are found during surveys, it is imperative that measures be taken to avoid attraction of Blackburn's sphinx moth to the project location and prohibit tree tobacco from entering the site. Tree tobacco can grow greater than 3 feet tall in approximately 6 weeks. If it grows over 3 feet, the plants may become a host plant for Blackburn's sphinx moth. We therefore recommend that you:

- Remove any tree tobacco less than 3 feet tall.
- Monitor the site every 4-6 weeks for new tree tobacco growth before, during, and after the proposed ground-disturbing activity.
  - Monitoring for tree tobacco can be completed by any staff, such as groundskeeper or regular maintenance crew, provided with picture placards of tree tobacco at different life stages.

Endangered Hawksbill sea turtle (*Eretmochelys imbricata*): The Service consults on sea turtles and their use of terrestrial habitats (beaches where nesting and/or basking is known to occur), whereas the National Oceanic and Atmospheric Administration (NOAA) Fisheries consults on sea turtles in aquatic habitats. We recommend that you consult with NOAA Fisheries regarding the potential impacts from the proposed project if it may affect off-shore or open ocean habitats.

Green sea turtles may nest on any sandy beach area in the Pacific Islands. Hawksbill sea turtles exhibit a wide tolerance for nesting substrate (ranging from sandy beach to crushed coral) with nests typically placed under vegetation. Both species exhibit strong nesting site fidelity. Nesting occurs on beaches from May through September, peaking in June and July, with hatchlings emerging through November and December.

To avoid and minimize project impacts to sea turtles and their nests we recommend you incorporate the following measures into your project description:

- No vehicle use on or modification of the beach/dune environment during the sea turtle nesting or hatching season (May to December).
- Do not remove native dune vegetation.
- Incorporate applicable best management practices regarding Work in Aquatic Environments (see enclosed) into the project design. Have a biologist familiar with sea turtles conduct a visual survey of the project site to ensure no basking sea turtles are present.
  - If a basking sea turtle is found within the project area, cease all mechanical or construction activities within 100 feet until the animal voluntarily leaves the area.
  - Cease all activities between the basking turtle and the ocean.
- Remove any project-related debris, trash, or equipment from the beach or dune if not actively being used.
- Do not stockpile project-related materials in the intertidal zone, reef flats, sandy beach and adjacent vegetated areas, or stream channels.

Optimal sea turtle nesting habitat is a dark beach free of barriers that restrict sea turtle movement. Nesting turtles may be deterred from approaching or laying successful nests on lighted or disturbed beaches. They may become disoriented by artificial lighting, leading to exhaustion and placement of a nest in an inappropriate location (such as at or below the high tide line). Hatchlings that emerge from nests may also be disoriented by artificial lighting. Inland areas visible from the beach should be sufficiently dark to allow for successful navigation by hatchlings to the ocean.

To avoid and minimize project impacts to sea turtles from lighting we recommend incorporating the following applicable measures into your project description:

- Avoid nighttime work during the nesting and hatching season (May to December).
- Minimize the use of lighting on or near beaches and shield all project-related lights so the light is not visible from any beach.
    - If lights can't be fully shielded or if headlights must be used, fully enclose the light source with light filtering tape or filters.
- Incorporate design measures into the construction or operation of buildings adjacent to the beach to reduce ambient outdoor lighting such as:
    - tinting or using automatic window shades for exterior windows that face the beach;
    - reducing the height of exterior lighting to below 3 feet and pointed downward or away from the beach; and
    - minimize light intensity to the lowest level feasible and, when possible, include timers and motion sensors.

Avoidance, Minimization, and Conservation Measures for listed plants in the Pacific Islands

Project activities may affect listed plant species by causing physical damage to plant parts (roots, stems, flowers, fruits, seeds, etc.) as well as impacts to other life requisite features of their habitat, which may result in reduction of germination, growth and/or reproduction. Cutting and removal of vegetation surrounding listed plants has the potential to alter microsite conditions (e.g., light, moisture, temperature), damaging or destroying the listed plants and also increasing the risk of invasion by nonnative plants, which can result in higher incidence or intensity of fire. Activities such as grazing, use of construction equipment and vehicles, and increased human traffic (i.e., trails, visitation, monitoring), can cause ground disturbance, erosion, and/or soil compaction, which decrease absorption of water and nutrients and damage plant root systems and may result in reduced growth and/or mortality of listed plants. Soil disturbance or removal has the potential to negatively impact the soil seed bank of listed plant species if such species are present or historically occurred in the project area.

