

CLEAN WATER FOR REEFS, PUAKŌ, HAWAI‘I

REGIONAL WASTEWATER MASTER PLANNING FOR PUAKŌ AND OTHER COMMUNITIES WITHIN SOUTH KOHALA

FINAL

TASK 3 – WASTEWATER MASTER PLAN



County of Hawai‘i
Department of Environmental Management
345 Kekuanao‘a Street, Suite 41
Hilo, Hawai‘i 96720

June 2024

Delivering a better world

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Prepared for:



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ACRONYMS AND ABBREVIATIONS

%	percent
AACE	American Association of Cost Engineers
AECOM	AECOM Technical Services, Inc.
AS	activated sludge
ATU	aerobic treatment unit
BAT	Best Available Technology
BOD	Biochemical Oxygen Demand
BOD ₅	Five-Day Biochemical Oxygen Demand
CAS	conventional activated sludge
CCH	City and County of Honolulu
CCI	Construction Cost Index
CCWG	Cesspool Conversion Working Group
CDP	Community Development Plan
COH	County of Hawai‘i
CWA	Clean Water Act
CWB	Clean Water Branch
CWRM	Commission on Water Resource Management
CWSRF	Clean Water State Revolving Fund
DBEDT	Department of Business, Economic Development and Tourism
DEM	Department of Environmental Management
DHHL	Department of Hawaiian Home Lands
DWS	Department of Water Supply
EDA	Economic Development Administration, United States
EIS	environmental impact statement
ENR	Engineering News Record
EPA	Environmental Protection Agency
FCA	Financial Capability Assessment
FM	force main
ft	foot (feet)
ft/s	foot (feet) per second
GIS	geographic information system
GO	general obligation
GP	General Plan
gpcd	gallon per capita per day
gpd	gallon(s) per day
HAR	Hawaii Administrative Rules
HCPT	Hawai‘i Cesspool Prioritization Tool
HDOH	State of Hawai‘i Department of Health
HRS	Hawai‘i Revised Statutes
I/I	inflow and infiltration
IWS	individual wastewater system
LCC	life cycle cost
LF	Linear feet
LPS	low pressure sewer
LQPI	Lowest Quintile Poverty Indicator
LUPAG	Land Use Pattern Allocation Guide

MBBR	moving bed bioreactor
MBR	membrane bioreactor
mg/L	milligrams per liter
mgd	million gallons per day
MHI	median household income
NPDES	National Pollutant Discharge Elimination System
NPV	net present value
NSF	National Sanitation Foundation
O&M	operation and maintenance
OSDS	onsite sewage disposal system
PDR	Project Definition Report
SAS	soil absorption system
SBR	sequencing batch reactor
SRF	state revolving fund
TDH	total dynamic head
TSS	total suspended solids
U.S.	United States
UIC	Underground Injection Control
USBR	United States Bureau of Reclamation
USDA	United States Department of Agriculture
WIFIA	Water Infrastructure Finance and Innovation Act
WQS	water quality standard
WRF	Water Reclamation Facility
WW	wastewater
WWPS	wastewater pump station
WWTF	wastewater treatment facility
WWTP	wastewater treatment plant
ZID	zone of initial dilution
ZOM	zone of mixing

EXECUTIVE SUMMARY

INTRODUCTION

The County of Hawai‘i (COH) contracted with AECOM Technical Services, Inc. to provide professional engineering services pursuant to Hawai‘i Revised Statutes (HRS) 103D-304 for the preparation of a Regional Wastewater (WW) Master Plan for Puakō and other communities and boundaries within the South Kohala District, Hawai‘i island for the County of Hawai‘i Department of Environmental Management (DEM). The DEM WW Division is managing the work performed for this WW Master Plan contract.

REGULATORY REQUIREMENTS

In 2017, the Hawai‘i State Legislature passed House Bill 1244, Act 125, to amend HRS 342D-72. This includes requirements for the replacement of all cesspools in Hawai‘i by Year 2050. Act 125 directed State of Hawaii Department of Health (HDOH) to investigate the State’s number, scope, location, and priority of cesspool replacements based on impact on public health. In 2022 Act 87 was approved further amending HRS 342D-72 to generalize the options for cesspool replacements to allow upgrades or conversions.

HRS 342D-72, as amended, can be found at the following link:

https://www.capitol.hawaii.gov/hrscurrent/Vol06_Ch0321-0344/HRS0342D/HRS_0342D-0072.htm

This Puakō and the South Kohala District WW Master Plan investigates various alternatives for treating WW. The WW treatment alternatives located in Puakō and the South Kohala District project area will be regulated by the HDOH Clean Water Branch and HAR. There are several options for effluent discharge considered for this Puakō and the South Kohala District WW Master Plan:

- Water reuse regulated by HDOH
- Land application regulated by HDOH
- Surface water discharge regulated by the United States Environmental Protection Agency and administered by HDOH
- Injection wells/groundwater discharge regulated by HDOH

CURRENT SITUATION

There are no COH WW facilities that presently serve or are being planned for the Puakō and the South Kohala District Project Area. Currently, the area is served by a mix of individual wastewater systems (IWSs) and privately owned treatment plants. These IWS are classified as on-site sewage disposal systems (OSDS). Currently, most of the WW in the Project Area is handled by Class IV OSDS (i.e., cesspools). WW discharged from Class IV OSDS is discharged directly into a seepage pit with no

treatment. There are ten (10) privately owned and operated WW treatment facilities located within the Puakō and the South Kohala Project Area.

FUTURE SITUATION

The Puakō and the South Kohala District is located within the northwestern portion of the COH to the north of Kailua-Kona. The Puakō and the South Kohala District is experiencing modest growth compared to other COH districts. A community planning effort for the Puakō and the South Kohala District was last undertaken in 2008. Though the effort is currently somewhat out of date, COH is currently working on several projects to plan future growth, including this report's project for WW services. To effectively plan WW services for Puakō and the South Kohala District project area, it is important to project the future direction and growth within the project area. This would help with design of the capacity and location of WW lines and facilities.

A key document containing the development goals within the Puakō and the South Kohala District project area is the COH's 2008 Puakō and the South Kohala District Community Development Plan (CDP). The CDP initiative stems from COH's 2005 General Plan (GP), which serves as a blueprint for long-term development on Hawai'i. The 2005 GP is the policy document for long range development on Hawai'i. Land use courses of action that pertain to Puakō and the South Kohala District project area include the following:

- Current Zoning
- Service Land Use Pattern Allocation Guide LUPAG map

Building upon the 2008 planning, COH released a draft GP 2045 in September 2023 for comments [1]. The future GP 2045 will update the 2005 and 2008 planning documents. Currently in progress, the draft GP 2045 includes a section on land use planning. The goals are similar to those of the CDP, such as directing growth towards urban and village centers. Policies and actions to achieve these objectives are outlined in the document and are under review by COH.

The draft GP 2045 depicts future land use designations. Several urban growth areas for the project area have been designated. The northern portion has a mix of recreation and low and medium density urban. The southern area is mostly low density urban with some medium density urban and recreation areas.

The Puakō and the South Kohala District WW Master Plan is using a 30-year planning period, through year 2052. The Hawai'i Department of Business, Economic Development and Tourism provides forecast estimates through 2040. This study extends another 12 years beyond this planning period to cover the January 1, 2050 deadline in Acts 125 and 87. These acts mandate every cesspool in the State to be "upgraded or converted to a director-approved WW system; or connected to a sewerage system" by year 2050.

The projected future populations described herein are multiplied by the per capita WW flows outlined in the previous Project Definition Report. This results in an

estimated Year 2052 WW flow estimates of 3.26 million gallons per day (mgd) for the full sewerage for the projected future population within the Puakō and the South Kohala District project area. A lesser projected future flow of approximately 1.41 mgd is estimated if all properties in land use zones of parcels greater than 1 acre in size are assumed to utilize onsite or IWS for WW treatment.

CONCEPTUAL DESIGN

For this Study, COH is using the City and County of Honolulu WW Design Standards for the conceptual-level hydraulic analysis of the sewers.

ALTERNATIVES

WW collection, treatment, and disposal system alternatives are discussed in this Study. Alternatives reviewed include:

- *Alternative 1: IWS or Decentralized Systems*
 - *Alternative 1A: IWS for All Residential + Decentralized Treatment for Commercial/Institutions*
 - *Alternative 1B: Both Decentralized Treatment and Low Pressure Sewers*
- *Alternative 2: Urban Sewering (1.41 mgd) with three (3) subregional wastewater treatment plants (WWTPs)*
 - *Alternative 2A: All Conventional Gravity Sewers and Pump Stations in Existing Roadways*
 - *Alternative 2B: Both Conventional Gravity Sewers and Pump Stations and Low-Pressure Sewers*
 - *Alternative 2C: Conventional Gravity Sewers and Pump Stations with Cross-Country Sewers in Easements*
- *Alternative 3: Full Sewering (3.26 mgd) with two (2) Regional WWTP*
 - *Alternative 3A: All Conventional Gravity Sewers and Pump Stations in existing Roadways*
 - *Alternative 3B: Both Conventional Gravity Sewers and Pump Stations and Low-Pressure Sewers*
 - *Alternative 3C: Conventional Gravity Sewers and Pump Stations with Cross-Country Sewers in Easements*
- *Alternative 4: Urban Sewering (1.41 mgd) with five (5) Regional WWTP*
 - *Alternative 4A: All Conventional Gravity Sewers and Pump Stations in existing Roadways*
 - *Alternative 4B: Both Conventional Gravity Sewers and Pump Stations and Low-Pressure Sewers*
 - *Alternative 4C: Conventional Gravity Sewers and Pump Stations with Cross-Country Sewers in Easements*

- *Alternative 5: Full Sewering (3.26 mgd) with four (4) Regional WWTP*
 - *Alternative 5A: All Conventional Gravity Sewers and Pump Stations in existing Roadways*
 - *Alternative 5B: Both Conventional Gravity Sewers and Pump Stations and Low-Pressure Sewers*
 - *Alternative 5C: Conventional Gravity Sewers and Pump Stations with Cross-Country Sewers in Easements*

EVALUATION OF ALTERNATIVES

The alternatives were evaluated using various criteria, including cost, environmental impacts, and technical considerations. The estimated conceptual level project capital cost prepared for this Master Plan are shown in August 2023 dollars (Engineering News Record20 Cities Index = 13,473).

The following is an estimate of the Puakō and the South Kohala District area WW collection and treatment capital costs or initial construction cost for each alternative. Due to the natural terrain in the project area, which generally slopes mauka to makai, it appears that options using low pressure sewers (LPSs) have lower capital costs than those using all conventional gravity sewers and pumping stations. As discussed later in Section 7.2, the operation and maintenance costs are higher for options with LPSs. Still, the overall life cycle costs are lower when using LPSs.

Table ES-1: Puakō and South Kohala WW Management Alternatives Summary

Alternative No.	Description	Flow Capacity (mgd)	Capital Cost
1A	IWS for All Residential + Decentralized Treatment for Commercial/Institutions	0 ¹	\$0.6B
1B	Both Decentralized On-Site Treatment and LPS	1.3	\$0.6B
2A	Urban Sewering, All Gravity Sewers (3 COH WWTPs, 2 Existing Private WWTPs)	1.41	\$1.3B
2B	Urban Sewering, Both Gravity Sewer and LPS (3 COH WWTPs, 2 Existing Private WWTPs)	1.41	\$1.1B
2C	Urban Sewering, Cross Country Sewer (3 COH WWTPs, 2 Existing Private WWTPs)	1.41	\$1.2B
3A	Full Flow Sewering, All Gravity Sewers (2 COH WWTPs, 3 Existing Private WWTPs)	3.26	\$2.1B
3B	Full Flow Sewering, Both Gravity Sewer and LPS (2 COH WWTPs, 3 Existing Private WWTPs)	3.26	\$1.8B
3C	Full Flow Sewering, Cross Country Sewer (2 COH WWTPs, 3 Existing Private WWTPs)	3.26	\$2.0B
4A	Urban Sewering, All Gravity Sewers (5 COH WWTPs)	1.41	\$1.2B

Alternative No.	Description	Flow Capacity (mgd)	Capital Cost
4B	Urban Sewering, Both Gravity Sewer and LPS (5 COH WWTPs)	1.41	\$1.0B
4C	Urban Sewering, Cross Country Sewer (5 COH WWTPs)	1.41	\$1.1B
5A	Full Flow Sewering, All Gravity Sewers (4 COH WWTPs)	3.26	\$2.1B
5B	Full Flow Sewering, Both Gravity Sewer and LPS (4 COH WWTPs)	3.26	\$1.8B
5C	Full Flow Sewering, Cross Country Sewer (4 COH WWTPs)	3.26	\$2.0B

Note: All flow would be treated and disposed of onsite without the use of sewers.
WWTP = wastewater treatment plant

The alternatives were compared based on the following criteria:

- Estimated Construction Cost
- Estimated Annual Operation and Management (O&M) Cost
- Operational Ease and Maintainability
- Flexibility to meet Potential Future Requirements
- Utilization and Acquisition of Land
- Environmental Concerns/Regulatory Permitting

Feedback from DEM, HDOH, and the public were gathered prior to ranking the alternatives. Public input was mixed, but overall favored the following:

- Environmental Concerns/Regulatory Permitting (i.e., systems that reduce pollution that could impact the reefs)
- Flexibility to meet Potential Future Requirements (i.e., systems/approach that would not require modification in the near term)
- Estimated Annual O&M Cost

The selection of an alternative also needs to include Countywide assessments of the improvements required for cesspool conversions and other required work. COH is currently in the process of planning for multiple areas and beginning a Countywide plan for implementation. Selection of the best alternative for the Puakō and the South Kohala District area WW collection and treatment could also be informed by the countywide process.

FUNDING AND FINANCING CONSIDERATIONS

To allow development of operating plans for this feasibility plan, the existing COH institutional arrangement should be reviewed, and a financial program should be

developed after selection of a plan and design. The operating plans should include preliminary allocation of the costs among various users of the WW system. Feasibility of the plan requires agreement among participating entities (COH) and stakeholders (ratepayers) on the implementation requirements.

Affordability is an essential metric for developing a WW management plan. A homeowner is typically financially burdened if the average monthly cost of installing and operating their OSDS exceeds 2 percent of their annual income.

SUMMARY AND CONCLUSIONS

Based on the overall evaluation criteria, Alternative 1B: Both Decentralized On-Site Treatment and LPS (either grinder pumps or septic tank effluent pump configuration) is ranked as most favorable, followed by Alternative 1A: IWS for All Residential + Decentralized Treatment for Commercial/Institutions. Alternative 1B has a slightly lower estimated cost than Alternative 1A and is much less costly than Alternative 2C, the third most favorable. COH's Countywide Integrated WW Master Plan, which would allow cross-prioritization of capital projects across the various districts, is in progress. As part of that Master Plan, the county would consider which areas would be better served by Alternative 1A (implemented by individual homeowners) and Alternative 1B (implemented by the county). Thus, rankings are preliminary and will be updated pending review by COH, DEM, and other project stakeholders.

1.0 INTRODUCTION

The County of Hawai‘i (COH) contracted with AECOM Technical Services, Inc. (AECOM) to provide professional engineering services pursuant to Hawai‘i Revised Statutes (HRS) 103D-304 for the preparation of a Regional Wastewater (WW) Master Plan for analyzing the potential environmental impacts of the addition of WW services for the Puakō and the South Kohala District, Hawai‘i island for the COH. The Department of Environmental Management (DEM) WW Division is managing the work performed for this WW Master Plan contract.

1.1 STUDY PURPOSE AND SCOPE

According to the State of Hawai‘i Department of Health (HDOH), approximately 88,000 cesspools exist within the State. Nearly 50,000 are located on Hawai‘i island within the COH. Almost 14,000 cesspools are also on Kaua‘i, over 12,000 on Maui, over 11,000 on O‘ahu, and over 1,400 on Moloka‘i. The quantity of cesspool effluent reaching ocean waters cannot be measured. HDOH estimates that cesspools within the State release approximately 53 million gallons of untreated sewage into the ground each day.

The Puakō and the South Kohala District WW Master Plan is being prepared to study the cost effectiveness of providing WW collection and treatment facilities within the Puakō and the South Kohala District. The purpose of the WW Master Plan is to evaluate various alternatives to provide WW infrastructure to help reduce risks to human health and the environment resulting from the current reliance on cesspools in the Project Area. The WW Master Plan also reviews alternatives to provide WW infrastructure to support the economic recovery in the Project Area.

AECOM prepared a Project Definition Report (PDR) as a basis for establishing parameters for the Puakō and the South Kohala District WW Master Plan [2]. The Puakō and the South Kohala District WW Master Plan evaluated various options for WW infrastructure improvements. The assessment was based on the requirements of the HDOH Clean Water Branch (CWB) regulations and COH WW design basis on City and County of Honolulu (CCH) guidelines. The following topics are addressed in this Puakō and the South Kohala District WW Master Plan report:

- Introduction
- Regulatory Requirements and Effluent Limitations
- Current and Future Situation
- Conceptual Design, Alternatives and Evaluation of Alternatives
- Funding and Financing Considerations
- Summary, Conclusions, and Recommendations
- References

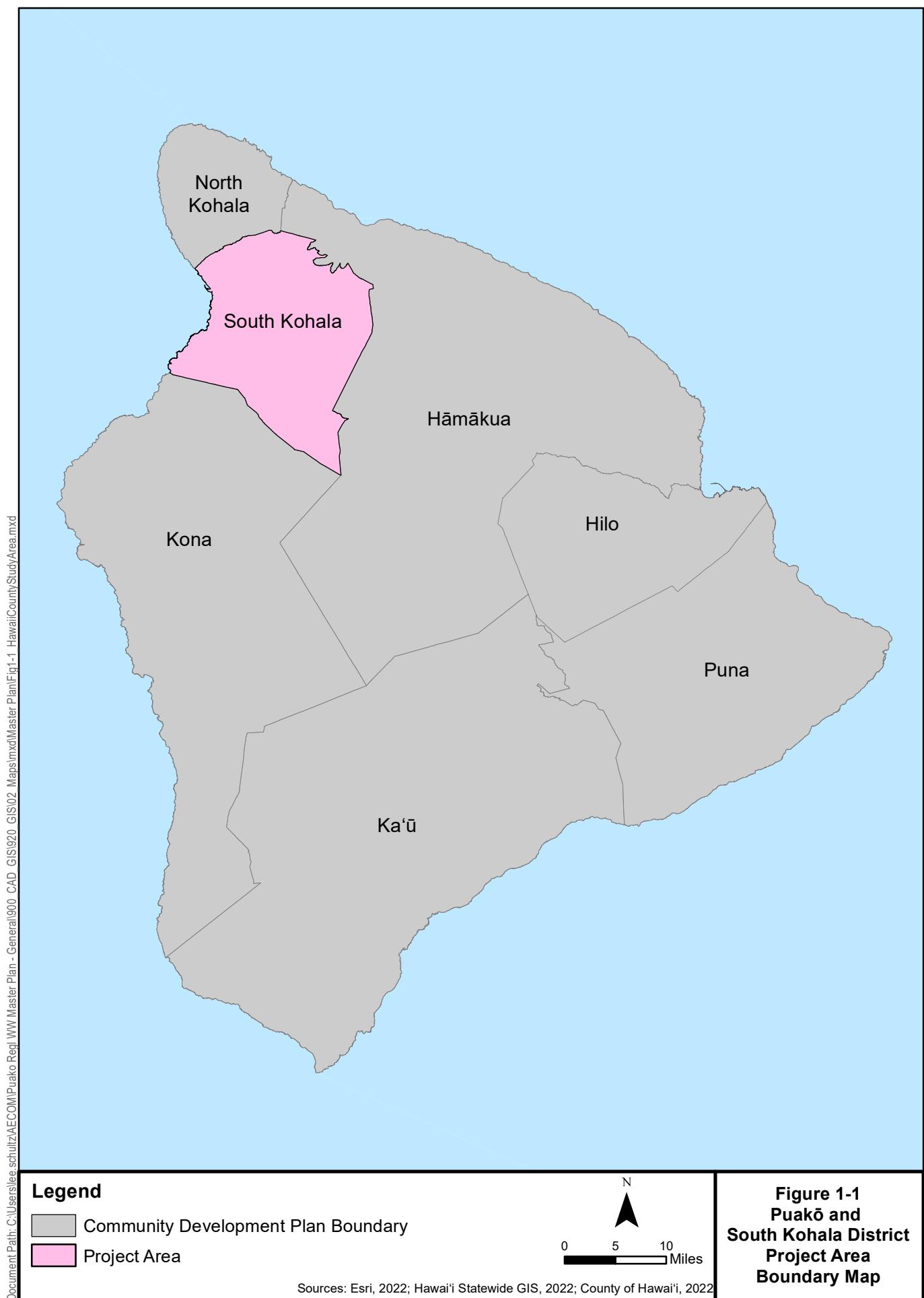
1.2 PLANNING AREA

The Project Area boundary for the Puakō and the South Kohala District WW Master Plan was established in the PDR [2]. The Puakō and the South Kohala District is located on the leeward side (west side) of the island and borders the North Kohala District on the north, the Kailua-Kona District on the south, the Hāmākua district on the east, and the Pacific Ocean on the west. The overall land area of the Puakō and the South Kohala District is approximately 176,449 acres (or approximately 275 square miles). The South Kohala District Community Development Plan (CDP) planning area, which encompasses Council District 9, also includes portions of Council Districts 1 and 8. The South Kohala District (herein referred to as the Project Area) is used for planning the addition of WW services.

The Project Area includes the following four communities:

- Waimea
- Waikoloa Village
- Kawaihae
- Puakō

See Figure 1-1 for a map showing the boundaries of the study area used for this Puakō and the South Kohala District WW Master Plan.



2.0 REGULATORY REQUIREMENTS

A regulatory review was performed for the Puakō and the South Kohala District WW Master Plan. Regulatory requirements impacting the Puakō and the South Kohala District WW Master Plan are described in this Chapter.

2.1 WASTEWATER TREATMENT AND DISPOSAL REQUIREMENTS

In 2017, the Hawai‘i State Legislature passed House Bill 1244, Act 125, to amend HRS 342D-72. This legislation included requirements for the replacement of all cesspools in Hawai‘i by Year 2050. Act 125 directed HDOH to investigate the State’s number, scope, location, and priority of cesspool replacements based on impact on public health. In 2022 Act 87 was approved further amending HRS 342D-72 to generalize the options for cesspool replacements to allow upgrades or conversions.

According to the latest HRS 342D-72 that was in effect at the time of this Master Planning effort, before January 1, 2050, every cesspool in the State of Hawai‘i is required to be:

- “Upgraded or converted to a director-approved WW system” or
- “Connected to a sewerage system.”

A “director-approved WW system” refers to the options described in the following articles:

- Hawaii Administrative Rules (HAR) 11-62-33 for treatment systems
- HAR 11-62-34 for disposal systems
- HAR 11-62-35 for other IWSs like composting toilets or innovative systems

HRS 342D-72, as amended, can be found at the following link:

https://www.capitol.hawaii.gov/hrscurrent/Vol06_Ch0321-0344/HRS0342D/HRS_0342D-0072.htm

It is possible that future rules or regulations related to cesspools and wastewater treatment may be adopted or existing rules and regulations may be amended. The County will need to monitor this situation and modify future wastewater planning documents if needed.

2.2 EFFLUENT LIMITATIONS

There are several options for effluent discharge:

- Water reuse regulated by HDOH
- Land application regulated by HDOH

- Surface water discharge regulated by the United States (U.S.) Environmental Protection Agency (EPA) and administered by HDOH
- Injection wells/groundwater discharge regulated by HDOH

The following paragraphs describe regulatory requirements for each potential treated WW effluent discharge alternative.

2.2.1

HDOH Water Reuse

HDOH regulates the treatment and use of recycled water. These regulations provide the public with protections so that human health and water resources are not compromised. Use of recycled water has become more significant due to Hawai'i's growing population, limited potable water resources, and other WW disposal issues.

Since increasing the safe use of recycled water will help meet the State's growing water needs, the Guidelines for the Treatment and Use of Recycled Water (hereafter referred to as the "Reuse Guidelines") outline the planning, design, and permit application processes for use of recycled water. The Reuse Guidelines consist of two volumes:

- *Volume I:* Recycled Water Facilities addresses technical requirements.
- *Volume II:* Recycled Water Projects covers the application process for a recycled water system.

There are different grades of recycled water depending on the level of treatment that the WW receives. Typical uses for each grade are listed in Section 6.3.1.2.

- R-1 is the highest grade of recycled water. The WW undergoes oxidation, filtration, and disinfection.
- R-2 is the next highest grade of recycled water. The WW undergoes oxidation and disinfection.
- R-3 is the lowest level of treatment that is permissible. The WW only undergoes oxidation.