In order to avoid or minimize potential adverse effects to listed plants that may occur on the proposed project site, we recommend minimizing disturbance outside of existing developed or otherwise modified areas. When disturbance outside existing developed or modified sites is proposed, conduct a botanical survey for listed plant species within the project action area, defined as the area where direct and indirect effects are likely to occur. Surveys should be conducted by a knowledgeable botanist with documented experience in identifying native Hawaiian and Pacific Islands plants, including listed plant species. Botanical surveys should optimally be conducted during the wettest part of the year (typically October to April) when plants and identifying features are more likely to be visible, especially in drier areas. If surveys are conducted outside of the wet season, the Service may assume plant presence.

The boundary of the area occupied by listed plants should be marked with flagging by the surveyor. To avoid or minimize potential adverse effects to listed plants, we recommend adherence to buffer distances for the activities in the **Table below**. Where disturbed areas do not need to be maintained as an open area, restore disturbed areas using native plants as appropriate for the location. Whenever possible we recommend using native plants for landscaping purposes. The following websites are good resources to use when choosing landscaping plants: Landscape Industry Council of Hawai‘i Native Plant Poster (https://hawaiiscape.com/Publications), Native Hawaiian Plants for Landscaping, Conservation, and Reforestation (https://www.ctahr.hawaii.edu/oc/freepubs/pdf/of-30.pdf), and Best Native Plants for Landscapes (https://www.ctahr.hawaii.edu/oc/freepubs/pdf/OF-40.pdf).

If listed plants occur in a project area, the avoidance buffers are recommended to reduce direct and indirect impacts to listed plants from project activities. However, where project activities will occur within the recommended buffer distances, additional consultation is required. The impacts to the plants of concern within the buffer area may be reduced by placing temporary fencing or other barriers at the boundary of the disturbance, as far from the affected plants as practicable.

The above guidelines apply to areas outside of designated critical habitat. If project activities occur within designated critical habitat unit boundaries, additional consultation is required.

All activities, including site surveys, risk introducing nonnative species into project areas. Specific attention needs to be made to ensure that all equipment, personnel, and supplies are properly checked and are free of contamination (weed seeds, organic matter, or other contaminants) before entering project areas. Quarantines and or management activities occurring on specific priority invasive species proximal to project areas need to be considered or adequately addressed. This information can be acquired by contacting local experts such as those on local invasive species committees (Kauaʻi: https://www.kauaiisc.org/; Oʻahu: https://www.oahuisc.org/; Maui Nui: https://mauiinvasive.org/; and Hawaiʻi: https://www.biisc.org/

Table 1. Recommended buffer distances to minimize and avoid potential adverse impacts to listed plants from activities listed below.

Action	**Buffer Distance (feet (meters)) – Keep Project Activity This Far Away from Listed Plant**	
	Grasses/Herbs/Shrubs and Terrestrial Orchids	**Trees and Arboreal Orchids**
Walking, hiking, surveys	3 ft (1 m)	3 ft (1 m)
Cutting and Removing Vegetation By Hand or Hand Tools (e.g., weeding)	3 ft (1 m)	3 ft (1 m)
Mechanical Removal of Individual Plants or Woody Vegetation (e.g., chainsaw, weed eater)	3 ft up to height of removed vegetation (whichever greater)	3 ft up to height of removed vegetation (whichever greater)
Removal of Vegetation with Heavy Equipment (e.g., bulldozer, tractor, “bush hog”)	2x width equipment + height of vegetation	820 ft (250 m)