The following is a summary of the approval process for construction or major modification of a WW recycling facility that intends to produce recycled water:

- Application Submittal: The application submittal consists of an engineering report and construction plans. The engineering report includes the design basis, treatment processes, and other information to demonstrate compliance with applicable requirements.
- Approval to Construct: Once the application submittal is reviewed and found to be acceptable, HDOH will issue an approval to construct. When construction of the facility is substantially complete, the applicant should provide at least two weeks' notice to HDOH so that HDOH can schedule and conduct a final inspection.
- Approval to Use: HDOH will inspect the project for consistency with the application submittal and compliance with requirements. Conditional approval may be given until pilot testing or test results demonstrate compliance with

requirements. If the facility is found to be acceptable and all required documents have been received, HDOH will issue an approval to use.

Once HDOH has determined that the application submittal conforms to HAR 11-62 and the Reuse Guidelines, HDOH will issue an Approval to Construct to the owner, with a copy to the engineer who prepared the application submittal.

In Hawai‘i, irrigation is not normally required on a year-round basis due to high rainfall from November through March. The project area has the lowest rainfall on the island and water recycling could be an economical alternative. Currently, golf courses in Waikoloa Beach Resort area is being irrigated with R1 recycled water. However, HDOH 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 (WQSSs) or when recycled water supply exceeds demand.

2.2.2

HDOH Land Application

Discussions with HDOH have indicated that the land application systems would be regulated as land disposal via requirements in HAR 11-62. Each site would need to obtain an “Authority to Construct” from HDOH. This application generally requires submission of plans, specifications, design data, and other information describing the project. If HDOH finds the project satisfactory, a letter approving construction will be issued. Upon completion of the project, HDOH will inspect the site for compliance.

The HAR 11-62 regulations require secondary treatment (five-day biochemical oxygen demand (BOD_5) and total suspended solids (TSS) less than 30 milligram(s) per liter [mg/L]) and disinfection prior to surface land application of WW effluent and establishes minimum monitoring, record-keeping, and reporting requirements. The HDOH director can establish more stringent requirements for systems, if needed, on a case-by-case basis. Groundwater monitoring is commonly required at land application systems to allow assessment of the groundwater impacts and system efficacy. Typical groundwater monitoring systems consist of three wells:

- One well located upgradient of the land treatment system
- Two wells located downgradient of the land treatment system.

Groundwater monitoring would typically consist of quarterly or semi-annual testing for nutrients (nitrogen and phosphorus), salts, and other parameters. The wells should be installed several months prior to starting WW effluent land application operations. This allows background data to be collected before operations commence. It is possible that HDOH and/or the community may request some form of monitoring in advance of approvals to assess the assimilative capacity of the land application system. Monitoring requirements would generally be established at the time that the draft permit requirements are first issued.

Table 2-1 highlights typical effluent characteristics for land application systems. See HAR 11-62 for additional requirements.

Table 2-1: Typical Effluent Characteristics for Land Application

Parameter	Value	Regulatory Reference
BOD ₅	30 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	Continuous disinfection except with subsurface disposal	11-62-24
Setback Requirement	25 feet from property line 10 feet from on-site buildings	11-62-23.1
Access Control	6-foot-high fence around entire site	11-62-08

2.2.3

EPA Surface Water Criteria

The Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the Waters of the United States and regulating quality standards for surface waters. The basis of the CWA was enacted in 1948 and was called the Federal Water Pollution Control Act and was amended in 1972 to what is now the CWA. The CWA is codified in Title 33 (Navigation and Navigable Waters) of the U.S. Code from Sections 1251–1388 (33 U.S.C §1251–§1388). The objective is to restore and maintain the chemical, physical, and biological integrity of Waters of the United States. One of the primary goals is to achieve “fishable and swimmable” waters wherever it is feasible.

Under the CWA, the EPA has implemented pollution control programs such as setting WW standards for industry. EPA has also developed national water quality criteria recommendations for pollutants in surface waters. The CWA outlaws discharge of any pollutant from a point source into navigable waters unless a permit has been obtained.

The National Pollutant Discharge Elimination System (NPDES) is one of the pollution control programs established by CWA. This program provides a regulatory framework for managing pollution in the nation’s waterways. It was established in 33 U.S.C. §1342 (also referred to as Section 402 of the CWA) and prohibits the discharge of pollutants from certain sources to waters of the United States without an NPDES permit.

The CWA allows EPA to authorize states, territories, and tribes to administer the NPDES program in that entity’s jurisdictional area, under oversight from the EPA. This process is called the “state authorization program”. The HDOH was first authorized to administer the NPDES permitting program within the State in 1974.

The Hawai'i NPDES permitting program is a regulatory mechanism to control water pollution through the issuance of permits. The purpose of issuing an NPDES permit is to implement federal and State water pollution control requirements to help protect human health and the environment. A permit does this by imposing restrictions and requirements on discharges of pollutants from permitted sites/facilities. Permittees are legally obligated to comply with the requirements specified in the issued permit. Violation of permit requirements may be punishable by requiring specific changes to the facility or operations, fines, or other enforcement actions based on the nature of the violation.

The NPDES permit is a document that outlines requirements to control water pollution. NPDES permits contain limits on what can be discharged, monitoring and reporting requirements, and other provisions to allow discharges to achieve published WQSSs.

There are two types of NPDES permits:

- Individual Permits
- General Permits

Individual permits are facility-specific permits that are issued to a specific permittee, after submittal of an NPDES permit application. The maximum period of permit coverage is five years, with the opportunity to renew coverage to continue discharge provided that there is a public notice and public comment period to comment on the proposed permit. Due to the need to draft a facility-specific permit and the public comment period, processing and issuance of an individual permit is typically a time-consuming process. Once issued, the permit may be modified either by HDOH or by the permittee upon request, following a public notice and public comment period for the proposed modifications. The following are key considerations related to individual NPDES permits:

- One Permit- One Permittee
- For Any Type of Discharge
- Facility-Specific Permit Conditions
- Submit NPDES Permit Application
- Public Notice of Proposed Permit
- 5-Year Maximum Coverage Term
- Issued NPDES Permit
- Can be Modified After Issuance Following Another Public Notice of Proposed Permit Changes

General permits are not issued to a specific permittee and are instead written to address a specific type of activity or discharge. Any number of facilities or projects can request to be covered under a general permit, provided they can meet the requirements outlined in the specific general permit. If a facility or project has multiple types of discharges, they may separately request coverage under multiple

general permits for their facility or project (e.g., a construction project may request coverage for construction storm water and dewatering discharges).

NPDES permits apply to discharges from regulated point sources to surface waters, including discharges through drainage systems such as storm drains that outlet to a surface water. A point source is any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel, or other floating craft. This term does not include return flows from irrigated agriculture or agricultural storm water runoff, except return flows from agriculture irrigated with reclaimed water.

All other activities and actions, including, but not limited to, land use decisions, whether (or not) construction or industrial activities should be allowed, business operation, zoning, and non-point source pollution are not authorized or approved by NPDES permits. Determining the validity or merits of an activity are outside the scope of any NPDES permit. Issuance of an NPDES permit does not convey any other rights, authorizations, approvals, or any other ability not specified in the permit.

Discharges of treated domestic WW, cooling water, and other wastewaters to surface waters need to have an individual NPDES permit to discharge.

A consideration impacting surface water discharges is the need to meet published WQSS at the point of discharge. Hawai'i WQSSs are described in HAR 11-54. Per HAR 11-54, the nearshore coastal waters surrounding the Puakō and the South Kohala District project area are Class AA.

The objective for Class AA waters is to remain in their natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality from any human-caused source or actions. Note that “zones of mixing (ZOM)” are not permitted for discharges into Class AA waters:

- Within a defined reef area, in waters of a depth less than 10 fathoms (18 meters)
- In waters up to a distance of 300 hundred meters (1,000 feet) offshore (if there is no defined reef)

Moving further offshore, the water quality classification is Class A out to the three-mile boundary line for Hawai'i State Waters. The objective for Class A waters is to protect their use for recreational purposes and aesthetic enjoyment. Other uses are permitted as long as they are compatible with the protection and propagation of fish, shellfish, and wildlife, and with recreation in and on these waters.

Table 2-2 presents WQSSs for Class A and AA discharges to the coastal waters in the vicinity of the Puakō and the South Kohala District project area (HAR 11-54, Appendix D).

Table 2-2: Water Quality Standards for Discharges to Coastal Waters

Water Quality Parameter	Not to Exceed Geometric Mean Value	Not greater than listed value 10% of the time	Not greater than listed value 2% of the time
Total Nitrogen	110 to 150 µg/L	180 to 250 µg/L	250 to 350 µg/L
Nitrate + Nitrite Nitrogen	3.5 to 5 µg/L	10 to 14 µg/L	20 to 25 µg/L
Ammonia Nitrogen	2 to 3.5 µg/L	5 to 8.5 µg/L	9 to 15 µg/L
Total Phosphorus	16 to 20 µg/L	30 to 40 µg/L	45 to 60 µg/L
Chlorophyll A	0.15 to 0.3 µg/L	0.5 to 0.9 µg/L	1 to 1.75 µg/L
Turbidity	0.2 to 0.5 NTU	0.5 to 1.25 NTU	1 to 2 NTU
Light Extinction Coefficient	0.1 to 0.2 k units	0.3 to 0.5 k units	0.55 to 0.85 k units

Note: Lower values represent “dry” criteria that receive less than three million gpd of fresh-water discharge per shoreline mile. Upper values represent “wet” criteria that receive more than three million gpd of fresh-water discharge per shoreline mile.

% percent

µg/L microgram(s) per liter

gpd gallon per day

NTU Nephelometric Turbidity unit

k unit Kelvin unit

For discharges into Class A waters, a zone of initial dilution (ZID) and/or ZOM area is allowed where the treated effluent and receiving waters undergo a mixing process. A ZOM/ZID is defined as the limited areas around an outfall that allow for the initial dilution of WW effluent discharges. The ZOM can provide assimilation of domestic, agricultural, and industrial discharges that have received the best possible degree of treatment or control. ZID/ZOM allow for dilution of wastes before compliance with the applicable water quality criteria must be met. ZID are a subset of ZOM that are applied to toxic pollutants.

A regulatory ZID/ZOM allows for certain numeric water quality criteria to be exceeded. However, the blended effluent and receiving waters must meet the published WQSs at the boundary of the ZID/ZOM. The regulatory ZID/ZOM is defined based on regulations and implementation policies and must be established first in order to calculate numerical effluent discharge concentration limits for surface water discharges.

According to HAR 11-55-41, a ZID/ZOM should be determined concurrently with the corresponding NPDES Permit. This would be done through a ZID/ZOM dilution study, assimilative capacity assessment and antidegradation analysis with the following objectives:

- Develop appropriate dilution ratios for implementation within NPDES permit.
- Develop appropriate ZID/ZOM boundary for implementation within permit.
- Determine whether dilution study is adequately protective.

After regulatory review and approval, the conditions of a ZID/ZOM may be incorporated as a condition of the NPDES permit. The studies, and application for a ZID/ZOM need to be submitted to HDOH with the required forms. HDOH will establish the ZID/ZOM taking into account the environmental impacts such as:

- The protected uses of the body of water
- Existing natural conditions of the receiving water
- Character of the effluent
- Design adequacy of the outfall and diffuser system to achieve maximum dispersion and assimilation of the treated or controlled waste with a minimum of undesirable or noticeable effect on the receiving waters

The ZID/ZOM requires HDOH to document the following:

- The granting of the ZID/ZOM is in the public interest.
- The proposed discharge does not substantially endanger human health or safety.
- Compliance with the existing WQSSs.
- The proposed discharge does not violate the basic standards applicable to all waters, will not unreasonably interfere with any actual or probable use of the water areas for which it is classified, and has received best available treatment.
- The discharge will receive the best degree of treatment or control.
- The receiving water has assimilative capacity to handle potential pollutants at the location that the ZID/ZOM is requested.

2.2.4

HDOH Injection Wells/Groundwater Disposal

The Underground Injection Control (UIC) program was established to protect the quality of Hawai'i's underground sources of drinking water from chemical, physical, radioactive, and biological contamination that could originate from discharges to injection wells.

Underground injection wells are used for injecting water or other fluids into a groundwater aquifer. HAR 11-23 provides conditions governing the location, construction, and operation of injection wells so that injected fluids do not migrate and pollute underground sources of drinking water. The rules also establish criteria for classifying aquifers as follows:

- Underground water that is a source of drinking water
- Underground water that is not a source of drinking water (exempted)

The boundary between exempted aquifers and underground sources of drinking water is generally referred to as the "UIC Line". Restrictions on injection wells differ, depending on whether the area is inland (mauka) or seaward (makai) of the UIC line. UIC Maps depict the UIC lines on all major islands. These maps are meant for general informational purposes only. HDOH maintains the official UIC maps containing information about the UIC Line.

The UIC maps are coded as follows:

- Code 1 (below or makai of the UIC line)
 - Underlying aquifer not considered drinking water source
 - Wider variety of wells allowed
 - Injection wells need UIC Permit or Permit Exemption
 - Permit limitations are imposed
- Code 100 (above or mauka of the UIC line)
 - Underlying aquifer considered drinking water source
 - Limited types of injection wells allowed
 - Injection wells need UIC Permit or Permit Exemption
 - Permit limitations are imposed, and requirements are more stringent

For regulatory purposes a vast majority of the Puakō and the South Kohala District project area is located above (or mauka) of the UIC line.

3.0 CURRENT SITUATION

This section summarizes the current circumstances of Puakō and the South Kohala District, including demographics, land use, and WW management.

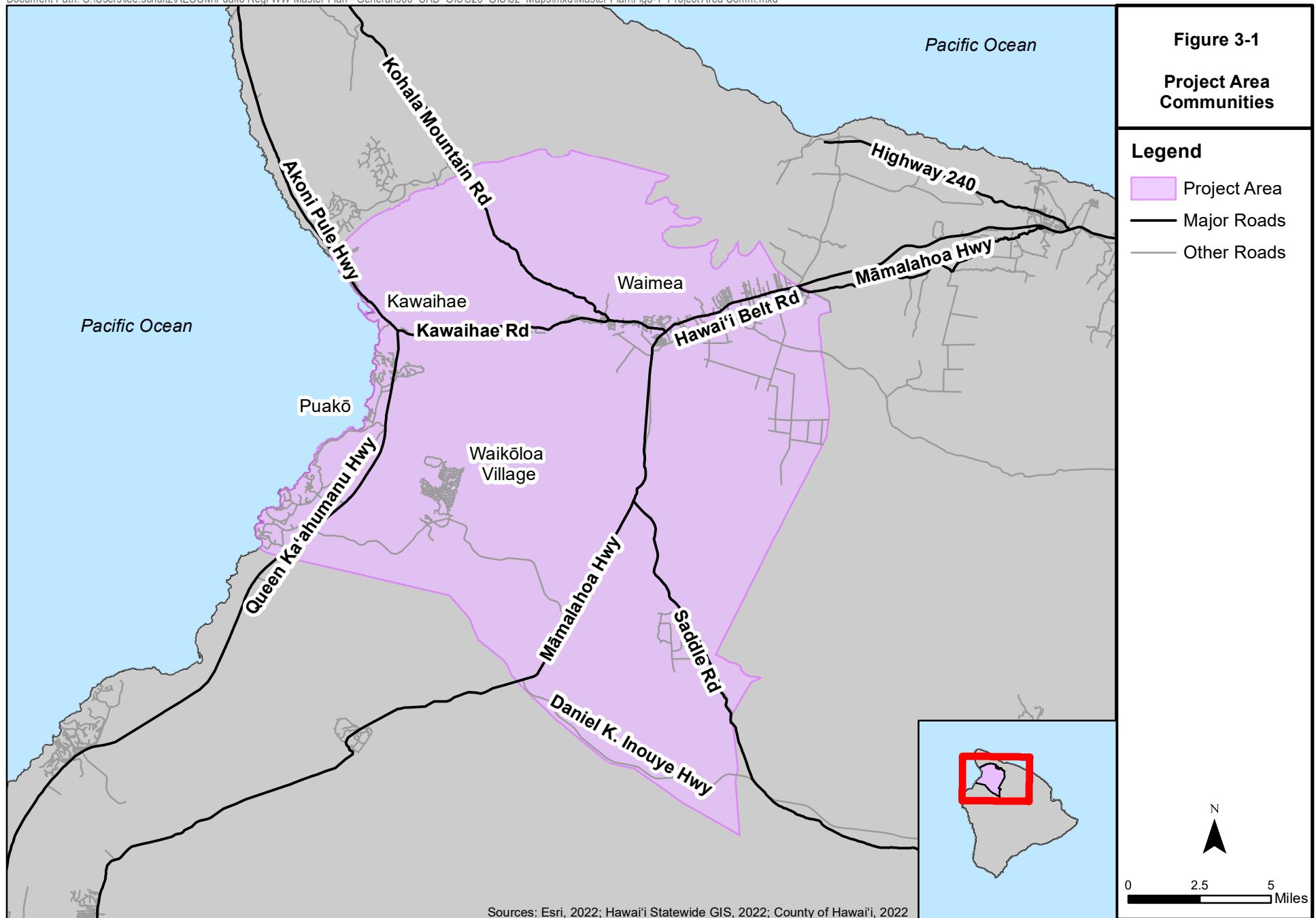
3.1 PLANNING AREA DESCRIPTION

The Puakō and the South Kohala District Project Area is located on the Leeward (west side) of the island and borders the North Kohala district on the north, Hāmākua district on the east, Kona district on the south, and the Pacific Ocean on the west (Figure 3-1). As described in the South Kohala CDP [3], South Kohala's natural environment includes the green, lush mountainous region in the north and rugged, dry landscape region in the south. The mountainous region includes Waimea town, which resides on a plateau between the Kohala Mountains and Mauna Kea, while the rugged, dry region includes Waikoloa Village. Along the rocky coast are some major resort areas, Puakō, and, in the northwest coast, Kawaihae. Kawaihae, Puakō, Waimea, and Waikoloa Village are key locations within the project area, with Waimea and Waikoloa Village being the two main population centers within the district [3].

Waimea town is a historic, rural community. Since the 18th and 19th centuries, this area has been influenced by the ranching and cattle industries, with Parker Ranch being located directly south of Waimea town. Today, Parker Ranch is one of the largest privately owned ranches in the world and is a major landowner in South Kohala. Waikoloa Village is a newer community that was developed in the 1970s. Due to its proximity to the resort areas along the coast, Waikoloa Village has evolved into a suburban community with residents of all ages. It is somewhat isolated from the surrounding areas since it is located away from a major highway, with Waikoloa Road being the only access road. Although it is not heavily populated, Kawaihae is another key location for the district because it contains the only recreational small boat harbor in northwest Hawai‘i and the only commercial harbor in west Hawai‘i. The harbor area is a major transportation node handling traffic from both harbor activities and from the surrounding land areas. The major resorts in the area include Mauna Kea Resort, Mauna Lani Resort, and Waikoloa Resort along the coastline. Puakō, a residential coastal town, is located immediately south of the Mauna Lani Resort. It consists mainly of single-family homes with a significant number operated as vacation rentals [3].

One of the major roadways in the Project Area is Queen Ka‘ahumanu Highway/Kawaihae Road/Hawai‘i Belt Road (Highway 19) that routes through Waimea, Kawaihae, and along the coast. ‘Akoni Pule Highway (Highway 270) runs through Kawaihae and connects to the North Kohala district. The other major roadways include Māmalahoa Highway (Routh 190) and Daniel K. Inouye Highway (Route 200), which connects Waimea to the southeastern ranch areas and the Hāmākua district. Waikoloa Village connects to Queen Ka‘ahumanu Highway and Māmalahoa Highway via Waikoloa Road (County).

Document Path: C:\Users\lee.schultz\AECOM\Puako Regl WW Master Plan - General\900_CAD_GIS\920_GIS\02_Maps\mxd\Master Plan\Fig3-1_Project Area Comm.mxd



3.2 ORGANIZATIONAL CONTEXT

COH has established an agency to oversee sewer systems. The DEM has the responsibility for matters relating to sewer O&M of five sewer systems; solid waste disposal and landfill programs; vehicle disposal; and all other environmental projects, including recycling programs of COH. The WW Division within DEM is responsible for the O&M of COH's WW collection and treatment facilities. Presently, COH does not provide any WW collection and treatment facilities in the Project Area.

There are existing sewer rates established by COH. The purpose of COH's Sewer Service Charges ordinance is to increase WW service charge rates to cover the costs of providing those services. These increases will reduce the WW Division's dependence on the General Fund and provide for improved maintenance and repair of the facilities. Ordinance No. 19 21, which became effective April 1, 2019, set monthly charges for residential, multi-residential, nonresidential, private haulers, and gang cesspools for five years. The monthly charge for residential was increased from \$48 to \$52, as of April 1, 2023.

3.3 LAND USE DATA

According to the 2008 CDP, the State land use districts, County of Hawai'i Land Use Pattern Allocation Guide (LUPAG), and the COH Zoning Code set forth policies and standards pertaining to land use in particular areas or regions. Under the State's land use designations, approximately 150,000 acres are designated as agricultural with another 15,000 acres designated as conservation and 11,000 acres designated as urban or rural in the South Kohala district.

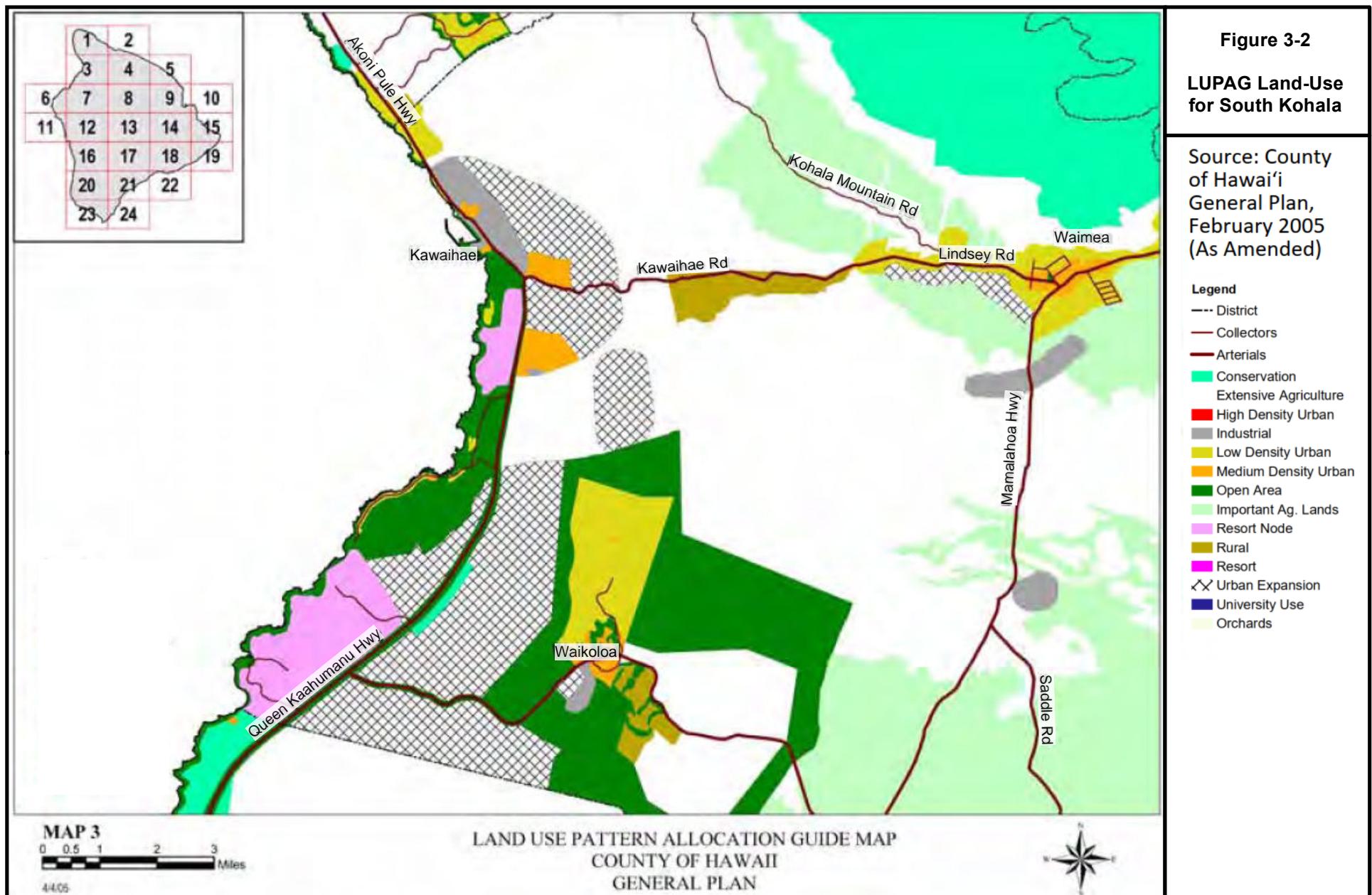
Conversely, under COH's LUPAG designations, approximately 123,000 acres are designated as agricultural, 14,000 acres as conservation, 14,000 acres as open area, and the remaining 26,000 acres as either urban expansion, resort, rural, low density urban or medium density urban designations in the South Kohala district. The 2005 General Plan (GP) depicts the LUPAG zones of the Project Area (Figure 3-2 through Figure 3-4) [4].

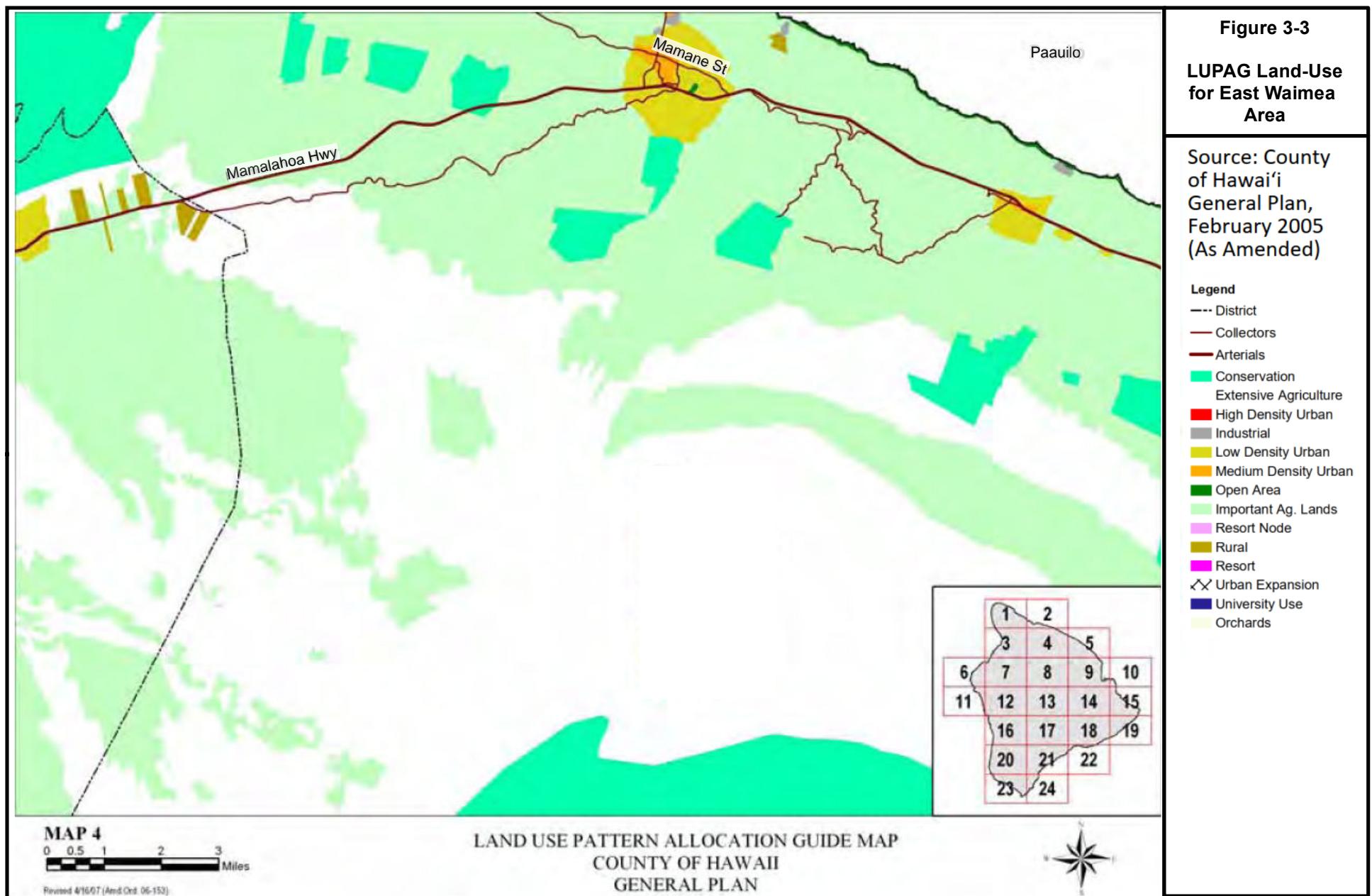
COH's LUPAG stems from the General Plan and estimates the future acreage allocation for land use and is intended to serve as a guide for the County.

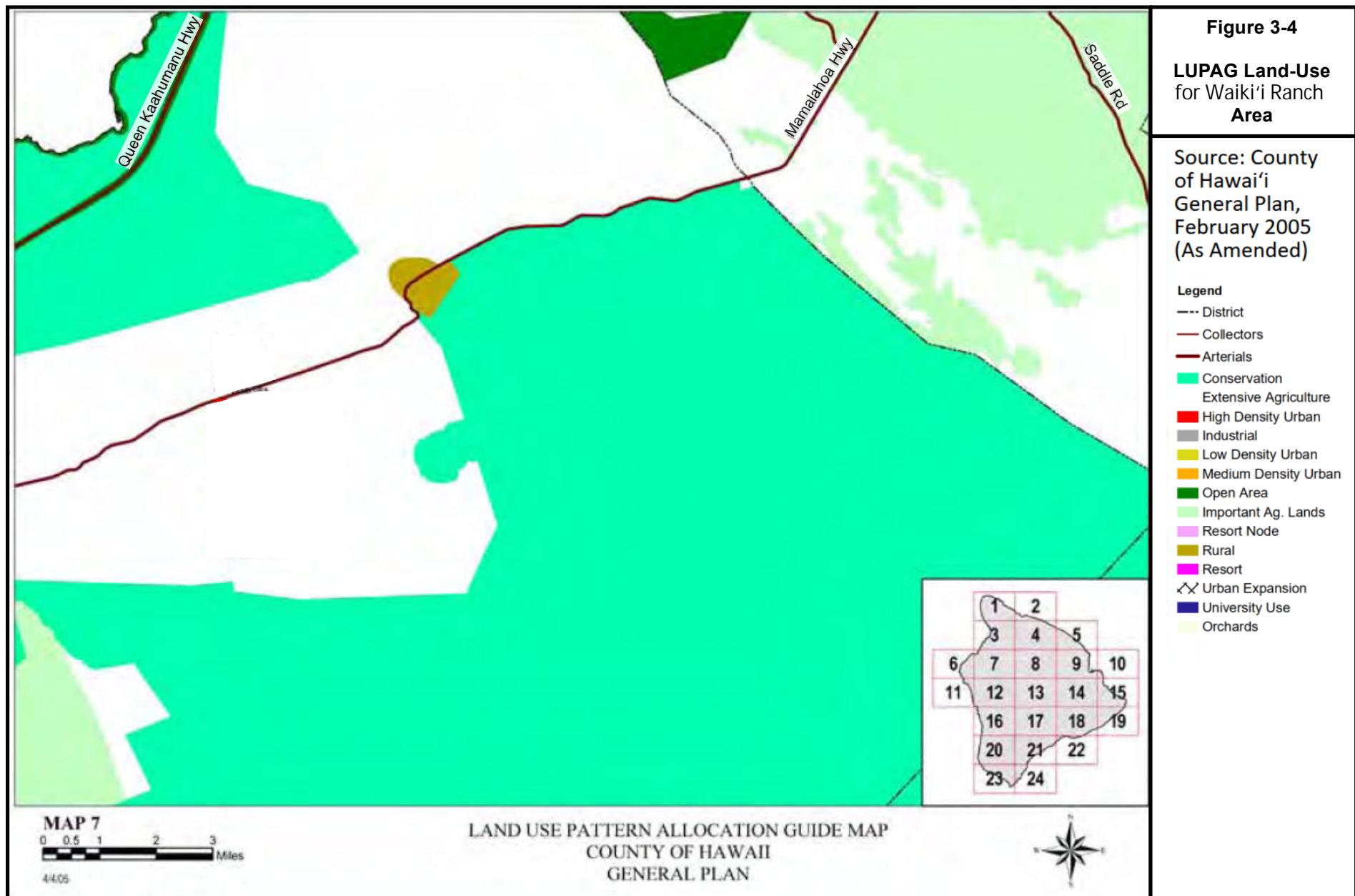
Both the State and County designate the majority of the lands in South Kohala as agriculture. While not all lands may be essential for agricultural production, future developments may need to consider preservation of these lands for open space preservation and/or environmental or scenic values. Despite the majority of the lands being designated as agriculture, the South Kohala district also has the highest number of lands designated as "Urban Expansion" under COH's LUPAG, as shown in Figure 3-2. The urban expansion areas are primarily located around the Kawaihae area and between Waikoloa and Waikoloa Resort. The lands surrounding Puakō are designated as "Open Area," while the lands around Waimea are designated as either agriculture or conservation, per COH's LUPAG.

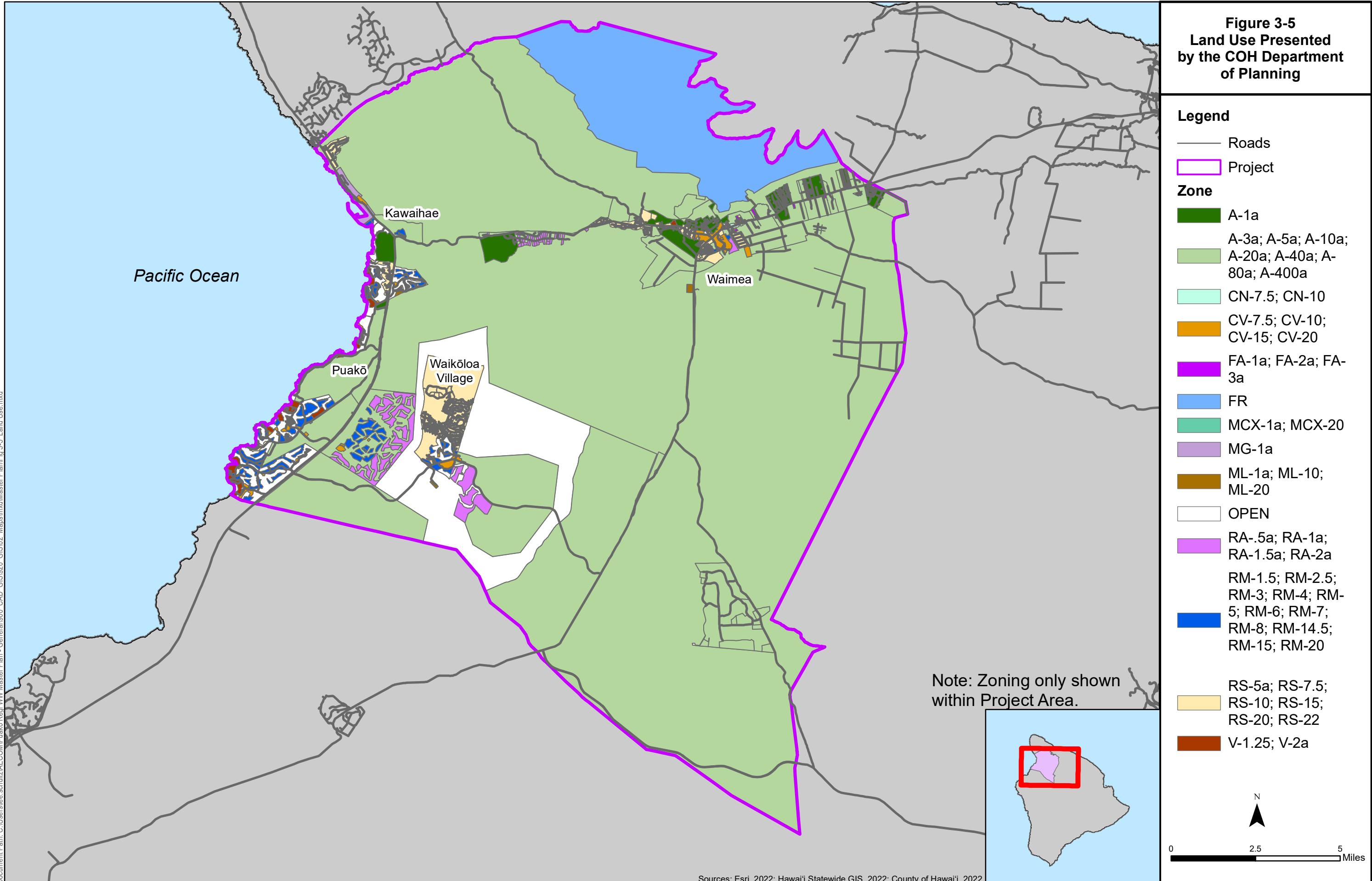
It is the South Kohala CDP's goal to focus development on the four communities of South Kohala – Waimea, Waikoloa Village, Kawaihae, and Puakō – while taking into account each community's unique goals and environments [3].

The Hawaii Statewide Geographic Information System (GIS) Program map was developed by the COH Planning Department and created from various district and urban zone maps (Figure 3-5). The zones are based on the COH Land Use Zoning Designations in the Hawai'i County Code, Chapter 25, Zoning Code. Most of the areas in Puakō and South Kohala are zoned as agricultural in this map, with a mix of commercial or residential zones in some locations such as Waimea, Kawaihae, Puakō, and Waikoloa Village.









3.4 DEMOGRAPHICS

Census data (2020) related to population, households, employment, and poverty are presented in Table 3-1 through Table 3-4. Areas that are not listed do not have a specific set of census results.

Table 3-1: Census Data on Population

UNITS:		[age]	[people]	[%]	[%]	[%]	[%]	[%]	[%]
Census #	Census Designated Place	Median Age	Total Pop.	Pop. < 18 y/o	Pop. 18–44 y/o	Pop. 45–64 y/o	Pop. > 65 y/o	Foreign-born	Hawai'i-born
217.05	Waimea and 217.06	38.8	10,969	23.6	32.9	26.1	17.4	20.2	56.4
217.07	Waikoloa Village	36.0	7,366	27.7	41.8	14.7	15.8	17.8	34.6
	Waikoloa Beach Resort	67.3	629	3.0	11.2	29.0	56.8	17.0	3.3
217.08	Kawaihae	38.9	594	25.4	31.5	26.1	17.0	2.0	90.4
218	North Kohala	48.6	5,906	17.5	38.3	15.6	28.6	10.4	55.8
Pop. y/o	population years old								

Table 3-2: Census Data on Households

UNITS:		[%]	[%]	[%]	[%]	[%]	[%]
Census #	Census Designated Place	Married households	Cohabiting Couples	Male Householder	Female householder	Households with 1 or more people < 18 y/o	Households with 1 or more people > 65 y/o
217.05	Waimea and 217.06	53.7	7.7	11.8	26.8	35.6	38.0
217.07	Waikoloa Village	60.2	7.2	15.9	16.6	38.3	29.6
	Waikoloa Beach Resort	78.4	2.8	6.3	12.5	3.4	64.9
217.08	Kawaihae	55.0	7.4	15.3	22.2	34.9	39.7
218	North Kohala	46.1	8.3	14.2	31.5	25.3	54.0

Note: Male or female householder indicates no spouse/partner present.
y/o years old

Table 3-3: Census Data on Employment

UNITS:	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[min]
Census #	Census Designated Place	In the Labor Force	Not in the Labor Force	Private wage/salary	Federal, State, or Gov.	Self-employed ^a	Workers who drive alone	Workers who carpool	Avg. time to get to work
217.05	Waimea and 217.06	67.0	33.0	84.5	9.4	6.1	66.4	18.5	28.9
217.07	Waikoloa Village	68.6	31.4	76.3	12.3	11.4	80.3	16.5	28.9
	Waikoloa Beach Resort	26.6	73.4	84.2	3.8	12.0	61.0	1.9	31.9
217.08	Kawaihae	71.9	28.1	79.7	13.6	6.6	83.8	11.3	38.1
218	North Kohala	63.0	37.0	70.2	11.8	18.0	67.0	18.7	29.4

Gov. government

^a in own (not incorporated) business**Table 3-4: Census Data on Poverty**

UNITS:	[%]	[%]	[%]	[%]	
Census #	Census Designated Place	Pop. in poverty	< 18 y/o	18–64 y/o	> 65 y/o
217.05 and 217.06	Waimea	9.6	11.6	8.6	10.3
217.07	Waikoloa Village	6.9	7.8	7.8	2.2
	Waikoloa Beach Resort	25.3	0.0	2.0	43.1
217.08	Kawaihae	6.4	7.4	6.7	4.0
218	North Kohala	11.5	14.8	14.3	3.9

Pop. population
y/o years old

3.5 WATER QUALITY AND USES

3.5.1 Groundwater

An assessment was performed on current groundwater quality and uses. Based on the Commission on Water Resource Management (CWRM) database, there are about 70 wells in the Puakō and the South Kohala District project area (Figure 3-6). Of these, 10 wells are municipal and owned and operated by COH Department of Water Supply (DWS). These are located within the Waimea and Lālāmilo areas and supply the COH DWS water systems for the South Kohala area. These water systems are combined systems for both potable water and fire flow. Ten of the wells are owned and operated by private owners. Eight of these wells are located near Waikoloa Village to service the Waikoloa Village and Beach Resort areas. This water

system is owned and operated by Hawaii Water Service. Two of these wells are located near Waiki'i Ranch to service the Waiki'i Ranch area.

Water quality data for these wells is limited. With the presence of cesspools nearby and upstream of these wells, there is potential for cesspool effluent to impact the drinking water quality at these wells. CWRM collects groundwater data for certain wells. These data include other characteristics such as quantity pumped, chloride, conductivity, temperature, and groundwater elevation. Analytical data for private wells are not available for public use, though it is possible that these wells could potentially be impacted.

For municipal wells, COH DWS performs water sampling for both compliance and monitoring. Samples are analyzed for parameters such as volatile organic compounds, pesticides, polychlorinated biphenyls, metals, and water quality metrics (alkalinity, chloride, nitrogen, phosphorus, turbidity, total dissolved solids, and others). In recent water quality data, there have not been exceedances detected in containments associated with septic tanks or cesspools. Annual water quality reports are published here:

<https://www.hawaiidws.org/waterquality/>

Hawaii Water Service performs water sampling for HDOH and EPA public health standards compliance for drinking water. Annual water quality reports are published here:

<https://www.hawaiwaterservice.com/waterquality/water-quality-reports/>

Construction activities could potentially impact groundwater if encountered during the proposed work. Also, dewatering may be necessary for construction below the groundwater table, which would be conducted in accordance with applicable regulations.

3.5.2 Surface Water

All Puakō and the South Kohala District nearshore coastal waters are classified as "AA" waters, as described in Section 2.2.3.

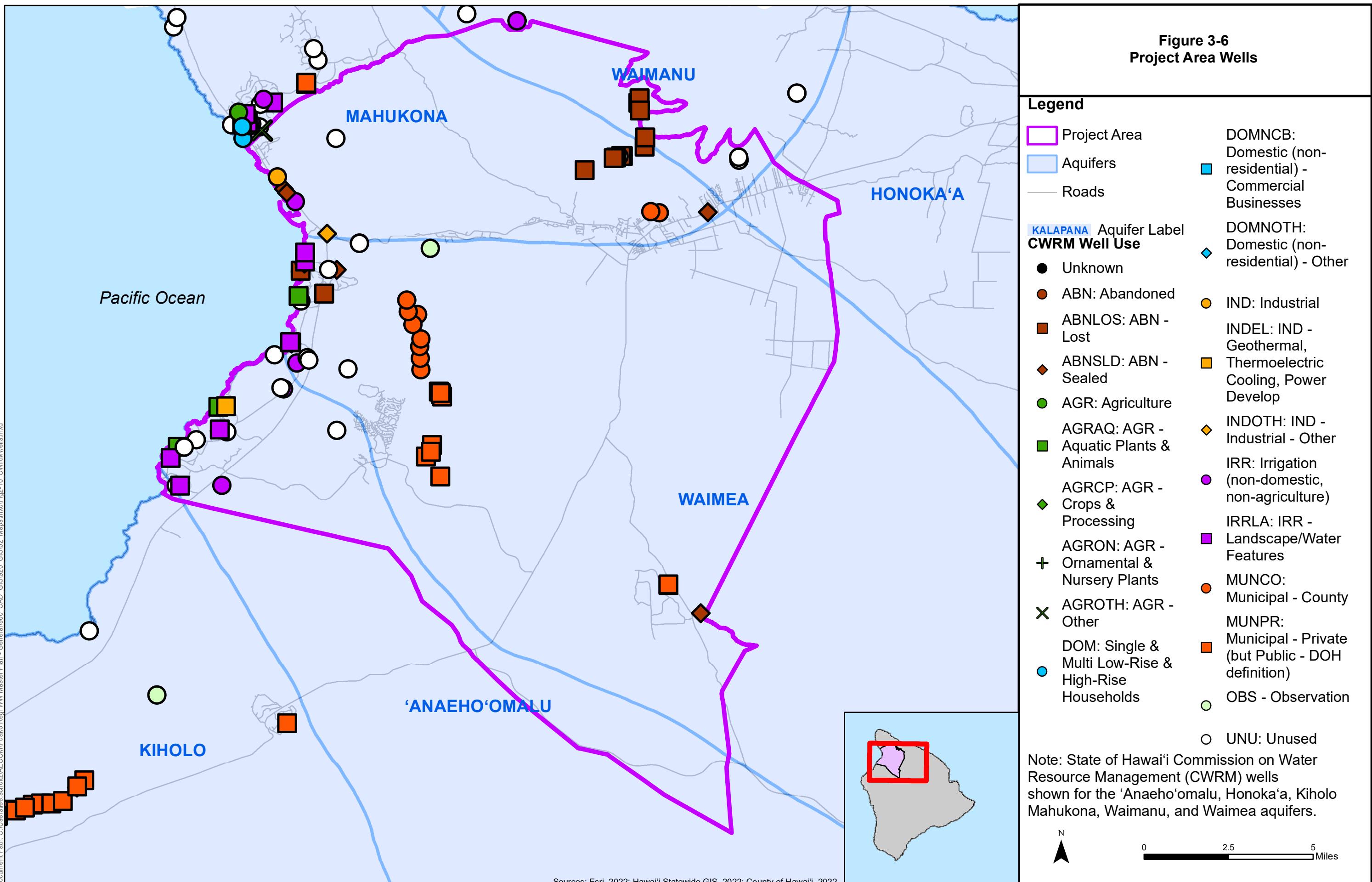
Hawai'i island has highly pervious and permeable land cover limiting the number of perennial streams. The project area spans about 13 different watersheds (Figure 3-7).

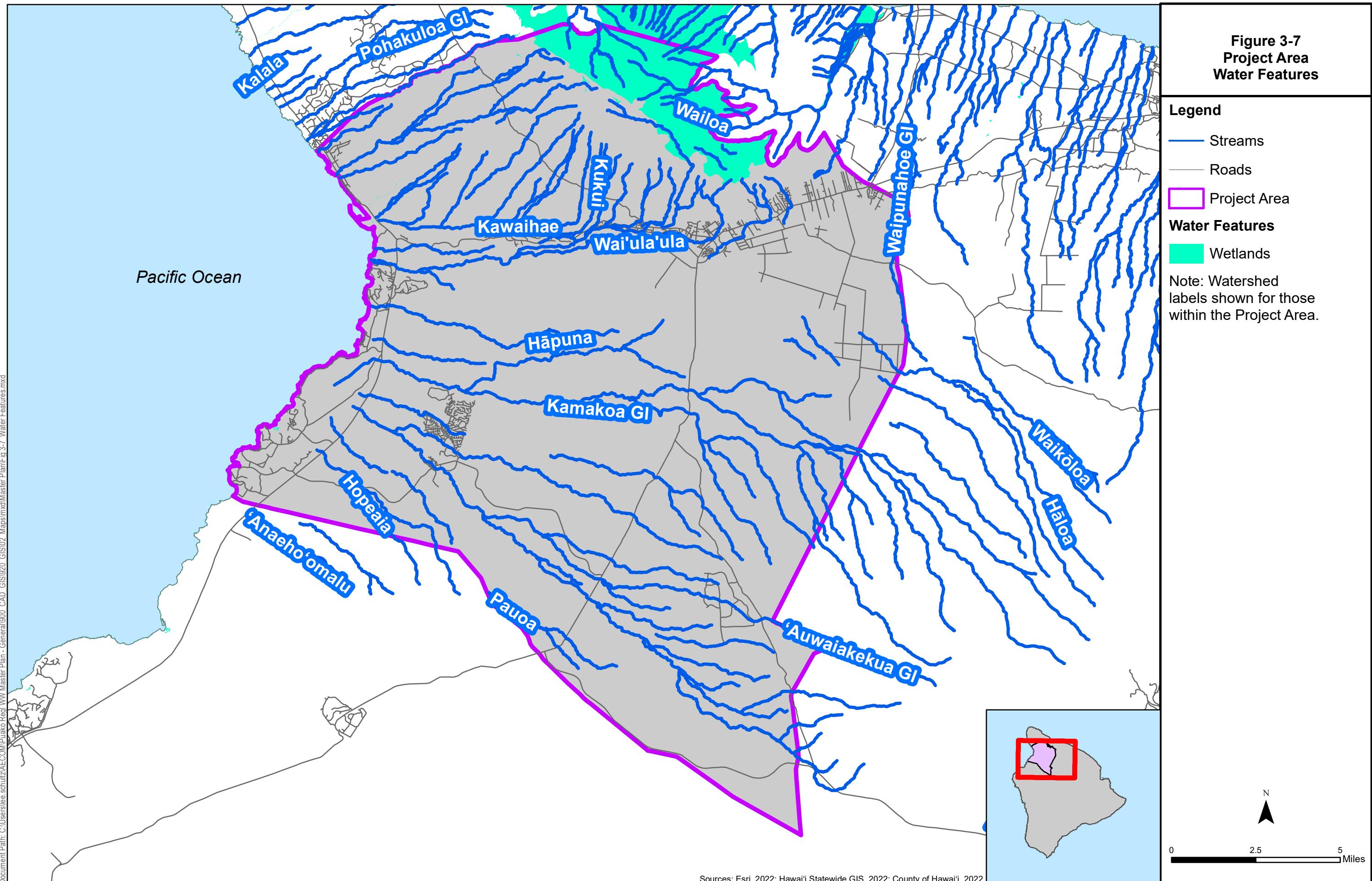
From the State of Hawai'i Department of Land and Natural Resources database, there is one potential freshwater forested wetland near the northeastern project area boundary known as Kohala Watershed Forest Reserve. As shown in the Section 6.0 seweraging figures, sewers are not planned for these areas, so this wetland would not be disturbed by future WW projects. This wetland is a proposed U.S. Fish and Wildlife Critical Habitat for Hawai'i island, which would be protected under the Endangered Species Act. During the design phase of a WW project, a jurisdictional determination from the U.S. Army Corps would help with identifying any

requirements. However, this wetland would not be part of the sewer network, as it is located far from town centers and residential or commercial areas.