Action		Buffer Distance (feet (meters)) – Keep Project Activity This Far Away from Listed Plant	
		Grasses/Herbs/Shrubs and Terrestrial Orchids	**Trees and Arboreal Orchids**
Use of Approved Herbicides (following label)	**Ground-based Spray Application; hand application (no wand applicator; spot treatment)**	10 ft (3 m)	Crown diameter
	Ground-based Spray Application; manual pump with wand, backpack	50 ft (15 m)	Crown diameter
	Ground-based Spray Application; vehicle-mounted tank sprayer	50 ft (15 m)	Crown diameter
	Aerial Spray (ball applicator)	250 ft (76 m)	250 ft (76 m)
	Aerial Application – herbicide ballistic technology (individual plant treatment)	100 ft (30 m)	Crown diameter
	Aerial Spray (boom)	Further consultation required	Further consultation required
Use of Insecticides (pollinators, seed dispersers)		Further consultation required	Further consultation required
Ground/Soil Disturbance/Outplanting/Fencing (Hand tools, e.g., shovel, ‘ō‘ō; Small mechanized tools, e.g., auger)		20 ft (6 m)	2x crown diameter
Ground/Soil Disturbance (Heavy Equipment)		328 ft (100 m)	820 ft (250 m)
Surface Hardening/Soil compaction	**Trails (e.g., human, ungulates)**	20 ft (6 m)	2x crown diameter
	Roads/Utility Corridors, Buildings/Structures	328 ft (100 m)	820 ft (250 m)

Action	Buffer Distance (feet (meters)) – Keep Project Activity This Far Away from Listed Plant	
	Grasses/Herbs/Shrubs and Terrestrial Orchids	**Trees and Arboreal Orchids**
Prescribed Burns	Further consultation required	Further consultation required
Farming/Ranching/Silviculture	820 ft (250 m)	820 ft (250 m)

Definitions (Wagner *et al*. 1999)

Crown: The leafy top of a tree.
Herb: A plant, either annual, biennial, or perennial, with the non-woody stems dying back to the ground at the end of the growing season.
Shrub: A perennial woody plant with usually several to numerous primary stems arising from or relatively near the ground.
Tree: A woody perennial that usually has a single trunk

References Cited

USFWS. 2010. Endangered and threatened wildlife and plants; determination of endangered status for 48 species on Kauai and designation of critical habitat. Federal Register 75: 18960–19165.

. 2012. Endangered and threatened wildlife and plants; endangered status for 23 species on Oahu and designation of critical habitat for 124 species; final rule. Federal Register 77: 57648–57862.

. 2013a Endangered and threatened wildlife and plants; determination of endangered status for 38 species from Molokai, Lanai, and Maui. Federal Register 78: 32014–32065.

. 2013b. Endangered and threatened wildlife and plants; determination of endangered species status for 15 species on Hawaii Island. Federal Register 78: 64638–64690.

. 2016. Endangered and threatened wildlife and plants; determination of endangered status for 49 species from the Hawaiian Islands. Federal Register 81: 67786–67860.

. 2016. USFWS Rare plant database. Unpublished.

Wagner, W.L., Sohmer, S., and D.R. Herbst. 1999. Manual of the flowering plants of Hawaii, revised edition. Honolulu, Hawaii. University of Hawaii and Bishop Museum Press. 1,919 pp.

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10345-05
September 8, 2024

Ms. Coleen Cole
U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
150 Waiānuenue Avenue Suite 103
Hilo, Hawaiʻi 96720

Subject: Environmental Assessment Early Consultation for the
Na'alehu Large Capacity Cesspools Closure
Nāʻālehu, Hawaiʻi Island, Hawaiʻi

Dear Ms Cole:

Thank you for your e-mail dated April 8, 2024 regarding the Early Consultation Environmental Assessment for the Na'alehu Large Capacity Cesspool Closure Project on the Island of Hawai'i. We acknowledge your comments and they have been considered in the preparation of the Draft EA with regard to meeting content requirements prescribed in Hawaiʻi Administrative Rules, Title 11, Chapter 200.1, Section 18. A record of your comments, along with this response, have been produced and are appended to the Draft EA in Appendix G.

We acknowledge your comments and note that a Natural Resource Assessment has been completed for the project area. The results of the assessment and best management practices are described in Section 4.6 of the Draft EA.

Please note that the Draft EA has been published and made available for review, and comment in the current issue of the State of Hawaiʻi's Environmental Review Program's (ERP) The Environmental Notice.

We appreciate your participation in the EA review process.

Sincerely,

Keola Cheng

Keola Cheng
Director - Planning

cc: Mr. Mark Grant, Wastewater Division Project Coordinator

Draft Environmental Information Document
& Environmental Assessment
Nāʻālehu Large Cesspool Closure

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