If constructing a new IWS or sewer system, excavation and land disturbance may contribute to sedimentation and runoff into streams and other nearby water bodies, and accidental release of construction equipment fluids also could contaminate surface waters. Construction controls required by NPDES permits would reduce the risk of sediment and construction-related contaminant reaching surface and coastal waters. For construction using the conventional open trench method, shoring, and dewatering techniques would be employed to mitigate potential impacts.

Following the construction of a new or converted IWS, polluted runoff can occur when the system does not adequately treat WW due to improper siting, inadequate maintenance, leaks, or if the system does not adequately treat, or clean, the WW. Accumulated sludge and scum must be removed on a regular basis; otherwise, these materials could move into downstream soil infiltration systems, causing clogging and leading to the failure of these systems. Therefore, it is important to design and construct the IWS properly and educate homeowners on maintenance. HDOH CWB manages permits, monitoring, and enforcement to protect streams and in general, coastal, and inland water resources.





3.6 ENVIRONMENT

The Puakō and the South Kohala District project area is located in the western portion, or the leeward side, of Hawai‘i island. The topography consists of rocky coastlines on the west, which rises to higher elevations in the lush, mountainous northern region and rugged, arid southeastern region of the district. The elevation change from sea level along the coastline to the northern Kohala mountains is approximately 5,100 feet (ft) at the highest point, while the elevation change to the southeast is approximately 5,700 ft. The Waikoloa Village area elevation ranges from 100 to 700 ft, while Waimea town elevation is approximately 3000 feet above mean sea level.

There are roughly 66 soil types within the Project Area which include but are not limited to various lava flow complexes, cobbly silt loams, hydrous loams, medial loams, and highly organic hydrous loam. The dominant soil types and approximate areas within the Project Area are as follows:

- *Soil symbol 333: Pu‘u Pa very cobbly medial very fine sandy loam, 6 to 12 percent slopes (49 square miles)*
- *Soil symbol 373: Hāpuna-Waikui-Lālāmilo complex, 0 to 20 percent slopes (40 square miles)*

These classifications are provided by the U.S. Department of Agriculture Natural Resources Conservation Service.

Soil percolation is a measure of how quickly water moves through soil and is useful in determining the effectiveness of an onsite treatment system. Soil percolation is determined by soil hydraulic conductivity, which has been mapped in the Project Area. Conductivities range from 0 to 100 feet per day. For majority of the Project Area, the conductivity ranges up to roughly 30 feet per day.

3.7 EXISTING WASTEWATER FLOWS AND TREATMENT SYSTEMS

3.7.1 Existing Population

WW flows generated from Puakō and South Kohala are estimated from the current population. Resident population is defined as the number of persons residing within the COH during a given year. Persons are counted as residents if they live within the County for a minimum of five months of the year. The resident population includes part-time residents. However, it excludes visitors (tourists), non-resident students, and military personnel stationed in the COH who maintain a home of record outside the County of Hawai‘i. The number of residents of the County may differ from time to time during the year and is typically represented as an “average” population count for a given year and is normally set at mid-year (as of July 1st of each year). Census data for the year 2020 is used as the starting point to establish population. Overall, the 2020 census population within the Project Area is estimated to be approximately 19,900. Table 3-5 shows the estimated 2020 population for Puakō and South Kohala.

Table 3-5: Estimated Year 2020 Project Area Census Population

Area Name a	Census Tract Number	Estimated 2020 Census Population
Waimea – Kohala	217.05	6,366
Waimea – Pu’u Anahulu	217.06	3,795
Waikoloa – South Kohala	217.07	4,997
Kawaihae – ‘Anaeho’omalu	217.08	4,152
North Kohala (Partial) b	218 (Inside South Kohala Boundary)	+ 613
Kawaihae – ‘Anaeho’omalu c	217.08 (Outside of South Kohala Boundary)	- 4
Total Population		19,919

OSDS onsite sewage disposal system

^a Area names of census tracts and COH Zoning/Community Development do not match exactly.^b Approximately 175 dwellings in Census Tract 218 with registered OSDS fall within South Kohala project area at 3.5 occupants/dwelling.^c Approximately 1 dwelling in Census Tract 217.08 with a registered OSDS falls outside the South Kohala project area at 3.5 occupants/dwelling.

3.7.2

Existing Wastewater Flows

To get average dry weather WW flows for current condition, the estimated 2020 population numbers are multiplied by the per capita flow of 105 gallons per capita per day (gpcd). This flow rate is based on the CCH WW System Design Standards, which the COH is using for this Master Plan. The 105 gpcd is summed from 70 gpcd of estimated daily per capita sewage flow and 35 gpcd dry weather infiltration which was based on the average of the low nighttime flows per day for the same period as the average dry weather flow, minus significant industrial or commercial nighttime flows. The total estimated 2020 average dry weather WW flow is 2.09 million gallons per day (mgd). See Table 3-6 for Year 2020 average dry weather WW flow estimates for the project area.

Table 3-6: Estimated Year 2020 Project Area Wastewater Flow

Area Name ^a	Census Tract Number	Estimated 2020 Average Dry Weather Wastewater Flow (mgd) ^b
Waimea – Kohala	217.05	0.67
Waimea – Pu’u Anahulu	217.06	0.40
Waikoloa – South Kohala	217.07	0.52
Kawaihae – ‘Anaeho’omalu	217.08	0.44
North Kohala (Partial) ^b	218 (Inside South Kohala Boundary)	0.06

Area Name ^a	Census Tract Number	Estimated 2020 Average Dry Weather Wastewater Flow (mgd) ^b
Kawaihae – ‘Anaeho’omalu	217.08 (Outside of South Kohala Boundary)	-0.00
Total		2.09

Note:

gpcd gallons per capita per day

^a Area names of census tracts and COH Zoning/Community Development do not match exactly.

^b Based on 105 gpcd and 100% of the current Project Area population served by the sewers

3.7.3 Existing Wastewater Treatment Systems

3.7.3.1 ONSITE SEWAGE DISPOSAL SYSTEMS

Currently there are ten (10) privately owned wastewater treatment plants (WWTPs) in Puakō and the South Kohala District. The WWTPs serve specific residential or resort areas, as described in the following subsections. Residential WW is also currently treated via onsite sewage disposal systems (OSDSs).

There is a total of approximately 4,070 OSDSs in Puakō and the South Kohala District (Figure 3-8). Of the 4,070 OSDSs, there are 780 Class I, 80 Class II, 10 Class III, and 3,200 Class IV OSDSs (cesspools, which are required to be converted under Acts 125 and 87).

HDOH definitions of the four OSDS classes are listed below.

- *Class I*: any system utilizing soil as a treatment medium
- *Class II*: a septic tank discharging to a seepage pit
- *Class III*: an aerobic treatment system discharging to a seepage pit
- *Class IV*: WW discharged directly to a seepage pit with no treatment (i.e., cesspool)

Note that the count of 3,200 cesspools is from the Hawaii Statewide GIS Program database, developed in 2010.

3.7.3.2 HAWAI’I CESSPOOL HAZARD ASSESSMENT & PRIORITIZATION TOOL

In the HDOH 2022 *Hawai’i Cesspool Hazard Assessment & Prioritization Tool Report*, the cesspool count within South Kohala is about 4,500 [5]. This value reflects cesspool closures or conversions and additional changes based on more recent permitting data, county tax records, dwelling database information, and other updates. The HDOH report assigns priority levels for cesspool conversions within the State of Hawai’i. According to the *Hawai’i Cesspool Hazard Assessment & Prioritization Tool Report*, cesspools were evaluated based on data from each Census Tract, and the whole area of each Census Tract is scored and ranked with the same priority level. The following is a list of the priority levels:

- *Priority Level 1:* Greatest contamination hazard (red)
- *Priority Level 2:* Significant contamination hazard (orange)
- *Priority Level 3:* Pronounced contamination hazard (yellow)

The areas where the highest development density using cesspools are the following:

- Puakō
 - All of the OSDSs in Puakō are Priority 1 cesspools.
- Waikōloa Village
 - All of the OSDSs in Waikōloa Village are Priority 1 cesspools.
- Waimea and Highway 19 east and west of Waimea town center
 - Most of the Waimea OSDSs are Priority 3 cesspools.
 - Some of the western OSDSs along Highway 19 closer to the coast are Priority 1 cesspools.
- Kawaihae
 - Most of the OSDSs in this area are Priority 3 cesspools.
 - A few OSDSs in the Kawaihae Town Center are Priority 1 cesspools.
- Waiki'i cattle ranch area (near the southeast boundary of Project Area alongside Saddle Road/Highway 200)
 - All of the OSDSs in the Waiki'i area are Priority 3 cesspools.

See Figure 3-9 for the HDOH cesspool priorities within the Project Area.

3.7.4

Existing Private Wastewater Treatment Plants

AECOM received design and operating information from the HDOH for the 10 existing private WWTP within the Puakō and South Kohala Project Area during the preparation of the related PDR submitted in June 2023. AECOM also conducted in-person site visits and staff discussions with the private WWTP operators in August 2023. In general, the larger-sized private WWTPs all have the capacity to accept additional WW flow based on their current permit limits. However, all indicated that the construction of the sewer collection system was not affordable with their present rate structure. The following sections summarize the current situation at each private WWTP.

3.7.4.1

WAIMEA TOWN PLAZA WWTP

The Waimea Town Plaza WWTP, managed by Hawaiiana Management Company, Ltd., is equipped with the Hanna Enterprises Vertical system and a chlorine contact tank. It serves 5 commercial units, one mixed-use commercial/residential unit, and 14 residential units. The plant processes an average of 1,700 gallons per day (gpd) and has a design capacity of 4,000 gpd. After treatment, the effluent is disposed into two injection wells.

3.7.4.2 WAIMEA WASTEWATER COMPANY, INC. (PARKER RANCH) WWTP

Waimea WW Company, Inc., or Parker Ranch WWTP is an R3 reuse treatment facility managed by Hawaii American Water. It provides services to the North Kohala Community Hospital, KTA Shopping Center, Parker Ranch Shopping Center, Waimea Town Center, Waimea Elderly Housing, and over 150 homes in the Lualā'i and Holoholo Ku subdivisions. The facility operates with a capacity of 100,000 gpd and typically sees an average daily flow of 50,000 gpd. Treatment is facilitated through an Aerated Lagoon, with the resulting R3 effluent being utilized for pasture irrigation.

3.7.4.3 'OULI 'EKAHI AFFORDABLE HOUSING SEWAGE TREATMENT PLANT

The 'Ouli 'Ekahi Affordable Housing WWTP in Kamuela, owned by the Big Island Housing Foundation, handles an average flow of 4,200 gpd with a peak capacity of 20,000 gpd. Serving 33 housing units, the plant utilizes the sequencing batch reactor (SBR) treatment method and disposes effluent through two deep trench leach fields.

3.7.4.4 KAWAIHAE VILLAGE WWTP

Managed by the Kawaihae Village Association, the Kawaihae Village WWTP operates with an activated sludge (AS) process. Serving 25 one-bedroom and 26 two-bedroom units, the facility processes an average of 7,500 gpd and contains a capacity of 10,000 gpd. Effluent is channeled into two injection wells. Sludge is separated through a clarifier and is sent to a sludge holding tank where it is aerated. Sludge is disposed quarterly.

3.7.4.5 SOUTH KOHALA WATER RECLAMATION FACILITY (WRF)

Owned by South Kohala Water Corp., the South Kohala WW Reclamation Facility employs an extended aeration AS method, generating R1 reuse effluent for golf course irrigation in Hāpuna. Sludge is sent to drying beds where it is dewatered. An ultraviolet system disinfects the effluent. The facility also features a backup infiltration basin on-site. It supports the Hapuna Beach Prince Hotel, Mauna Kea Beach Hotel, golf course concessions, Hāpuna maintenance and laundry facilities, and various residential units. With a peak capacity of 600,000 gpd, the plant typically processes an average of 213,000 gpd.

3.7.4.6 PUAKŌ BEACH APARTMENTS PLAZA WWTP

The Puakō Beach Apartments WWTP, utilizing the Extended Aeration AS method, processes a typical flow of 1,473 gpd and has a peak capacity of 22,000 gpd. Effluent disposal is managed through two injection wells. Sludge is separated through two clarifiers and is pumped out and sent to Kealakehe WWTP for disposal. Managed by Hawaiiana Management Company, the facility serves 38 units, accommodating both owner-occupied and seasonal residences.

3.7.4.7 KAMAKOA WRF (K-PLANT)

Owned by Hawaii Water Service, the Kamakoa Water Reclamation Plant (K-Plant) utilizes the moving bed bioreactor (MBBR) process. The facility processes an average flow of 90,000 gpd, with a design capacity of 400,000 gpd. Effluent does not undergo

disinfection and is disposed through leach fields. Sludge is separated through two Dissolved air flotation tanks and sent to a screw press that operates once per week. Dewatered sludge is hauled to the West Hawai'i Sanitary Landfill every two months. K-Plant treats flow from the Paniolo Estates Subdivision, Waikoloa School, Kamakoa Housing, and Kekuna Affordable Housing Apartments.

3.7.4.8 KALAHUIPUA'A (MAUNA LANI) WWTP

The Kalahuipua'a Lagoons Treatment Facility, also known as the Mauna Lani WWTP, provides services to the Mauna Lani and Fairmont Orchid Hotels, as well as neighboring residences. The facility incorporates a primary and a secondary Aerated Lagoon, each holding 8.7 million gallons (MG) and being 15 ft deep. The plant operates with a flow capacity of 750,000 gpd and typically processes an average of 260,000 gpd. All treated effluent is directed to disk screens before being disposed into two injection wells. The operation is overseen by Hawaii American Water.

3.7.4.9 WAIKOLOA VILLAGE WWTP (A-PLANT)

The Waikoloa Village WWTP (A-Plant) is operated by Hawaii Water Service. It serves the south side of Waikoloa Village which includes condominiums and the Commercial Center area. The plant has an operational average flow of 240,000 gpd and a design capacity of 500,000 gpd. The facility utilizes the MBBR treatment process. Treated effluent is managed through 6 open seepage pits. In terms of sludge treatment, it is directed to two 50,000-gallon aerobic digesters, then dewatered using a centrifuge. The dewatered sludge is then transported to the West Hawai'i Sanitary Landfill on a monthly basis.

3.7.4.10 WAIKOLOA RESORT WRF

The Waikoloa Resort Water Reclamation Facility (WRF), under the management of Hawaii Water Service, provides WW treatment for the Waikoloa Resort area. The area encompasses hotels, 30 multi-family units, 8 single-family homes, 100 condo units, and Hilton Grand Vacation Phase III with its 200 condo time-share units. Operating with an average flow of 650,000 gpd, its capacity extends up to 1,000,000 gpd. The plant employs the membrane bioreactor (MBR) treatment process. The resulting Reuse R1 effluent irrigates both of Waikoloa Beach Resort's golf courses: the Kings' and Waikoloa Beach Golf Courses. This irrigation solution is a mix of R-1 water and brackish well water. Regarding sludge management, it is retained in two WAS storage tanks equipped with blowers. Following a screw press process, the sludge is transported to the West Hawai'i Sanitary Landfill weekly.

3.7.4.11 SUMMARY OF EXISTING WWTP FLOWS

The 10 existing private WWTP locations are presented in Figure 3-10. A summary of existing WWTP flows is presented in Table 3-7. Total current average WW flow for the 10 existing private WWTPs is approximately 1.47 mgd. Of the 1.47 mgd total flow, 0.35 mgd is estimated to be residential flow from the census population. The remainder is primarily the resort type of WW flows from South Kohala WRF, Mauna Lani WWTP, and Waikoloa Resort WRF serving tourist and transient people who are not among the census population.

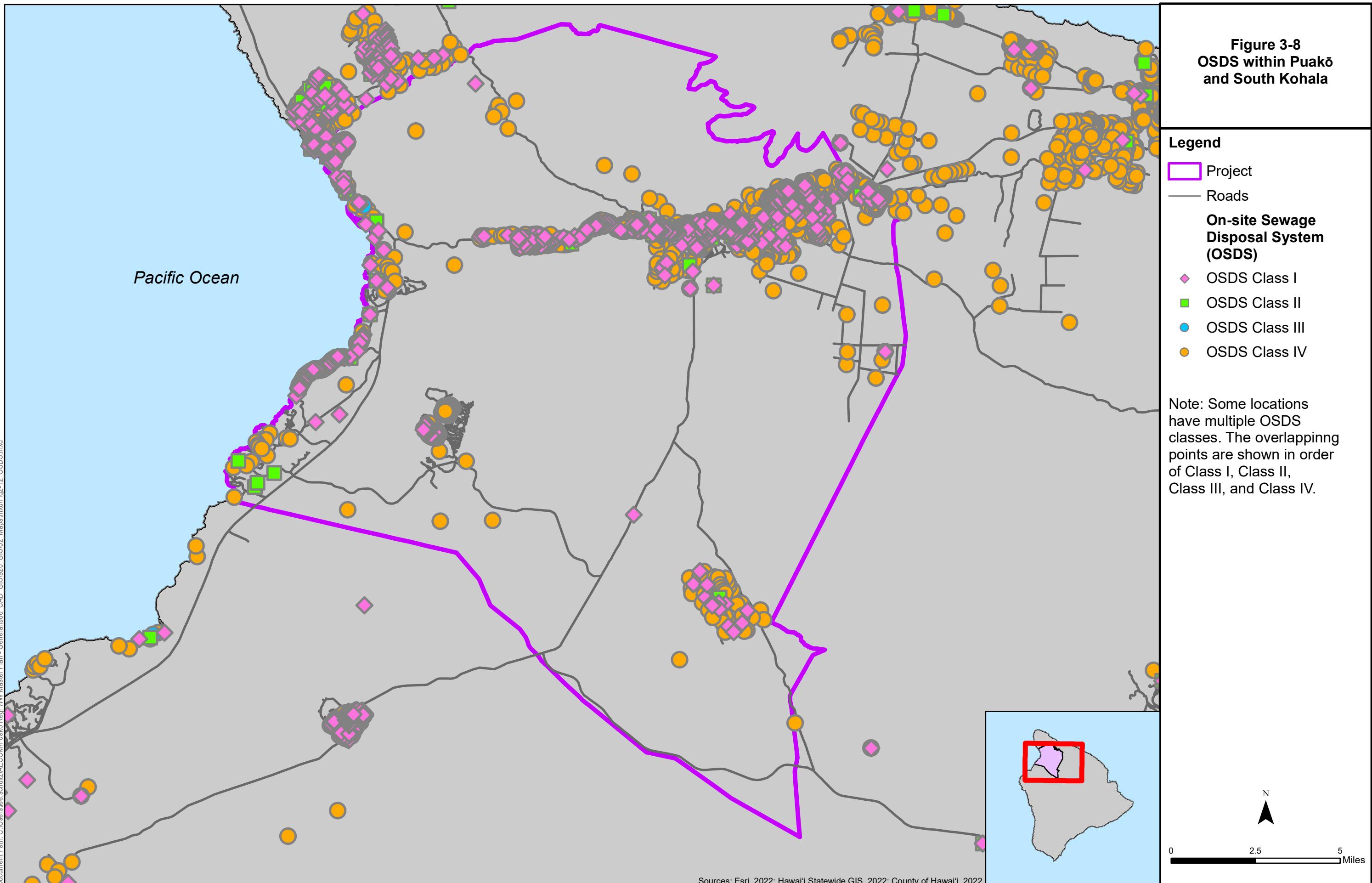
Table 3-7: Existing Private WWTP Flow Summary

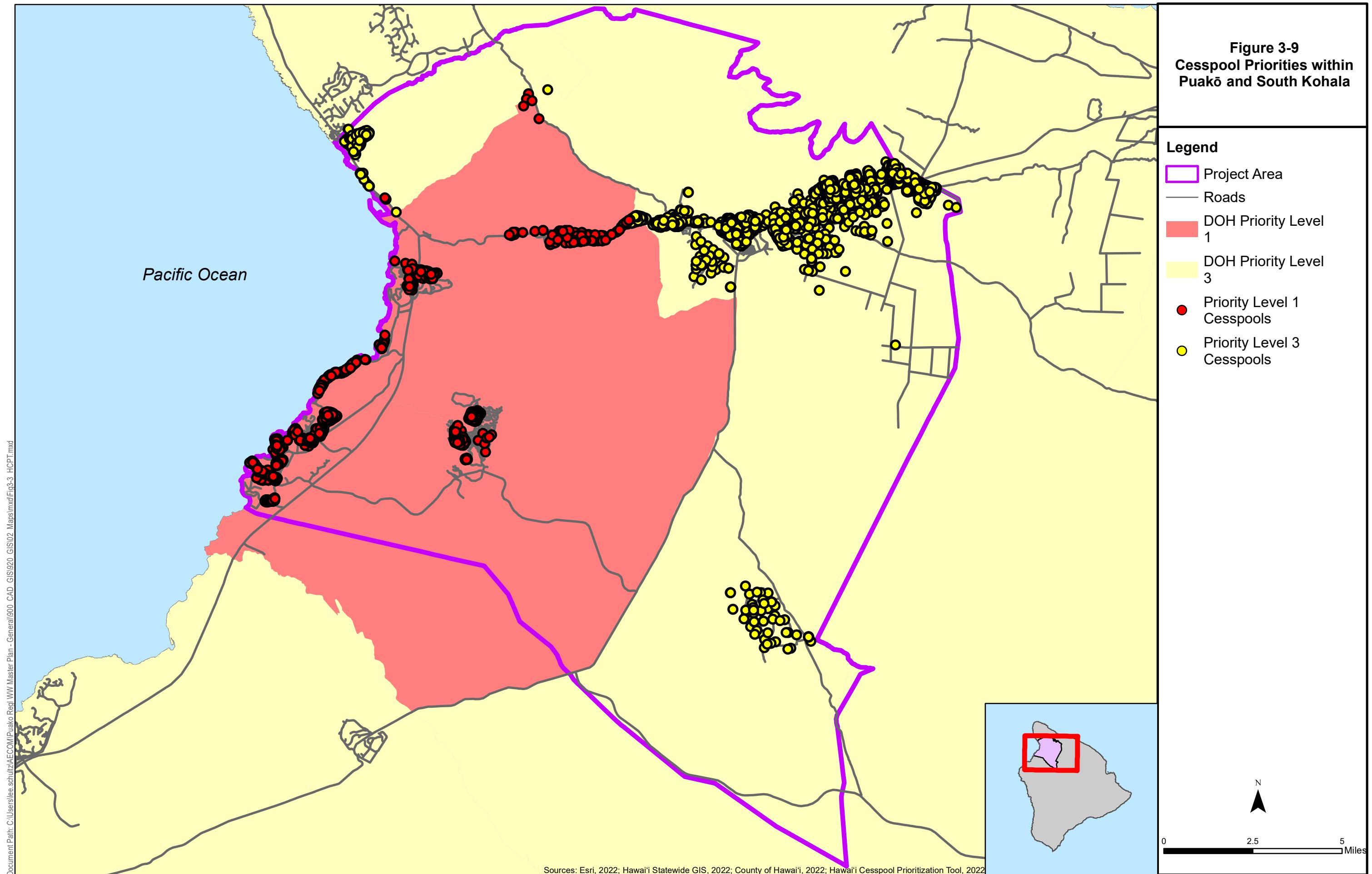
Existing Private WWTP	Design Capacity, mgd	Current Avg. Flow, mgd	Type of Flow, mgd			Estimated Census Population Served ^b	Available Capacity, mgd
			Comm.	Res.	Resort ^a		
#1 Waimea Town Plaza	0.004	0.0017	0.0017	---	---	---	---
#2 Parker Ranch WWTP	0.10	0.005	---	0.005	---	48	0.10
#3 'Ouli 'Ekahi Affordable Housing STP	0.02	0.0042	---	0.0042	---	40	---
#4 Kawaihae Village WWTP	0.01	0.0075	---	0.0075	---	71	---
#5 South Kohala WRF	0.60	0.213	---	---	0.213	---	0.39
#6 Puakō Beach Apartments Plaza WWTP	0.022	0.0015	---	0.0015	---	14	---
#7 Kamakoa WRF (K-Plant)	0.40	0.09	---	0.09	---	857	0.31
#8 Mauna Lani WWTP	0.75	0.26	---	---	0.26	---	0.49
#9 Waikoloa Village WWTP (A-Plant)	0.50	0.24	---	0.24	---	2286	0.26
#10 Waikoloa Resort WRF	1.0	0.65	---	---	0.65	---	0.35
Total	3.41	1.47	0.0017	0.35	1.12	3,316	1.89

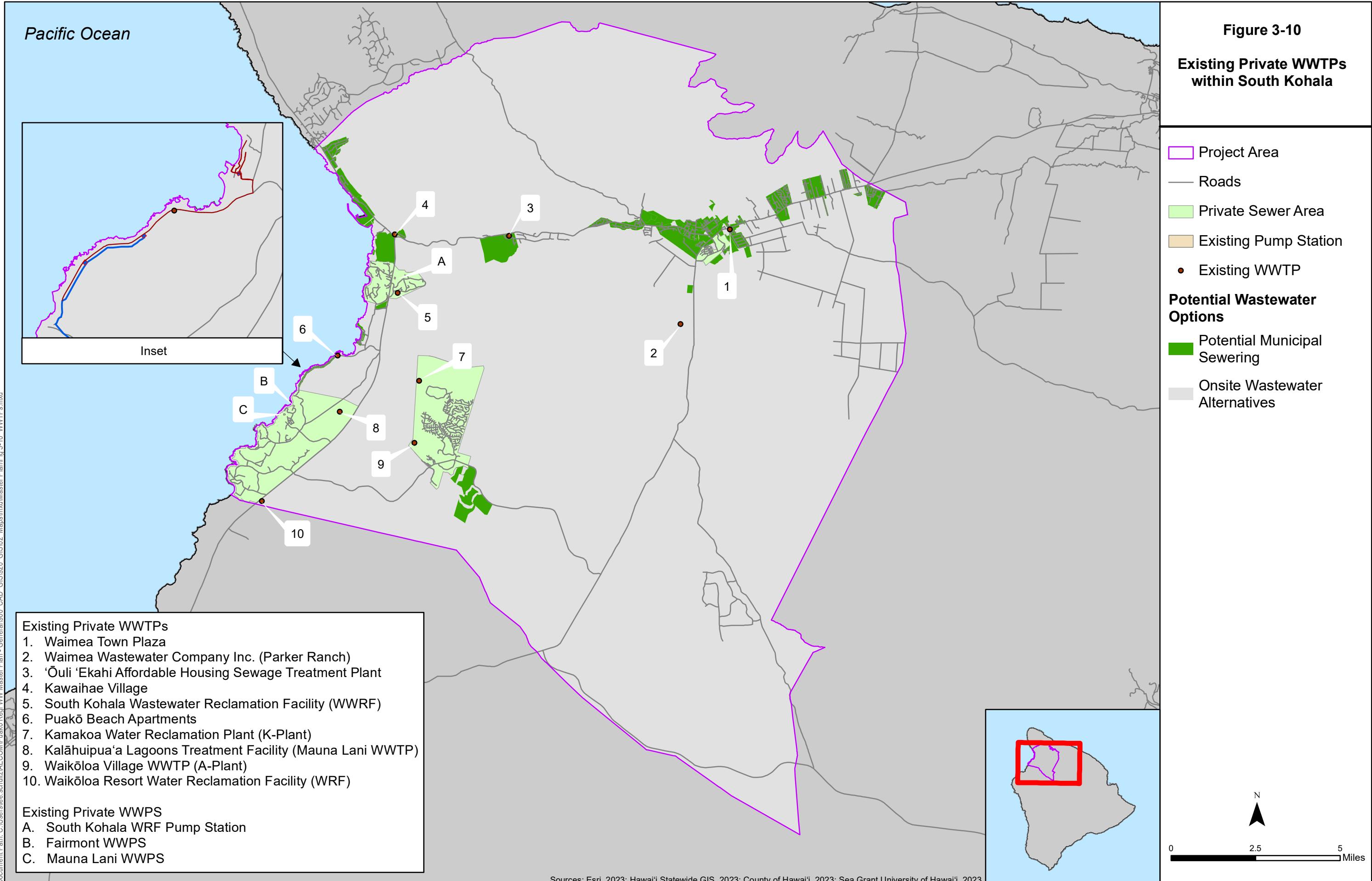
STP sewage treatment plant

^a Assuming all flows to Plants #5, #8, and #10 are resort/transient type of flow.^b Assuming 105 gpcd for residential flow.

Based on the total estimated residential flow of 0.35 mgd and 105 gpcd, the census population is estimated to be 3,316. The estimated population served for each residential unit is different from the design density for residential units, 4 persons per single-family home, in the CCH design standards. In general, there are fewer than 4 persons per single-family home. The difference in served population estimated from treatment plant average flow and that from design standard population indicates not all housing units were occupied and some housing units were not occupied with 4 persons. Another factor causing the difference is that a portion of the WW generated by the served population was not reflected in the WW treatment flow. This portion of the WW flow was accounted for elsewhere when the population is at work, school, and other areas. However, this factor was not considered in estimating the served population due to a lack of information at this planning level.







3.8 CURRENT INFILTRATION AND INFLOW

The total WW flow that is used for sizing and designing a WW system would include wet weather inflow and infiltration (I/I) allowances. Inflow and infiltration are separate flows, as defined below:

- *Inflow:* Water other than sanitary flow that enters a sewer system from sources which include, but are not limited to, area drains, cross connections between storm sewers and sanitary sewers, stormwater, surface runoff, or drainage. Inflow is generally measured during wet weather.
- *Infiltration:* Water that infiltrates a sewer system through defective pipes, pipe joints, connections, or manholes. Infiltration is generally measured during seasonally high ground water conditions, during rainy events.

Due to the limited number of public sewer systems in Puakō and the South Kohala District I/I from long sewer laterals and sewer mains that are typical to a public sewer system are not prevalent. It is still possible for I/I to enter laterals connecting to existing OSDSs. However, it is anticipated that the OSDSs are designed to account for on-site I/I flow.

3.9 PERFORMANCE OF EXISTING SYSTEMS

Currently, the COH has no WW collection or treatment infrastructure within the Puakō and South Kohala project area. The COH has WWTP and collections systems in the following other areas:

- Hilo
- Kealakehe (Kailua-Kona)
- Papaikou
- Kulaimano
- Kapehu
- Honoka'a
- Naalehu
- Pahala

The COH is currently under an EPA Administrative Order to develop a program to systematically repair, rehabilitate, and replace aging infrastructure within some of the above areas. The COH is addressing the requirements of this recent island-wide administrative order separately. Because the COH does not have any WW collection, conveyance, or treatment facilities in the Puakō and South Kohala project area, these enforcement activities are not part of the scope of work for this WW Master Plan.

All WWTPs within the South Kohala district are privately owned, operated, and maintained. As previously discussed, site visits to the Waikoloa Resort WRF, Waikoloa Village WWTP, Kamakoa WRF, Kalahui Pua'a (Mauna Lani) WWTP, and South Kohala WRF were conducted with some site observations and recent HDOH

O&M inspection report results discussed below. The Waimea Town Plaza WWTP, ‘Ouli ‘Ekahi Affordable Housing Treatment Plant, and Kawaihae Village WWTP were noted to be under a corrective action plan. Furthermore, the plants were either too small or did not have the capacity to accommodate additional flows. Puakō Beach Apartments Plaza WWTP is also too small and does not have the capacity to accommodate additional flows. The Waimea Wastewater Company, Inc. (Parker Ranch) WWTP, which is operated and maintained by Hawaii American Water, has capacity for future flows, but it is currently spoken for by Parker Ranch. No further investigation was conducted on these five WWTPs.

The Waikoloa Resort WRF, Waikoloa Village WWTP, and Kamakoa WRF are privately owned, operated, and maintained by Hawaii Water Service. The Waikoloa Resort WRF services the nearby Waikoloa Resort area. It was noted during the site visit that a recent development considered sending flow to this WWTP, but the cost for sewers were too expensive. The 2019 HDOH O&M inspection report found the overall plant rating to be unacceptable due to some exceedances at the time of inspection. The Waikoloa Village WWTP and Kamakoa WRF service the Waikoloa Village area. The Kamakoa WRF was under a corrective action plan at the time of the site visit for their disposal. This is also reflected in the 2019 HDOH O&M inspection report, which found the overall plant rating to be unacceptable due to current disposal system. A new 400,000-gpd leach field is currently being designed that will take up the entire remainder of the 15-acre site. The Waikoloa Village WWTP had an overall plant rating of acceptable, per the 2019 HDOH O&M inspection report, and there were no discernable issues observed during the site visit. It was mentioned that the plant would like to reuse the water, but it is too costly now. The nearby golf course or some new developments might be able to take their water in the future.

The South Kohala WRF is operated and maintained by the South Kohala Water Corporation and services the Mauna Kea Beach Hotel area. The collection system uses traditional gravity flow with four pump stations throughout the area. The 2023 HDOH O&M inspection report found the overall plant rating to be unacceptable due to issues with the supervisory control and data acquisition system, data recording, and exceedances. These issues were not discussed during the site visit.

The Kalahui Pua‘a (Mauna Lani) WWTP is operated and maintained by Hawaii American Water. It was noted during the site visit that while there is existing capacity for future flows, the resort has ownership for this remaining capacity. Additionally, the resort used to use recycled water for irrigation, but they were no longer interested. The 2023 HDOH O&M inspection report found the overall plant rating to be conditionally acceptable due to two BOD_5 violations observed earlier in the year and the observation of a fish population problem in the lagoons.

4.0 FUTURE SITUATION

To more effectively plan WW services for Puakō and South Kohala, it is important to project the area's future direction and growth. This would help with design of the capacity and location of WW lines and facilities.

South Kohala is experiencing modest growth compared to the other COH districts [3]. This master plan will help COH evaluate potential WW management options to support this growth. COH's vision is to direct this growth towards the four communities within the district – Waimea, Waikoloa Village, Kawaihae, and Puakō.

A key document containing the development goals within the Puakō and the South Kohala District project area is the COH's 2008 Puakō and the South Kohala District CDP. The CDP initiative stems from COH's 2005 GP, which serves as a blueprint for long-term development on Hawai'i. Building upon the 2008 planning, COH is presently drafting a GP 2045. The future GP 2045 will update the 2005 and 2008 planning documents. Currently in progress, the draft GP 2045 includes a section on land use planning. The goals are similar to those of the CDP, such as directing growth towards urban and village centers. Policies and actions to achieve these objectives are outlined in the document and are under review by COH.

4.1 FUTURE ENVIRONMENT – NO PROJECT ALTERNATIVE

In the event of no COH sewer project, there would be a “no project” alternative. This would consist of property owners individually complying with HRS 342D-72, which set a deadline of January 1, 2050 for all cesspools to be “upgraded or converted to a septic system or aerobic treatment unit (ATU) system” or “connected to a sewerage system” [6].

4.1.1 General Process for Compliance with HRS 342D-72

A general flowchart is presented in Figure 4-1 to help the homeowner comply with HRS 342D-72 as amended by Acts 125 and 87. The starting step is for a licensed engineer to evaluate the site, as required by HAR 11-62-31.2 [7]. A list of licensed engineers is provided by HDOH: see Step 1 of the link below.

<https://health.hawaii.gov/wastewater/home/iws/>

The engineer will perform a site assessment, such as identifying soil types or determining land slope. Based on this information, the homeowner would decide one of three options:

- Connection to a nearby sewer (if applicable). The homeowner would apply for this through COH DEM.
- Apply for an exemption allowed by HRS 342D-72. This may be granted if the property owner applies for an exemption and presents documentation showing

a “legitimate reason that makes it infeasible to upgrade, convert, or connect the cesspools...[A] legitimate reason shall include but not be limited to:

- Small lot size;
- Steep topography;
- Poor soils; or
- Accessibility issues.” [7]

Lot size is a primary requirement by HAR 11-62-31.1 to convert cesspools to a septic tank system or an ATU system. Per HAR 11-62-31.1, each dwelling may have an IWS if there is at least 10,000 square feet of land area per dwelling lot. For an existing lot less than 10,000 square feet and created and recorded before August 30, 1991, only one IWS is allowed. A soil absorption system (SAS) is not allowed for following poor soil conditions, including soil percolation rate that is less than one minute per inch and greater than sixty minutes per inch within the upper five feet of the soil, and fractured lava. Under these poor soil conditions, a soil replacement system could be used.

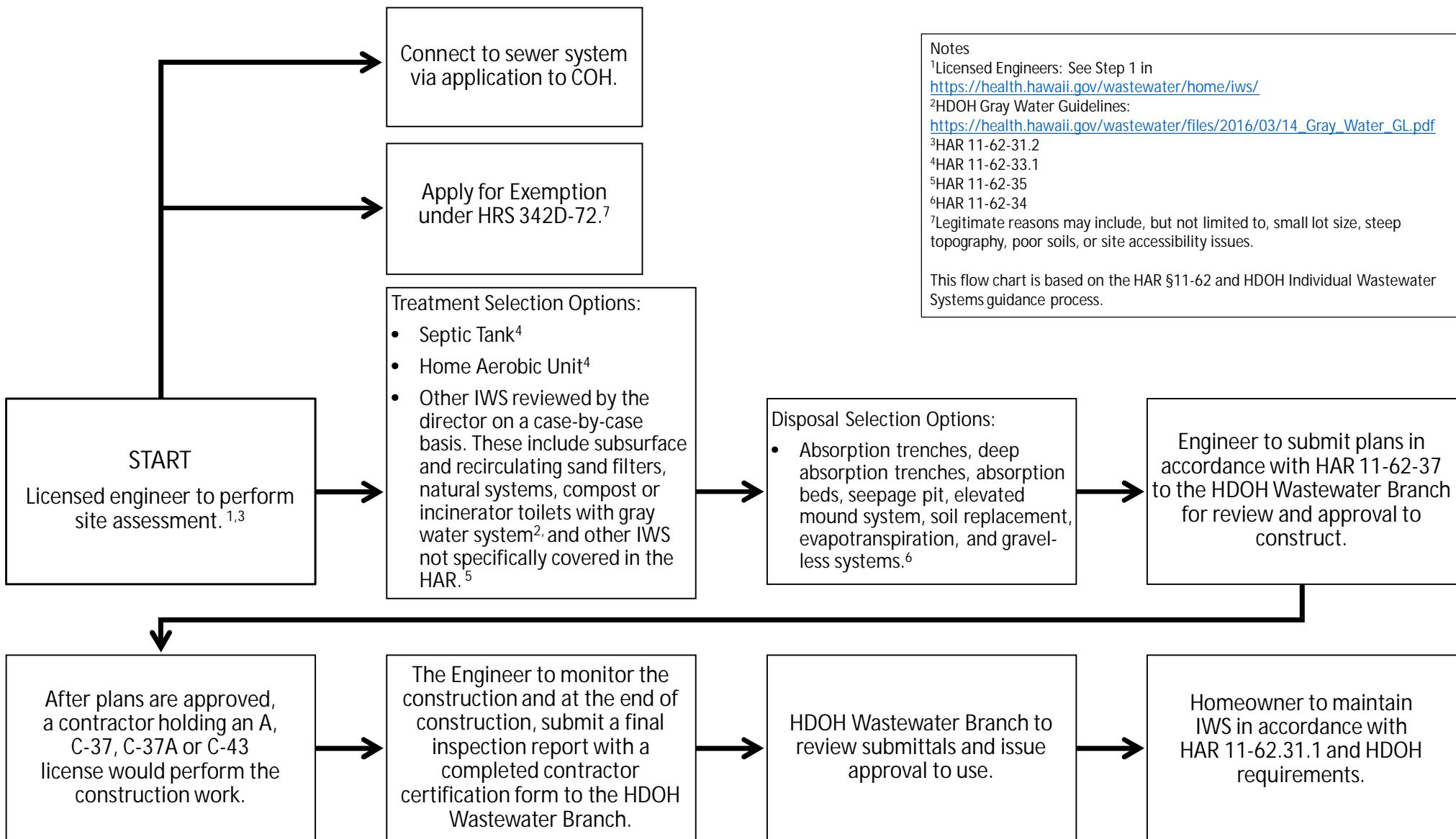
- Proceed to select a treatment and disposal method for the IWS. The engineer would develop and submit the plans to the HDOH WW Branch, following the requirements in HAR 11-62-37.

After approval, a contractor holding an A, C-37, C-37A, or C-43 license would be needed to construct the IWS or upgrade the cesspool. While the construction takes place, the licensed engineer must monitor the construction of the IWS.

When construction is complete, the engineer would submit a final construction inspection report and a contractor certification form to the HDOH WW Branch. The WW Branch will issue an approval letter if there are no disparities between the construction inspection report and the contractor certification form.

The homeowner should maintain the installed IWS and disposal system, as needed, in accordance with HAR 11-62.31.1 and HDOH requirements.

Figure 4-1 General Flow Chart for Compliance with HRS 342D-72



4.2 PLANNING PERIOD

This master plan is based on a 30-year planning period, through year 2052. The Hawai'i Department of Business, Economic Development and Tourism (DBEDT) provides population forecast estimates through 2040. The master plan evaluation extends another 12 years from this in order to obtain a 30-year horizon that will include the January 1, 2050 deadline in Acts 125 and 87. These acts mandate every cesspool in the State to be “upgraded or converted to an HDOH director-approved WW system; or connected to a sewerage system” by year 2050 (Section 4.1).

4.3 LAND USE

COH's goals for growth management include re-shaping the pattern of future development to prevent further sprawl and focusing on the four community areas of Waimea, Waikoloa Village, Kawaihae, and Puakō [3]. Due to differences between each community, each community has developed their own community plan, which identifies key priorities and issues specific to the area.

Land use projections and community specific guidelines for the four South Kohala communities are summarized from the South Kohala CDP and described below.

4.3.1 South Kohala Communities

4.3.1.1 WAIMEA

Waimea is a linearly developed town from east to west and is concentrated along Māmalahoa Highway and Kawaihae Road. Development along these roadways is approximately six miles with the town center around the midpoint. Due to the town's development pattern, traffic congestion is an issue around the town center where most of the commercial development is concentrated. Also located near the town center are several of the town's 12 schools. South of Waimea is Parker Ranch, while north of Waimea is the Kohala Mountains. General land use guidelines for Waimea include moderating the pace of growth and change and management of natural resources and important agricultural lands [3].

4.3.1.2 WAIKOLOA VILLAGE

Waikoloa Village is the most rapidly growing community in the South Kohala district. Housing consists of single-family homes and condominium units. There are not too many commercial developments in Waikoloa Village, but there is the Waikoloa Village Golf Course at the southern end of the community. Currently, the only access road to Waikoloa Village is Waikoloa Road from Queen Ka'ahumanu Highway and Māmalahoa Highway. General guidelines for this community include providing necessary community facilities for this growing town and providing environmental stewardship, sense of place, and open space [3].

4.3.1.3 KAWAIHAE

The main development feature for Kawaihae is the Kawaihae Harbor, which is used for both recreational and commercial activities. Kawaihae Harbor hosts two small boat harbors (north and south) and includes a commercial center with small shops and restaurants. While the population in Kawaihae is quite small compared to the rest of the district, there are three residential subdivisions in the areas surrounding the commercial center. The majority of the workforce commutes from the neighboring communities.

North of the harbor is the Kawaihae Industrial Park, which is located on State of Hawaii Department of Hawaiian Home Lands (DHHL) owned lands. According to the South Kohala CDP, there are minimal plans to expand the industrial park. DHHL owns 10,000 acres of land in Kawaihae and has partially developed a 90-acre park and residential subdivision lot. There are no further plans to develop more residential homestead lots due to a lack of potable water.

It is the community's goal to preserve the cultural and historic importance of the area while balancing recreational, commercial, and industrial uses around the harbor [3].

4.3.1.4 PUAKŌ

Puakō is a beach town that consists of mainly single-family homes and also includes several cultural and historical sites, including the Puakō petroglyph field and the Hokuloa Church. It is the goals of the community to manage the effects of growth and development and promote environmental stewardship [3].

4.4 DEVELOPMENT GOALS

The South Kohala CDP focuses planning on the four major communities of the district and is essentially a collection of four distinct community plans. In addition to these focused plans, the CDP also identified key ideas and concerns that were applicable to the entire district. These key ideas and concerns are intended to guide the future development of district. The general policies for district include the following:

- Preservation of culture and sense of place of South Kohala communities
- Provide for transportation and circulation needs of the South Kohala community
- Provide affordable and workforce housing resources
- Development of programs and standards that will protect the South Kohala community from natural hazards
- Development of guidelines and programs that promote environmental stewardship and the concept of sustainability

In addition to the district wide policies, each community identified policies or issues specific to their areas to be considered in future planning and development. The community specific policies/issues are listed below [3]:

- Waimea
 - Preserving Waimea's "sense of place"
 - Moderating the pace of growth and change in Waimea
 - Wise management of natural resources and important agricultural lands
 - Development of affordable housing
 - Timely construction of transportation and circulation improvements
- Waikoloa Village
 - Provide infrastructure and facilities for a growing community
 - Environmental stewardship, sense of place, and open space
 - Provide transportation and circulation improvements in a timely manner
 - Encourage affordable housing and smart growth
- Kawaihae
 - Create a balance of recreational, commercial, and industrial uses around the harbor area while preserving the cultural and historic importance of the area
 - Establish additional sources of potable water for the Kawaihae area
 - Improve marine water quality along the Kawaihae coast
 - Improve traffic safety for vehicular and non-vehicular transportation along 'Akoni Pule Highway
- Puakō
 - Manage effects of growth and development
 - Mitigate risk of natural disasters
 - Environmental stewardship
 - Improve traffic safety

4.5

FUTURE ZONING

COH is currently reviewing and updating its zoning and subdivision codes (Chapters 25 and 23 of the 1983 Hawai'i County Code). The purpose of the update is to implement updates to the general plan and various comprehensive development plans, to provide for more predictability, to increase consistency, to incorporate best practices in land use and zoning, to promote desirable and equitable development, and to meet the needs of the Hawai'i island community [8]. The process was initiated in early 2023, will last approximately 18 months, and includes several rounds of community engagement with public meetings, focus groups, and open houses.

The draft 2045 GP depicts future land use designations (Figure 4-2 and Figure 4-3). The land use designations around Waimea town are primarily productive and extensive agriculture with conservation lands designated north of Waimea. In the northern portions of Kawaihae, the land use is designated for rural and low-density

urban. A portion of the land between Kawaihae and Waimea is designated for urban expansion reserve.

The land use around Puakō is designated as conservation. Waikoloa Village has land use designations of low density and medium density urban. Between the Waikoloa Resort and Waikoloa Village, a large portion of land is designated as urban expansion reserve with some medium density urban.

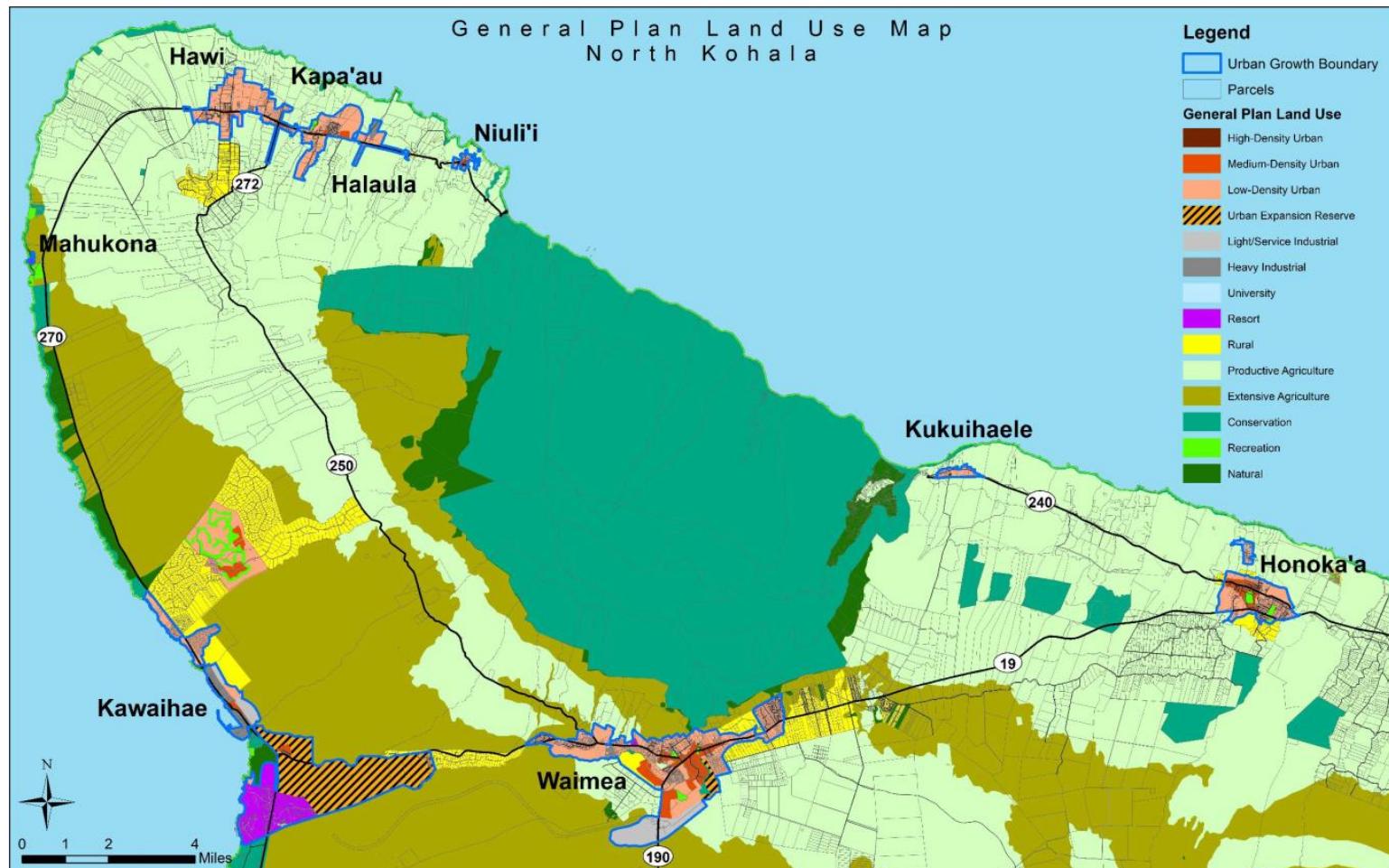


Figure 4-2: Future Land-Use Data – Northern Project Area

Source: County of Hawai'i Draft General Plan 2045, September 2023

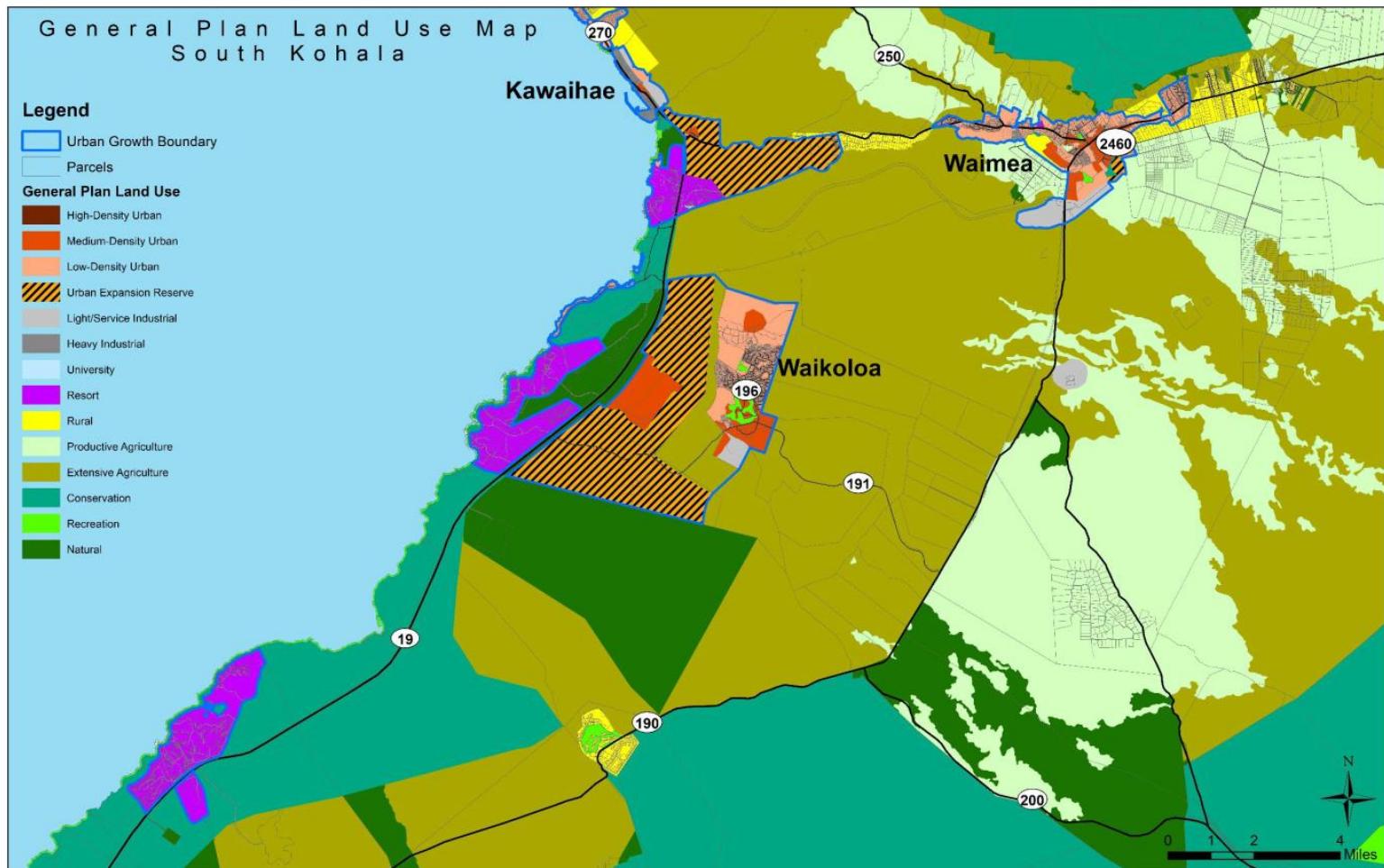


Figure 4-3: Future Land-Use Data – Southern Project Area

Source: County of Hawai'i Draft General Plan 2045, September 2023

4.6

DEMOGRAPHIC AND ECONOMIC PROJECTIONS

Demographic projections are summarized from the draft GP 2045, since that contains information more recent than the 2005 GP. About 60 percent of COH's population lives in rural areas, and minimal change to this is expected through 2045. Population density is relatively low but expected to gradually increase with the curbing of sprawl development and establishment of village and town centers. Over the next 25 years, however, COH's population growth rate is expected to decline from an average 2.3 percent per annum to about 0.9 percent per annum. Job growth averages 1.4 percent, mirroring population trends, and is expected to remain at that level for the next several decades. "Senior tsunami" is imminent, since by 2025, the large middle cohort will be retiring. This will present a variety of opportunities and challenges for housing, economic development, and public services.

As regional and village centers develop, these will further grow the economy, drawing businesses and consumers. There is an upward trend in visitor arrivals, which will likely increase through 2045[9]. The South Kohala district includes three resort complexes, Mauna Kea Resort, Mauna Lani Resort, and Waikoloa Resort. These resorts account for 40 percent of all hotel rooms within the County. In addition to the hotels, these resorts include other recreational amenities such as golf courses and commercial facilities. With emerging interest in native Hawaiian culture and nature, the South Kohala district, from its resorts to the historic Waimea town, have been drawing more visitors. Economic activity is expected to grow as agricultural tourism and eco-tourism become more popular [3]. These provide community-based services while still protecting and nurturing natural and cultural systems.

COH goals in the CDP include promoting agricultural use and other "green" employment, as well as the use of renewable energy [3]. Therefore, new employment is projected within "green" industries such as alternative energy research and development and natural resources management.

4.7

POTENTIAL FUTURE DEVELOPMENTS

There are eight developments currently planned within the South Kohala district (Figure 4-4). The majority of these developments are being planned in the Waikoloa or Waikoloa Resort areas. The only development being planned outside of the Waikoloa areas is 'Ōuli Farms. This development will be located east of the Mauna Lani Resort to the south of Kawaihae Road and is planned for an 840-acre community with over 200 acres of farming and approximately 140 homes. Each large home parcel will range from 2 acres and upwards and will include at least an acre for planted farm crops. It is the intent that the crops will contribute to the island's food production and sustainability.

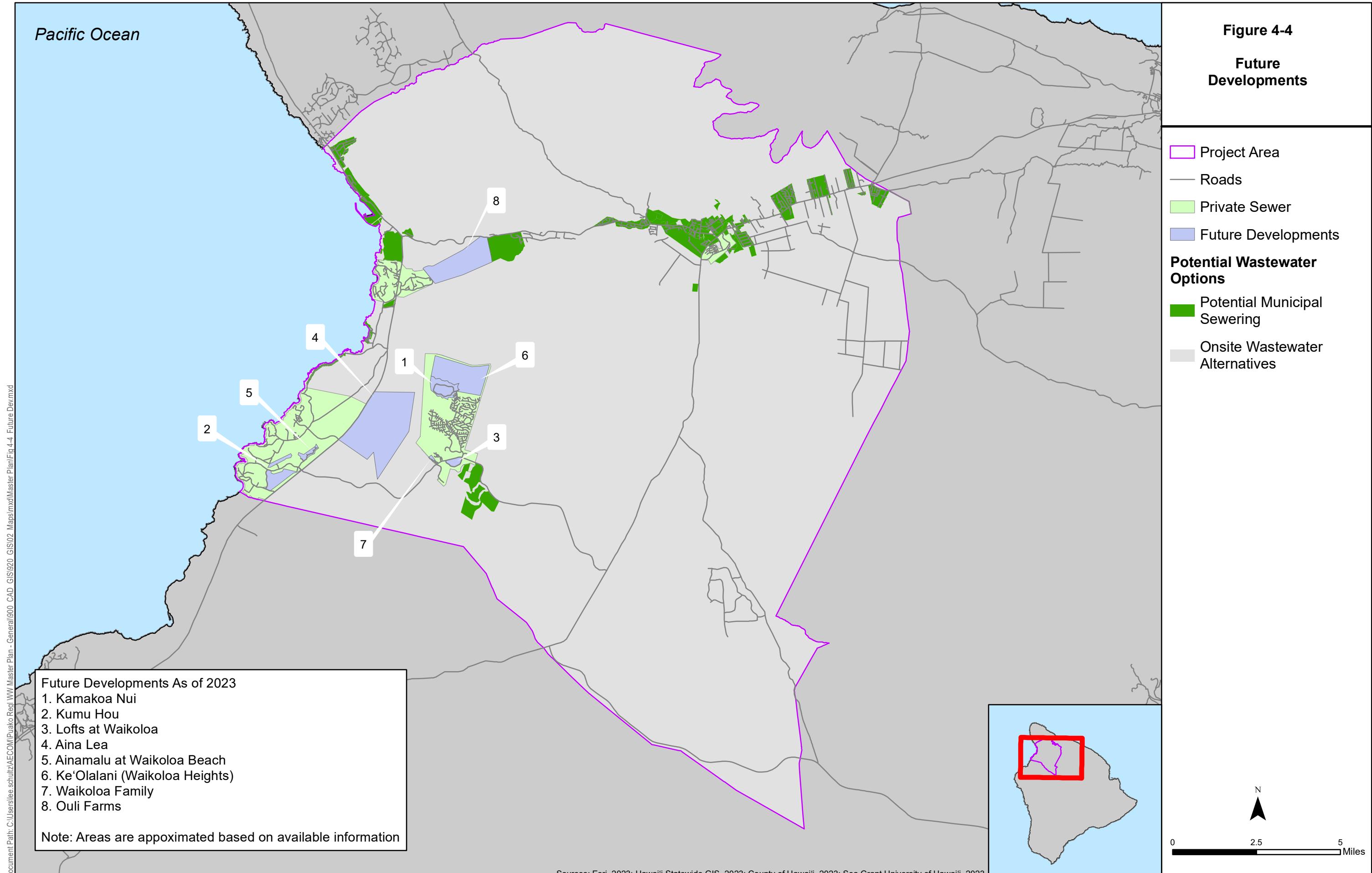
The Waikoloa Resort area currently has two major developments being planned. The larger development is Kumu Hou. This development would eliminate nine holes of the existing golf course to make way for 1100 units, including timeshares, single-family units, and workforce housing. Construction is anticipated for 2025. The other development is Ainamalu at Waikoloa Beach. This is the newest development at Waikoloa Resort, with 34 resort residences and 6 golf estates already built.

Planning is underway for more development. In addition to the existing units, there is a lot of designated open space around this area for recreational activities.

The Waikoloa area has four of the current developments – Kamakoa Nui, Lofts at Waikoloa, Ke’Olalani (Waikoloa Heights), and Waikoloa Family. The largest planned development area is Ke’Olalani (Waikoloa Heights). The first phase of this development is currently under construction and includes 100 homes, a clubhouse, and pool. Over the next 10 years, it is the plan to build out more than 2,400 homes. The second largest development is Kamakoa Nui. A master plan was developed to guide the initial and future development of approximately 240 acres over the next 20 years in the northern portion of Waikoloa Village. The first of three phases that will construct a total of 1250 dwelling units is expected to start construction within the next three to five years.

Waikoloa Plaza is a recent development that was constructed in the southern portion of Waikoloa. This development included a new shopping center and apartment complex known as the Lofts at Waikoloa. Two additional phases for the Lofts at Waikoloa are expected within the next few years that will include the construction of additional apartment units which will provide additional multi-family and workforce homes. West of Waikoloa Plaza is the smallest new development in the district – Waikoloa Family. Construction of this development was completed earlier this year with occupancy taking place soon. This development included the construction of 110 affordable, rental units.

Between the Waikoloa Resort and Waikoloa is the largest development planning area within the South Kohala district, known as Aina Le’ā. This development originally included six main groups of facilities, which consisted of single-family homes, townhomes and condos, parks, luxury villas, a community center, and mixed use/commercial facilities. This development was planned to construct 1,500 homes and a new golf course over the next 10–15 years. However, due to a recent court order, the land designated as urban for Aina Le’ā was reverted back to an agricultural classification. Despite this reclassification, projections and maps for future growth consider the previous development plans for planning. Due to the everchanging development planning throughout the region, these projections should be updated on an ongoing basis.



4.8 FORECASTED POPULATION

Forecasted growth rates are provided in the draft GP 2045 and include rates for towns within Puakō and South Kohala, such as Waimea, Kawaihae, Puakō and Waikoloa Village. For the Puakō and South Kohala population forecast, the DBEDT annual “residential” growth rates are applied until Year 2040. For the remaining planning period to 2052 (see Section 4.2 on planning period), the annual average growth rate is extrapolated from the graphed data ending in Year 2040 [2]. Table 4-1 shows the estimated future population projections for each census tract in the Puakō and South Kohala Project Area, with a total population of 31,025.

Table 4-1: Projected Project Area Population Estimates (2052)

Area Name ^a	Census Tract Number	Projected Future Population (2052)
Waimea – Kohala	217.05	9,915
Waimea – Pu’u Anahulu	217.06	5,911
Waikoloa – South Kohala	217.07	7,783
Kawaihae – ‘Anaeho’omalu	217.08	6,467
North Kohala (Partial) ^b	218 (Inside South Kohala Boundary)	955
Kawaihae – ‘Anaeho’omalu ^c	217.08 (Outside of South Kohala Boundary)	-6
Total Population		31,025

^a Area names of census tracts and COH Zoning/Community Development do not match exactly.

^b Estimate 98 new dwellings in Census Tract 218 that would fall within South Kohala Project Area at 3.5 occupants/dwelling.

^c Estimated increase of 1 dwelling in Census Tract 217.08 that would fall outside of the South Kohala Project Area at 3 occupants/dwelling.

4.9 FORECASTED FLOWS AND LOADINGS

The projected future populations described in Section 1.1 are multiplied by the per capita WW flows from Section 3.7. Table 4-2 lists projected future Year 2052 WW flow estimates for the census tracts in the Puakō and South Kohala Project Area, with a total flow of 3.3 mgd [2].

Table 4-2: Estimated Future Year 2052 Project Area Wastewater Flow

Area Name ^a	Census Tract Number	Estimated 2052 WW Flow (mgd) ^b
Waimea – Kohala	217.05	1.04
Waimea – Pu’u Anahulu	217.06	0.62

Area Name ^a	Census Tract Number	Estimated 2052 WW Flow (mgd) ^b
Waikoloa – South Kohala	217.07	0.82
Kawaihae – ‘Anaeho’omalu	217.08	0.68
North Kohala (Partial) (2)	218 (Inside South Kohala Boundary)	0.10
Kawaihae – ‘Anaeho’omalu	217.08 (Outside of South Kohala Boundary)	-0.00
Average WW Flow (total)		3.26

^a Area names of census tracts and COH Zoning/Community Development do not match exactly.

^b Based on 105 gpcd and 100 percent of the future Project Area population served by sewers.

4.10 FUTURE IMPACTS TO THE ENVIRONMENT

In accordance with the HAR 11-200, COH is required to consider the significance of potential environmental effects of any proposed WW projects. This would include evaluation of all phases of the proposed project, its potential impacts on the quality of the environment, and potential mitigation measures.

Potential future impacts associated with WW improvement projects would be described in an environmental impact statement (EIS). The EIS would be based on the general planning level details of an infrastructure study. If individual projects within South Kohala are selected and designed, separate project specific HRS Chapter 343 documents would need to be prepared as appropriate, including site-specific environmental surveys and documentation. The development of WW design details will also better inform the assessment of impacts on the environment.

4.10.1 Air Emissions/Odor Control

Nuisance odors are a common occurrence at wastewater pump stations (WWPSs), WWTPs and biosolids processing facilities. WW collection systems with WWPSs that have long detention times can result in septic conditions throughout the WWTP and subsequent odor problems in biosolids handling and end use. Biosolids processors are faced with odors during thickening, digestion, dewatering, conveying, storage, truck loading, air drying, composting, heat drying, alkaline stabilization, and/or incineration.

Odors can have detrimental effects on aesthetics, property values, and the quality of life in the community. Odor complaints at operating facilities can also lead to long term problems. Therefore, proper design for odor control should be included for new WWPSs and WWTP.

4.10.2 Short-term Impacts

Short-term impacts associated with construction of WW systems include use of water, energy, fuel, and other resources. Further, impacts on water resources, flora and fauna, and health, safety, and well-being could be expected. Use of water would be expected during construction and removal of cesspools would improve the surface and groundwater resource quality. Construction would require clearing of vegetation, depending on the specific locations selected. Construction may also affect certain neighborhoods with noise, dust, and traffic, although not expected to be significant nor long-term. Construction worker employment and material acquisition are other short-term impacts.

4.10.3 Long-term Impacts

Impacts on resources could be long-term. For example, a WWTP would require use of fuel and energy for operation. Commitment of the land for the facility could involve the loss of land resources, clearing of trees and vegetation, and use of materials to construct the facility. Beneficial impacts would include direct and indirect employment and support of current and future economic activities and development and growth in the service area. Other probable impacts include air quality (odor and dust), soils (through excavation and possible accidental and planned release of contaminants), visual and aesthetic resources, noise, and transportation (largely vehicular traffic impacts during construction),

5.0 CONCEPTUAL DESIGN

The following outlines the main design criteria and assumptions that support the conceptual design of the proposed pipe network and WWTP and WWPS locations in Section 6.0.

5.1 DESCRIPTION OF DESIGN

Design of the proposed WW collection system shall be in accordance with CCH WW Design Standards [10] and Low Pressure Sewer Design Guidelines [11] because there are currently no COH WW design standards.

5.1.1 Gravity Sewer and Force Main Design Criteria

A summary of the key design standards is summarized below.

- Gravity Sewer Design Criteria
- Gravity sewer hydraulic capacity: not to exceed 85 percent of pipe's full flow capacity
- *Minimum velocities and slope:* Gravity sewers shall be designed with the following minimum slopes for each pipe size in order to provide minimum mean velocities of 2.5 ft per second (s) (ft/s).
 - 8-inch: 0.0052 ft/ft
 - 10-inch: 0.0039 ft/ft
 - 12-inch: 0.0031 ft/ft
 - 16-inch: 0.0021 ft/ft
 - 18-inch: 0.0018 ft/ft
 - >18-inch: 0.0016 ft/ft
- *Maximum velocity:* Generally, no more than 10 ft/s is permitted
- *Depth of sewer:* In general, sewers should be designed with sufficient depth to serve properties within the tributary area. Properties that are not able to be served by gravity flow due to insufficient sewer depth shall use a pump to discharge to the gravity sewer.
- *Minimum ground cover above gravity sewers:* 4.0 ft
- Easement widths and access:
 - 15 ft for 6-inch and 8-inch lateral and branch sewers
 - 15 ft for trunk and interceptor sewers 8-inch to 16-inch
 - 25 ft for trunk and interceptor sewers larger than 16-inch
 - 40-ft easement is used for the Master Plan to account for permanent easement requirement and construction requirement

- Force Main Design Criteria
 - Velocities in force mains:
 - *Minimum:* 3.0 ft/sec (desirable)
 - 1.75 ft/sec (absolute)
 - *Maximum:* 10.0 ft/sec
 - Total dynamic head (TDH): maximum of 100 ft

5.1.2 Low Pressure Sewer Design Guidelines

Key criteria of the CCH Low Pressure Sewer (LPS) Design Guidelines are summarized below.

- Pump Station
 - Pump Station Basin
 - The pump station basin shall be watertight and consist of a dry well and wet well section in order to facilitate maintenance duties without confined space entry.
- Appurtenances
 - A gravity operated flapper-type check valve and flapper-type anti-siphon valve, and isolation valve shall be included within the LPS system pump station basin.
- Pump and Motors
 - Type of Pumps:
 - Semi-positive displacement type grinder pump
 - All LPS system pump types are to be the same in a single LPS system
 - Pump and Motor Performance
 - A minimum of 14 gpm against TDH of 0 ft
 - A minimum of 7 gpm against TDH of 185 ft
 - Capable of operating at negative TDH without overloading the motor
 - *Pump motors:* 1 horsepower, motor speed not exceeding 1,750 rotations per minute
- LPS System Lateral
 - Design
 - Minimum diameter: 1-1/4-inch
 - *Velocity:* 2 – 6 ft/sec
 - *Minimum cover:* 12-inch
- LPS Main
 - Design

- *Diameter:* 1-1/4 to 4 inch
- *Velocity:* 2 – 6 ft/sec
- *Minimum cover:* 4 ft
- Velocities shall be determined based on the maximum anticipated number of simultaneous LPS system pump stations in use given in Table 5-1.

Table 5-1: Maximum Number of LPS System Pump Stations Operating Simultaneously

Total Number of LPS System Pump Stations	Assumed Maximum Number of LPS System Pump Stations Operating Simultaneously
1	1
2-3	2
4-9	3
10-18	4
19-30	5
31-50	6
51-80	7
81-113	8
114-146	9
147-179	10
180-212	11
213-245	12
246-278	13
279-311	14
312-344	15

- Appurtenances
 - Air valves shall be placed at high points
 - Flushing stations: in-line flushing stations at intervals of at most 1,000 ft for straight runs of pipe, at bends of 45 degrees or greater, where a main joins another main, and at the upstream terminal end of any main
- Other Design Considerations
 - Retention time
 - Preferred to be less than 8 hours to minimize risk of odor

- System with negative heads
 - Anti-siphon check valves provide for negative head pumping. The use of combination air/vacuum release valves should be considered for systems with negative heads of 25-30 ft or more.

5.1.3 Design Assumptions

A topographic survey for Puakō and South Kohala has not been performed at this planning phase. Based on a site visit, the Puakō and the South Kohala District project area was observed to have rolling terrain in some areas, such as Kawaihae, Waimea, Waikoloa, and in the southern portion of the project area near Waiki'i Ranch. There are also neighborhoods sloping downwards from the road.

The conceptual design for the collection system was largely based on Google Earth elevation data and Global Positioning System Visualizer, which is provided by digital elevation model data using the U.S. Geological Survey's National Elevation Dataset or the National Aeronautics and Space Administration's Shuttle Radar Topography Mission. In general, it is acceptable for digital elevation model data to be used for preliminary studies [12]. This information was used to identify the proposed gravity sewer, low pressure sewer (LPS), and force main (FM) routes. At this level of planning, these locations are not specific and should be updated during the final design.

The noted areas that will likely need pumps to send flow to receiving gravity sewers are identified with "Neighborhood Pump Station" in Section 6.5 figures. During design, topographic survey information would be obtained and could indicate additional areas that may need to pump WW to a branch or trunk sewer. In many situations, neighborhood pump stations could be avoided by installing sewers in easements to allow for gravity flow.

The open cut method is assumed for sewer installation, with a maximum depth of approximately 25 to 30 ft. In areas with rolling terrain, the gravity sewer depth could exceed this 30-ft limit. However, sewer tunneling does not appear to be cost effective, given Puakō and South Kohala's unique subsurface geologic formation that is comprised of lava rock. Therefore, if gravity sewer depths exceed 30 ft due to rolling terrain conditions, "Regional Pump Stations" are proposed to pump WW from upstream lower ground elevations to downstream higher ground elevations, allowing flow by gravity to continue farther downstream.

LPS systems for each clustered package treatment plant are based on key hydraulic design considerations such as TDH and flow velocity for this report. Some additional design considerations are necessary for the final design, including odor control for potential long WW retention time, and the need for combination of air/vacuum relief valves to accommodate topography and existing utility interferences.

The conceptual design concentrations for the various WW treatment systems were based on CCH Design Standards – General Requirements for WW Facilities [13] and other EPA publications [14] [15]. At this level of planning, these estimated

concentrations may vary based on site-specific data and should be verified and updated during the final design.

5.1.3.1 RAW DOMESTIC WASTEWATER

CCH Design Standards – General Requirements for WW Facilities suggest using per capita pollutant loading rates of 0.2 pounds of BOD₅ and TSS per person per day. At the per capita WW flow rate of 105 gallons per person per day, the estimated BOD₅ and TSS concentrations are calculated to be 228 mg/L. These concentrations fall within the range cited in other EPA publications. Estimated raw domestic WW pollutant concentrations for total nitrogen, total phosphorus, and fecal coliform are taken from EPA publications.

5.1.3.2 CESSPOOL

Cesspools are underground excavations that receive domestic WW from uses such as bathrooms, kitchens, and washers. Because cesspools usually have open bottoms and perforated sidewalls, they do not provide any appreciable treatment prior to discharging into the environment. Therefore, estimated pollutant concentrations discharging from cesspools are typically equal to the raw domestic WW.

5.1.3.3 SEPTIC TANK

Septic tanks are typically concrete or plastic watertight vessels that receive raw WW. The septic tank retains settled and floating solid matter and provides treatment using the natural bacteria contained in the tank. The partially treated effluent typically discharges into the ground. The estimated effluent concentrations assume 30 to 50 percent removal of the solid material per EPA publications.

5.1.3.4 SEPTIC TANK AND SOIL ABSORPTION SYSTEM

The most commonly used HDOH-approved IWS uses a soil absorption system (SAS) coupled with a septic tank. A SAS uses soil to further treat septic tank effluent prior to discharging the effluent into the environment. HDOH requires suitable soil to be provided within the SAS to act as an effective filter in the removal of organisms and suspended solids before the effluent reaches any limiting feature such as highly permeable earth formations, bedrock, or the groundwater table. The SAS needs to be located to maximize the vertical separation to any limiting feature. HDOH requires the vertical separation to be three feet (or more) to the seasonal high groundwater level, bedrock, or other limiting feature. The EPA publications indicate that removal efficiencies of 90 percent or greater can be achieved by a SAS with 5 feet of vertical separation to groundwater or bedrock. The estimated effluent concentrations listed in this report assume 60 percent removal of the solid material in the septic tank effluent by a SAS with 3 feet of vertical separation to groundwater or bedrock.

5.1.3.5 SEPTIC TANK/AEROBIC TREATMENT UNIT WITH SOIL ABSORPTION SYSTEM

An ATU unit is an IWS that aerobically digests organic matter over a period of time and allows the clarified effluent to discharge outside the tank into a SAS or other HDOH-approved method. The ATU is typically combined with a septic tank that

pretreats the domestic WW ahead of the ATU. The ATU sludge can be recirculated back to the septic tank to achieve some degree of nitrogen and phosphorus treatment. The clarified ATU effluent then discharges into a SAS or other HDOH-approved method.

5.1.3.6 SECONDARY TREATMENT – NO DISINFECTION

Secondary (biological) treatment is the removal of biodegradable organic matter (in solution or suspension) and suspended solids. Secondary treatment typically removes 85 to 90 percent of the organic material and particulate solids from the raw domestic WW. Secondary treatment can also remove 50 to 60 percent of the nitrogen and phosphorus prior to discharge. Secondary treatment effluent can be discharged according to current regulations (see Chapter 2) or recycled. HDOH classifies R-3 recycled water as WW that is oxidized and meets secondary treatment BOD_5 and TSS limits below 30 mg/L. Since R-3 is not filtered or disinfected, there are more stringent limitations on where it may be recycled or reused.

5.1.3.7 ADVANCED TREATMENT – FILTRATION AND DISINFECTION

Secondary (biological) treatment can be improved by adding filtration and disinfection for removal of pollutants. These improvements provide advanced treatment and typically remove 95 to 98 percent of the organic material and particulate solids from the raw domestic WW. The advanced treatment can also remove 70 to 80 percent of the nitrogen and phosphorus prior to discharge. Advanced treatment effluent can be discharged according to current regulations (see Chapter 2) or recycled. HDOH classifies R-1 recycled water as WW that is oxidized, filtered and disinfected with BOD_5 and TSS concentrations typically 10 mg/L or lower, turbidity below 2 nephelometric turbidity units, and fecal coliform no greater than 23 per 100 mL in more than one sample during any 30-day period (and <2.2 during any 7 day period). Since R-1 is filtered and disinfected, there are less stringent limitations on where it may be recycled or reused.

5.1.3.8 ENHANCED TREATMENT – BEST AVAILABLE TECHNOLOGY LIMITS

The best available technology (BAT) or enhanced treatment processes can remove pollutants to levels beyond conventional secondary treatment systems. Enhanced treatment can be provided for removing pollutants to relatively low levels by adding additional treatment stages, or chemicals to enhance the removal of pollutants. Coagulants such as alum or ferric chloride can be added in combination with filtration to reduce effluent phosphorus concentrations below 0.2 mg/L. Chemicals such as methanol can be added in conjunction with a dual stage nitrogen removal process to reduce effluent nitrogen concentrations below 3 mg/L. The enhanced treatment typically also improves removal of BOD_5 and TSS. With enhanced treatment, 99 percent of the organic material and particulate solids can be removed from the raw domestic WW. When enhanced treatment is provided the water quality typically exceeds all HDOH R-1 recycled water treatment objectives. The enhanced treatment effluent can then be further treated using potable water treatment technologies such as microfiltration + reverse osmosis. In some situations, it could be injected into the aquifer to reduce/mitigate migration of seawater into a water supply aquifer.

Table 5-2 shows estimated effluent parameters and concentrations for the various types of treatment described above.

Table 5-2: Estimated Effluent Parameters and Concentrations for Various Treatment Types

Treatment Type	WW Treatment Cost Factor	Parameter and Estimated Concentration				
		BOD (mg/L)	TSS (mg/L)	TN (mg/L)	TP (mg/L)	Fecal Coliform (#/100mL)
Raw Domestic WW	0X	200–300	200–300	40–60	8–0	>10 ⁶
IWS Effluent						
Cesspool		200–300	200–300	40–60	8–10	>10 ⁶
Septic Tank		<150	<150	<40	<8	<10 ⁶
Septic Tank + SAS	0.25X	<100	<100	<40	<8	<10 ⁵
Septic Tank + ATU + SAS		<50	<50	<30	<6	<10 ⁵
Centralized or Decentralized Treatment Effluent						
Secondary Treatment (R-3)	1X	<30	<30	<20	<4	<10 ⁴
Advanced Treatment (R-1)	1.4X	<10	<10	<10	<2	<10
Enhanced Treatment (BAT)	>2X	<5	<5	<3	<0.2	<2
= Level of Treatment Used For Cost Estimates Alternatives 2 to 5						

BOD Biochemical Oxygen Demand

TP total phosphorus

5.1.4 Conceptual Design

The conceptual designs for the proposed alternatives described in Section 6 are based on the design criteria and assumptions described in this chapter. The preliminary pipe network and WWTP and WWPS locations are presented in Section 6.5.

6.0 ALTERNATIVES

Currently, there are no public WW collection and treatment systems for Puakō and South Kohala. WW generated in individual lots are continuously treated and disposed of by OSDS of different classes, or by private collection and treatment systems. However, by 2050, all Class IV OSDS (i.e., cesspools) are required by HRS 342D-72 to be converted, upgraded, or decommissioned.

Various alternatives were developed based on combinations of treatment, flow amounts, collection, and disposal. The alternative components are listed below and will be described in Section 6.1 for collection, Section 6.2 for treatment, Section 6.3 for disposal or reuse, and Section 6.4 for projected 2052 design average flows.

- **Collection System**
 - Gravity sewers in existing roads
 - LPSs
 - Cross-country gravity sewers in new easements
- **Treatment System**
 - IWS
 - Decentralized treatment
 - Centralized treatment
- **Disposal System**
 - Onsite (as part of IWS or decentralized system)
 - Disposal (land application) or reuse
- **Projected 2052 Design Average Flow**
 - Urban sewerizing
 - Full flow

The alternatives are listed below, summarized in Table 6-1, and described in Section 6.5.

- *Alternative 1: IWS or Decentralized Treatment*
- *Alternative 2: Urban Sewering Flow (1.41 mgd) to Three COH WWTPs (West Waimea, Waimea Town, and East Waimea, 0.93 mgd) or Existing Private WWTPs (0.48 total, 0.35 mgd current and 0.13 future)*
- *Alternative 3: Full Flow (3.26 mgd) to Two COH WWTPs (West Waimea and Waiki'i, 1.24 mgd) or Existing Private WWTPs (2.02 mgd total, 0.35 mgd current, 0.69 mgd future with COH collection system, and 0.98 by private sewerizing)*

- *Alternative 4:* Urban Sewering Flow (1.06 mgd) to Five COH WWTPs (East Waikoloa, Makai, West Waimea, Waimea Town, and East Waimea)
- *Alternative 5:* Full Flow (3.26 mgd) to Four COH WWTPs (West Waimea, Makai, West Waikoloa, and Waiki'i), 1.93 mgd COH WWTP flow, 1.33 mgd private WWTP flow (0.35 mgd current, 1.33 mgd by private sewerage)

They are mostly differentiated by the treatment system, either decentralized or centralized. Alternative 1 uses IWS and decentralized treatment, while Alternatives 2 through 5 are based on centralized treatment and collection systems where practical.

Alternatives 2 and 3 are based on sending flows to both new COH WWTPs and existing private WWTPs. Alternatives 4 and 5 assume sending flows only to new COH WWTPs.

Additionally, urban seweraging flows are used in Alternatives 2 and 4, while full flow seweraging is assumed for Alternatives 3 and 5.

For each of the centralized alternatives, there are also three different methods of WW collection (see list above).

Table 6-1: Summary of Alternative Descriptions

WW Treatment		Flow Scenario						Collection System				Disposal	
Alternative Code	Alternative Description	Decentralized Treatment	Centralized Treatment	IWS in Unsewered Areas	IWS in Sewered Areas	Urban Sewering	Full Flow Sewering ^c	Alternative Sewer Options ^{a,b}	Gravity Sewer in Existing Roadway	Regional PS	Neighborhood PS	LPS	Cross-Country Gravity Sewer
1A	All IWS or Decentralized Treatment	✓	---	✓	✓	---	---	---	---	---	---	---	---
1B	Both Decentralized Treatment and LPS (1.3 mgd decentralized plant capacity)	✓	---	---	---	1.3 mgd 1.11.06 m(')(Waiki'i)		LPS	---	---	---	✓	---
2A	3 COH WWTPs and Existing Private	---	✓	✓	---	1.41 mgd	---	Gravity Sewers	✓	✓	✓	---	---
2B	WWTPs – Urban Sewering (COH WWTP Flow: 0.93 mgd, Private WWTP Flow: 0.48 mgd, Total: 1.41 mgd)	---	✓	✓	---			Gravity & LPS	✓	✓	---	✓	---
2C		---	✓	✓	---			Cross Country	✓	✓	✓	---	✓
3A	2 COH WWTPs and Existing Private	---	✓	---	---	---	3.26 mgd	Gravity Sewers	✓	✓	✓	---	---
3B	WWTPs – Full Flow Sewering (COH WWTP Flow: 1.24 mgd, Private WWTP Flow: 2.02 mgd, Total 3.26 mgd)	---	✓	---	---			Gravity & LPS	✓	✓	---	✓	---
3C		---	✓	---	---			Cross Country	✓	✓	✓	---	✓
4A	5 COH WWTPs – Urban Sewering COH	---	✓	✓	---	1.41 mgd	---	Gravity Sewers	✓	✓	✓	---	---
4B	WWTP Flow: 1.06 mgd, Private WWTP Flow: 0.35 mgd, Total: 1.41 mgd)	---	✓	✓	---			Gravity & LPS	✓	✓	---	✓	---
4C		---	✓	✓	---			Cross Country	✓	✓	✓	---	✓
5A	4 COH WWTPs – Full Flow Sewering (COH	---	✓	---	---	---	3.26 mgd	Gravity Sewers	✓	✓	✓	---	---
5B	WWTP Flow: 1.93 mgd, Private WWTP Flow: 1.33 mgd, Total 3.26 mgd)	---	✓	---	---			Gravity & LPS	✓	✓	---	✓	---
5C		---	✓	---	---			Cross Country	✓	✓	✓	---	✓

PS = pump station

^a Intent of the Gravity & LPS option is to use LPS systems to replace neighborhood PSs and associated branch sewers and force mains.^b Intent of the Cross-Country Gravity Sewer option is to install gravity sewers in easements to replace a considerable amount of neighborhood PSs and associated force mains.^c Total projected flow within project area is 3.3 mgd but full flow seweraging does not include those future development areas located within private sewer service area.

Water Reuse and Land Application

6.1 COLLECTION SYSTEM

For the alternatives using decentralized treatment, use of LPS was evaluated. For the alternatives involving centralized systems, three different collection system methods were evaluated: conventional gravity sewers in existing roads, gravity sewers in combination with LPS in certain areas, and gravity sewers in new rights-of-way (easements) in certain areas.

6.1.1 All Conventional Gravity Sewers in Existing Roads

Conventional gravity WW collection systems are the most popular method to collect and convey WW. Pipes are installed on a slope, allowing WW to flow by gravity from a house to the treatment facility or pump station.

Typically, 4-inch and 6-inch on-lot laterals collect WW from each lot and connect to a branch sewer in the road. The largest sewer size that allows for lateral connection is 16-inch based on CCH WW Design Standards (there are currently no COH WW design standards). Manholes will be installed at all changes in pipe grade, size, or alignment, and at all points where sewer mains intersect for maintenance purposes. The branch sewer mains flow to a larger trunk sewer or interceptor sewer that will transport WW to a central WWTP.

Gravity sewers will be installed by open cut method with a maximum depth of approximately 25 to 30 ft. At this depth in the project area, the majority of trench excavation work will be in bedrock.

Where the rolling terrain does not allow for gravity sewer installation, “regional WWPSs” are proposed (Section 6.1.4). If some streets or a small neighborhood are located at lower elevations that prevent WW flow by gravity to the trunk sewer, “neighborhood WWPSs” could be used to pump WW from the neighborhood to the trunk sewer (Section 6.1.4).

6.1.2 Both Gravity Sewers and Low Pressure Sewers

If using conventional gravity sewers, neighborhood WWPSs are proposed for small neighborhoods or selected streets that are located at lower elevations that prevent WW flow by gravity to the trunk sewer. A potential solution to address these circumstances is the use of LPS.

LPS use small diameter force main pipelines, usually constructed of plastic or polyethylene material, which are shallowly buried, and laid in a manner following the surface terrain. LPS diameters range from 1.5 inch to 4 inches, where the smaller diameter lines join at main junctures. The piping network can extend for many thousands of feet at a total dynamic pumping head of up to 185 feet.

Each home uses a small pump, either a septic tank effluent pump (STEP) or a grinder pump, in an underground vault to discharge sewage to the main line. Existing septic tanks that are in good condition can be converted to connect to LPS by adding a STEP. If existing septic tanks are not in good condition or if the home does not have an existing septic tank, a new septic tank with an effluent pump could be an option. One

benefit of the STEP system is to convey only liquid WW to LPS pipes and the receiving WWTP. Solids will remain in the septic tank, to be pumped out when needed. Another benefit of the STEP system is that the LPS system using STEP might provide a higher hydraulic capacity, since flow velocities in LPS pipes could be less than the required scouring velocity of 2 ft/s for solids containing WW.

Another type of a LPS system pump is the grinder pump, which will reduce all forms of sanitary waste to a slurry and pump it to the LPS pipes and WWTP. In this option, typical maintenance is required for the pumps and pump basins, but no septic tank and solids will need to be maintained by the homeowner. The grinder pump could be a centrifugal type or semi-positive displacement, progressing cavity type. The progressing cavity grinder pump would provide a more predictable flow over a wide range of typical system pressures. Due to rolling terrain in the project area, the LPS system might operate under negative TDH, and combination air/vacuum release valves would be needed. This evaluation does not differentiate between STEP system or grinder pumps as they have comparable costs at this level of detail. Where LPS systems are recommended for implementation, system details will be evaluated as part of the design process.

6.1.3 Cross-Country Sewers (in New Easements)

To reduce the number of WWPSs, especially neighborhood WWPSs, gravity sewers could be installed along easements. This could be in a new right-of-way behind or next to a row or set of houses located downhill from a trunk sewer. The gravity sewer in the easement could join another gravity sewer that flows to a trunk sewer, or it could discharge to a single WWPS. This would involve coordination with landowners to approve COH to establish easements for installing and maintaining the associated sewer lines. However, adequacy of provisions for all weather access to manholes for maintenance and sewer lines for repair, rehabilitation or replacement should be considered during design.

6.1.4 Neighborhood and Regional WWPSs

If a smaller neighborhood is located downhill from the trunk sewer, then neighborhood WWPSs could be used to pump the WW uphill to the trunk sewer. Neighborhood WWPSs would be submersible with outdoor electrical controls in weatherproof enclosures, 2 constant speed pumps (1 duty + 1 standby), small self-enclosed standby generator, and odor control.

If a larger area was subject to undulating terrain, a regional WWPS could be used. Regional WWPSs are wetwell/drywell configuration with electrical/control building with indoor standby generator, 3 variable speed pumps (2 duty + 1 standby) and odor control.

All WWPS would have security fencing and perimeter landscaping to match the surrounding properties.

6.2 TREATMENT SYSTEM

The different options for WW treatment consist of IWS, decentralized, and centralized systems.

6.2.1 IWS

IWS are regulated by HAR 11-62 Subchapter 3. Requirements include that the total WW flow for an IWS shall not exceed 1,000 gallons and each IWS should have at least 10,000 feet of land area. The following sections describe the IWS treatment and disposal systems that are listed in HAR.

6.2.1.1 SEPTIC TANK AND LEACH FIELD

Septic tanks and leach fields are now fairly common in Hawai‘i. A septic tank is a holding tank manufactured of polyethylene plastic, fiberglass reinforced plastic, or pre-cast reinforced concrete. Its primary function is to provide adequate holding time for the separation of suspended solids and floatable matter from the WW. Diagram 6-1 shows a flow schematic of a septic tank and leach field system [16] [17].

WW flows through the septic tank by gravity. The tank employs no mechanical parts. Some anaerobic bacterial decomposition of the settled sludge occurs in the tank, converting organic wastes to gases over time and reducing the solids volume. Septic tanks may be designed with one or two compartments. In either design, the separated liquid is drawn off in the zone between the floating scum and the settled sludge layers.

Biological treatment of the clarified effluent from the septic tank principally occurs during disposal in the leach field. Nutrients in the WW promote the formation of a biological growth mat (biomat) which accounts for most of the nitrogen reduction within the leach field.

Maintenance checks must be made regularly to determine when the floatables and sludge in the septic tanks need to be pumped out to prevent excessive buildup. Such buildup causes scum and sludge to escape to the leach field and plug the pipe openings leading to the leach field.

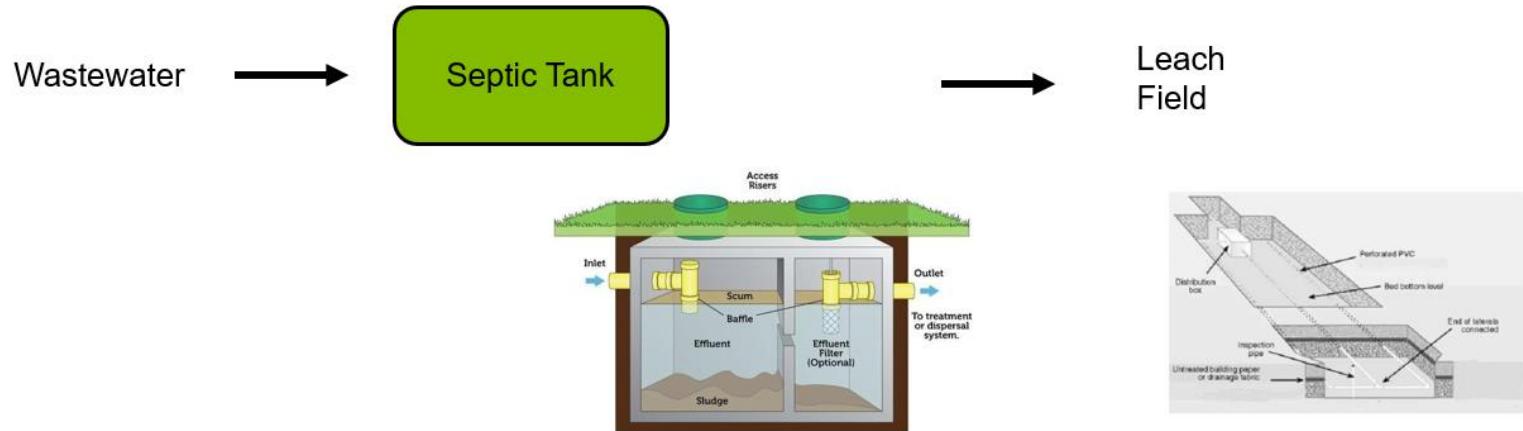


Diagram 6-1: Septic Tank and Leach Field

Source: EPA [16] and University of Missouri [17]

6.2.1.2 AEROBIC TREATMENT UNIT AND LEACH FIELD

ATUs come in a variety of forms. The basic design consists of a single tank that is separated into chambers to permit entering WW to be treated in separate stages (Diagram 6-2 [18]). The initial chamber is a settling compartment for the removal of heavy solids and floatable matter. The WW then flows to a second chamber, where it undergoes aerobic biological decomposition, typically with air pumped in from an external source. ATUs generally use a flow-through design with no moving parts, except for an external air pump to supply oxygen to a submerged aerator to sustain biological treatment.

Packaged ATUs achieve a high degree of WW treatment and can be customized with add-on treatment chambers for enhanced nutrient removal or for filtration of particles. Additionally, after biological treatment, calcium hypochlorite tablets may be stacked in a partially submerged capsule to impart chlorine disinfection of the effluent prior to disposal.

An ATU operates effectively as long as the tank is aerated to promote biological degradation of organic matter. Buildup of biological solids occurs at a slower pace than in septic systems due to sustained decay of bacterial matter itself in an aerobic environment. Sludge pumping schedules are typically longer than two years.

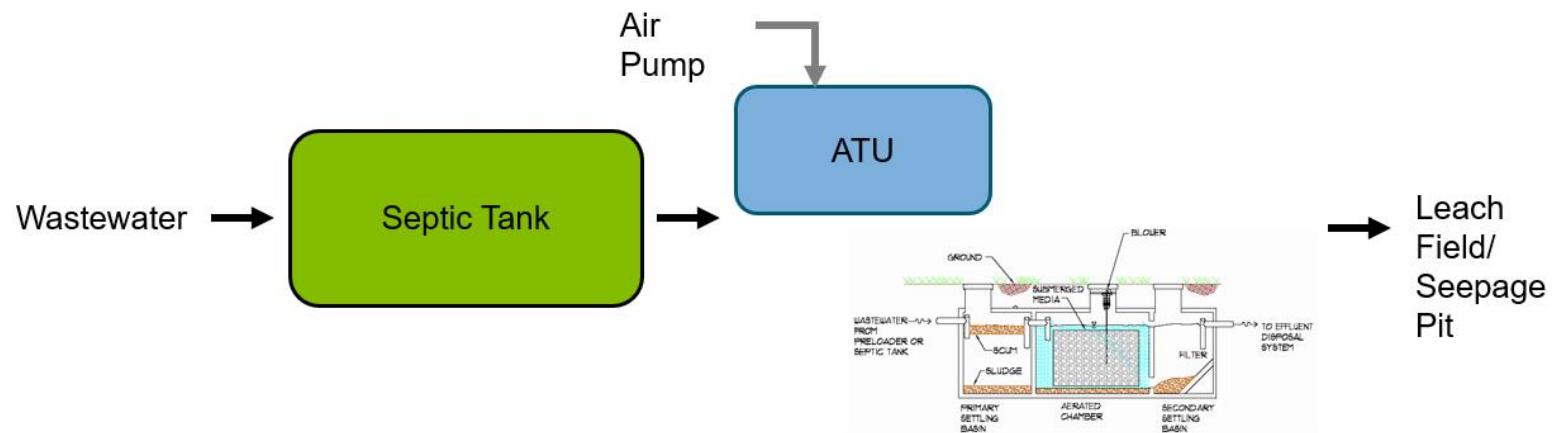


Diagram 6-2: ATU System

Source: EPA [16]

6.2.1.3 SUBSURFACE AND RECIRCULATING SAND FILTERS

Subsurface and recirculating sand filters are listed in the HAR to be reviewed by HDOH on a case-by-case basis. A recirculating filter is a treatment technology in which septic tank effluent percolates through a bed of sand or textile material, undergoing further biological treatment. Carbon oxidation, nitrification, and denitrification can all occur. A portion of the percolated water is pumped back to the pump chamber or the treatment process, and another portion passes on to a dispersal system, such as drip irrigation or a seepage pit. The nitrate in the recirculated water undergoes denitrification under anaerobic conditions. See Diagram 6-3 for an illustration of recirculating filters.

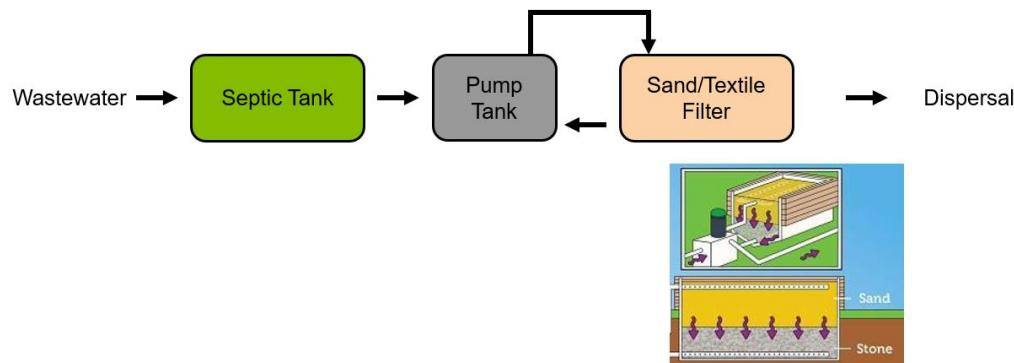


Diagram 6-3: Recirculating Sand Filter

Source: EPA [16]

6.2.1.4 ALTERNATIVE TOILETS AND INNOVATIVE TREATMENT AND DISPOSAL OPTIONS

Alternative toilets including composting toilets and incinerator toilets were developed for use in locations where water or electricity is scarce. In Hawai‘i, household gray water (not from toilets and kitchen sinks) must have an overflow pathway to a WW treatment and disposal system in accordance with HDOH gray water reuse guidelines [19]. Therefore, if an alternate toilet is installed, it must be in combination with a WW and disposal treatment unit. Diagram 6-4 shows a flow schematic of the components that must be installed for an alternative toilet system. The HAR states that HDOH shall review composting toilets and incinerator toilets. For other emerging technologies in the research phase or undergoing pilot testing, such as nano membrane toilets (“Gates toilet”), they are also reviewed and approved by the HDOH director on a case-by-case basis.

HAR 11-62-35 states that innovative WW systems may be approved if:

1. The innovative design provides or may benefit the people of the State.

2. The owner of the innovative system shall agree that for up to twelve months after the initiation of the operation of the creative design, operational data shall be gathered and submitted to the director.
3. The owner shall submit a written agreement stating that if the director finds the operation of the innovative system unsatisfactory at any time, the owner shall promptly repair or modify the system or replace it with another acceptable system.

In general, HDOH will base the approval on appropriate testing standards by the National Sanitation Foundation (NSF). NSF 40 and NSF 245 are the most accepted standards for IWS. HDOH also recognizes testing done by the University of Hawai'i at Mānoa when using NSF protocols for certification of acceptance in Hawai'i.

However, the NSF only certifies commercial products by specific manufacturers. The WW system must have a standardized pre-engineered product commercially available for purchase by a company that can legally do business. NSF does not certify technologies that can't be commercially sold. Rather, these technologies would need to have design criteria in HAR 11-62 to be used in Hawai'i or continue to be evaluated according to HAR 11-62-35.

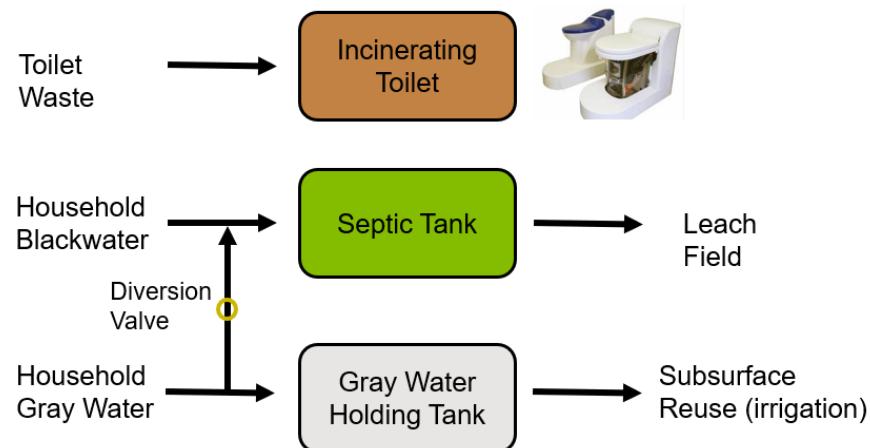


Diagram 6-4: Alternative Toilet System

Source: Incinerating Toilets, Inc. [20]

6.2.2 Decentralized Treatment System

Per HAR regulation, if total development of an area exceeds 50 single-family dwelling units or if flow exceeds 15,000 gpd for buildings other than dwellings, an IWS may not be used. In these situations, decentralized cluster packaged treatment units would be an option.

Available cluster WW treatment technologies include extended aeration AS, MBRs, attached growth bioreactors, MBBRs, and other package treatment plants. These treatment technologies are available in pre-engineered, self-contained treatment units of various specific treatment capacities. Installation generally would involve

pouring of a concrete pad for the system, bringing in power supply, influent and effluent piping and disposal system, and possibly seeding with a source of bacteria. The system would then be ready to start operations.

Available effluent disposal methods include leach fields for smaller flows or other methods (see Section 6.3.1) for larger flows. For solids handling at decentralized cluster systems, it may be more economical for biosolids to be hauled to an existing larger WWTP for further processing.

6.2.2.1 EXTENDED AERATION ACTIVATED SLUDGE

This is a variation of the conventional activated sludge (CAS) process, but uses longer aeration time and longer sludge age to provide removal of biodegradable organic wastes under aerobic conditions without primary settling. The long aeration time means a larger aeration tank than CAS. The process has a high Biochemical Oxygen Demand (BOD) removal efficiency and generates less sludge than CAS.

6.2.2.2 SEQUENCING BATCH REACTOR

SBR systems are designed for batch treatment of WW. An SBR is typically used for sewer systems that have a wide range of inflow and/or organic loadings. The SBR system requires limited operator attention. The SBR systems generally produce a stable, high quality effluent. SBR plants can be designed to be mechanically simple, flexible and easy to operable. The biochemistry in the SBR process is similar to the extended aeration AS process. Aeration, un-aerated mixing, settling, decanting effluent, and solids wasting are all accomplished within a single pair of tanks. While one tank is filling with WW and running through the un-aerated mixing, and aeration cycles the other tank is idle with no flow entering it while the solids settle, effluent is decanted, and the waste sludge is removed. At the end of the cycle the tanks alternate. After the waste sludge pumping cycle is completed, the influent valves switch to begin filling the tank that had been decanted, and the other tank that was in the react mode would be put into “idle” mode allowing the solids settle, the effluent to be decanted, and the waste sludge to be removed.

6.2.2.3 MEMBRANE BIOREACTOR

MBR is an AS process that uses membrane filtration instead of a secondary clarifier to separate mixed liquor from treated effluent. Fine screening is an essential pre-treatment step to protect the membranes from damaging debris and particles. Fine screens extend the membrane life, reduce operating costs, and guarantee a higher sludge quality. MBR systems nearly always have an anoxic tank and internal pumping of mixed liquor to facilitate nitrogen removal via denitrification. An MBR is a recommended process for water reuse applications, since the membranes provide a barrier to many pathogens. Better effluent quality does come with higher capital, operation, and energy costs, which may present hurdles to implementing MBR systems for cluster systems.

6.2.2.4 AERATED LAGOONS

Aerated lagoons can be used to treat municipal and industrial wastewaters that are low (100 to 200 mg/L BOD₅ and TSS concentration) to medium (200 to 300 mg/L BOD₅ and TSS concentration) strength. Aerated lagoons require a relatively large amount of land compared to other alternatives. O&M requirements are typically less than those required for extended aeration AS, SBR, or MBR technologies considered for this report. Aerated lagoons typically include lining systems, inlet and outlet structures, hydraulic controls, aeration equipment, and aeration system anchorage/restraint cables. For secondary treatment applications effluent filters are suggested for effluent polishing to remove suspended solids/algae from the effluent as needed to meet HDOH effluent limits for BOD and TSS (typically 30 mg/L).

6.2.2.5 ATTACHED GROWTH BIOREACTORS

These take advantage of biological treatment by promoting biological mass to grow as a biofilm on the surface of a media or disk, as opposed to suspended flocculated biomass in an AS process. The media should have a large surface area to volume ratio to support microbial growth and form biofilms. Some versions of the process eliminate secondary clarifiers, decreasing associated cost and space requirements.

6.2.2.6 MOVING BED BIOREACTOR

This process is a combination of AS (suspended growth) and attached growth processes. It uses plastic floating media within an aeration basin to carry attached growth on biofilms. Pre-treated (settled) influent enters the aeration basin for treatment and may enter a second basin for further treatment (full nitrification). Fine-bubble aeration with high oxygen transfer efficiency is commonly used for mixing/suspension. In order to keep the carrier media in the tank, there is a strainer attached to the aeration basin effluent pipe. The aeration effluent, which contains sloughed biofilm and suspended solids, is conveyed either to a secondary settling tank or, more commonly, to a dissolved air flotation separator.

6.2.3 Centralized Treatment System

In a centralized treatment system, WW is collected by a network of sewer lines that discharge to a WWTP. The WWTP would consist of facilities and equipment for pretreatment (e.g., screens, grit chambers, and/or equalization basin), primary treatment (e.g., primary clarifiers), biological (secondary) treatment (e.g., AS, SBR, MBR, attached growth process such as trickling filters, aerated lagoon, moving bed reactor etc.), and tertiary treatment (e.g., filtration, disinfection). Innovative and sustainable treatment options may also be available, such as algae-based WW treatment to produce algae for later use as fertilizer or biofuel.

The treated WW would continue to disposal (see Section 6.3.1 on disposal options). Solids would be processed (e.g., dewatering, thickening, and stabilization) (Section 6.2.3.1) and sent to disposal or reuse (Section 6.3.2). Odor control would be provided at all centralized WWTPs (see Section 4.10.1) (e.g., chemical addition, air treatment such as activated carbon, chemical scrubbers, biofilters, biotrickling filters). A typical WWTP conceptual site layout is shown on Diagram 6-5.

6.2.3.1 SOLIDS HANDLING

Dewatering and Thickening

Dewatering and thickening is the process by which biosolids are condensed to produce a concentrated solids product and a relatively solids-free supernatant. Thickening of WW solids reduces the volume of residuals, improves operation, and reduces costs for subsequent storage, processing, transfer, end use or disposal. Thickening is often used before anaerobic digestion or alkaline stabilization to reduce capital costs of stabilization equipment. There are several different methods for thickening biosolids, including belt filter press, centrifugal thickening, gravity belt thickening, and heat drying.

Belt Filter Press: A belt filter dewateres by applying pressure to the biosolids to squeeze out the water. Biosolids sandwiched between two tensioned porous belts are passed over and under rollers of various diameters. Increased pressure is created as the belt passes over rollers which decrease in diameter. Belt filter presses can be used to dewater most biosolids generated at municipal WWTPs and are a common type of mechanical dewatering equipment. Using mechanical equipment to dewater solids may not be the most cost-effective alternative for WWTPs operating at less than about 4 mgd. In these situations, it may be less expensive to haul liquids to another facility for dewatering and processing or disposal rather than installing dewatering equipment [21].

Centrifuge Thickening and Dewatering: This is a high speed process that uses the force from rapid rotation of a cylindrical bowl to separate WW solids from liquid. Thickening before digestion or dewatering reduces the tankage needed for digestion and storage by removing water. Centrifugal thickening can be cost effective for small plants. WWTPs that must landfill WW solids may benefit from the use of a centrifuge [22].

Gravity Thickening: This uses the natural tendency of higher-density solids to settle out of liquid to concentrate the solids. Gravity thickeners consist of a circular tank (usually with a conical bottom) that is fitted with collectors or scrapers at the bottom. Primary and/or secondary solids are fed into the tank through a center well, which releases the solids at a low velocity near the surface of the tank. The solids settle to the bottom of the tank by gravity, and the scrapers slowly move the settled, thickened solids to a discharge pipe at the bottom of the tank. A v-notch weir located at the top of the tank allows the supernatant to return to a clarifier [23].

Heat Drying: In this process, heat from direct or indirect dryers is used to evaporate water from WW solids. A major advantage of heat drying versus other biosolids improvement methods is that heat drying is ideal for producing Class A biosolids (see Section 6.3.2 for the different classes of biosolids). Heat drying does require a substantial capital investment and a large amount of energy [24].

Stabilization

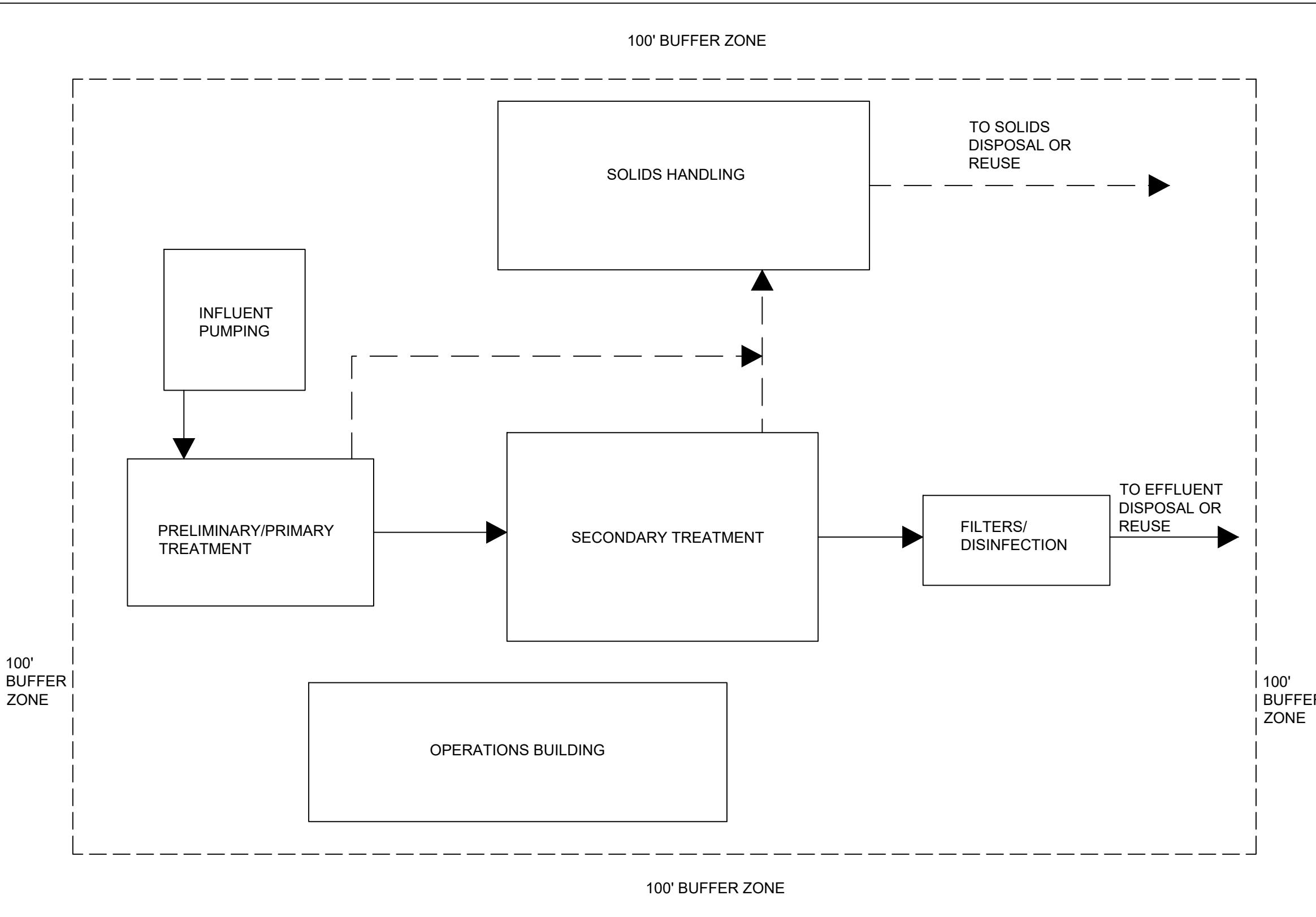
WW solids need to be processed or stabilized before they can be beneficially used. Stabilization helps to minimize the potential for odor generation, destroys pathogens (disease causing organisms), and reduces the material's vector attraction potential. One method of stabilization is to add alkaline materials to raise the pH level to make conditions unfavorable for the growth of organisms (such as pathogens).

Alkaline stabilization can achieve the minimum requirements for both Class A and Class B biosolids (see Section 6.3.2 for the different classes of biosolids) with respect to pathogens, depending on the amount of alkaline material added and other processes employed. Generally, alkaline stabilization meets the Class B requirements when the pH of the mixture of WW solids and alkaline material is at 12 or above after 2 hours of contact. Class A requirements can be achieved when the pH of the mixture is maintained at or above 12 for at least 72 hours, with a temperature of 52°C maintained for at least 12 hours during this time.

Where lime or another alkaline additive (for example, recycled kiln dust), is relatively inexpensive, alkaline stabilization is often the most cost-effective process for WW solids stabilization. Alkaline stabilization is also practical at small WWTPs that store WW solids for later transportation to larger facilities for further treatment [25].

Anaerobic Digestion

Anaerobic digestion is a naturally occurring biological process in which large numbers of anaerobic bacteria convert organic matter into methane and carbon dioxide (a mixture called biogas) in the absence of air. It is a widely used biological process for treating WW solids. This process stabilizes the organic matter in WW solids, reduces pathogens and odors, and reduces the total solids/sludge quantity by converting part of the volatile solids fraction to biogas. Anaerobic digestion results in a product that contains stabilized solids, as well as some available forms of nutrients such as ammonia-nitrogen [26].



Notes:
Illustration not to scale.
See table to the right for estimated site area, including buffer zone.

Description	Approximate Size Area (acres)
COH East Waimea WWTP (0.52 mgd)	5
COH Waimea Town WWTP (0.5 mgd)	5
COH West Waimea WWTP (1.4 mgd)	10
COH Makai WWTP (0.39 mgd and 0.59 mgd)	5
COH West Waikoloa WWTP (0.5 mgd)	5

Diagram 6-5
Conceptual Site Layout of WWTP

6.3 DISPOSAL OR REUSE OPTIONS

In the IWS and decentralized system alternative, disposal would occur onsite (see Section 6.2.1).

After WW treatment in the centralized system alternatives, the effluent and solids would have to be disposed of or reused appropriately. The subsections below describe these different disposal or reuse options.

6.3.1 Effluent Disposal or Reuse

For a WWTP, available effluent disposal options include land application, water reuse, underground injection well, and surface water discharge. A meeting with HDOH CWB was conducted to discuss what disposal options are available for the Puakō and South Kohala district. Primary methods that will be considered for effluent disposal are:

- Land Application
- Recycled Water

Disposal by injection wells/groundwater discharge is also possible and discussed below.

6.3.1.1 LAND APPLICATION

Land application refers to an effluent disposal system in which treated WW is applied to land using infiltration basins. Infiltration is typically a shallow (about 6 feet deep) earthen depression with an inlet pipe and berm around its perimeter. Water disposal occurs by seepage, evaporation, and plant transpiration. During seepage, effluent undergoes further treatment as it percolates through the soil matrix to the groundwater. WW that is applied to land generally must have passed through both primary and secondary treatment at a minimum.

There are other types of land application for effluent disposal, such as slow-rate land application. This can provide additional treatment in removing nutrients as WW effluent percolates through plant root zones and soil. However, land area requirements for slow-rate land application are significantly greater than infiltration basins.

For regulatory requirements on effluent limitations, see Section 2.2.2.

6.3.1.2 RECYCLED WATER

There are three types of recycled water regulated by the HAR and HDOH: R-1, R-2, and R-3. For regulatory requirements on effluent limitations, see Section 2.2.1. It is important to keep in mind that water reuse is not considered a disposal method; therefore, a backup disposal system, such as land disposal, is required. Below is a list of suitable uses for recycled water that are potentially applicable to Puakō and South Kohala:

- R-1 Water (oxidized, filtered, and disinfected effluent) is applicable to all landscape and agricultural irrigation; drinking water for livestock and poultry with the exception of dairy animals that produce milk for human consumption; supply to restricted recreational impoundments; dust control; washing aggregate and concrete manufacturing; and industrial processes and industrial cooling.
- R-2 Water (oxidized and disinfected effluent) is applicable to subsurface drip irrigation for golf course and landscaping, and surface drip or subsurface drip irrigation for non-edible vegetation in areas with limited public access.
- R-3 Water (oxidized WW effluent) is applicable to drip or subsurface drip irrigation for non-edible vegetation in areas with limited public access.

According to HDOH Reuse Guidelines, recycled water shall only be applied (e.g., sprayed) in approved areas. Three categories of areas are designated by the Reuse Guidelines:

- *Unrestricted Areas*: Recycled water application is unconditionally allowed.
- *Conditional Areas*: Recycled water application is currently allowed, but may, in the future, be subject to monitoring requirements or restrictions.
- *Restricted Areas*: Recycled water application is prohibited.
- Areas on Hawai‘i designated for unrestricted, conditional and restricted use of recycled water are shown in Figure 6-1 [27].

The Puakō and South Kohala Project Area includes areas regulated as either conditional or unrestricted for recycled use. Currently Parker Ranch WWTP is producing R3 effluent water for pasture irrigation and South Kohala WW Reclamation Facilities and Waikoloa Resort WRF are producing R1 effluent for golf course irrigation. The locations that are conditional for recycled use are forest reserves. Since these are protected natural resource areas with restrictions on access and activities, recycled water use would not be applicable. Elsewhere in the project area, many locations allow unrestricted recycled water use.

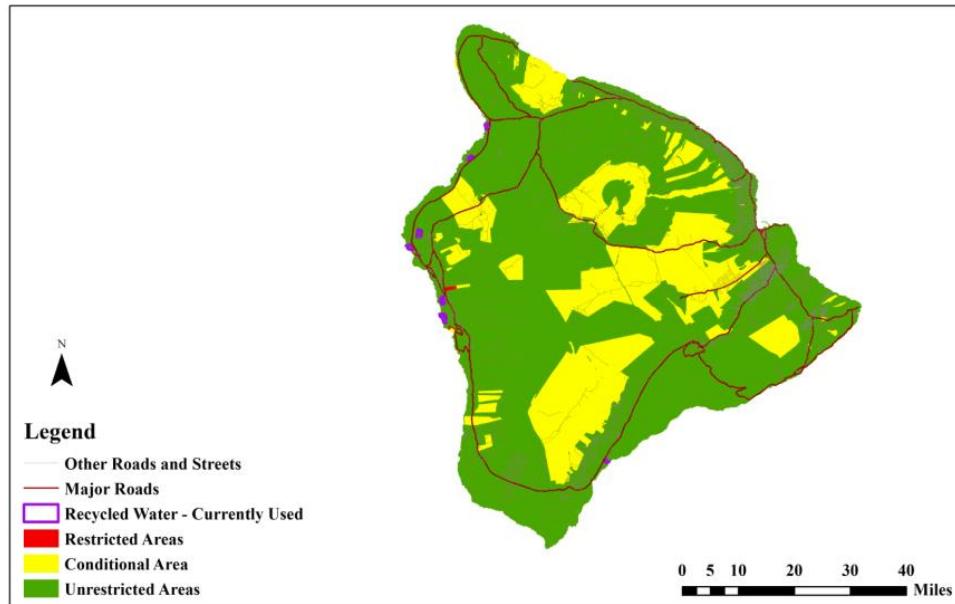


Figure 6-1: Recycled Water Use on the Island of Hawai'i

Source: HDOH [27]

When considering water reuse for agricultural or landscaping irrigation, a soil water balance should be evaluated to prevent surface runoff from the applied recycled water. The fate of water that is added to the ground, either by rainfall or irrigation, is determined in a shallow layer of soil at the surface. The rainfall or irrigation water will either evaporate to the atmosphere through direct evaporation; be absorbed by plants and later transported to the atmosphere through transpiration; or percolate through soil and recharge the underlying groundwater aquifer. The remaining water will impact soil moisture or surface flow through runoff. The soil water balance can be summarized by the following equation:

- Rainfall + Irrigation = Transpiration + Recharge + Change in Soil Moisture + Runoff
- Mean annual rainfall and evapotranspiration for the island of Hawai'i are shown in Figure 6-2 and Figure 6-3.

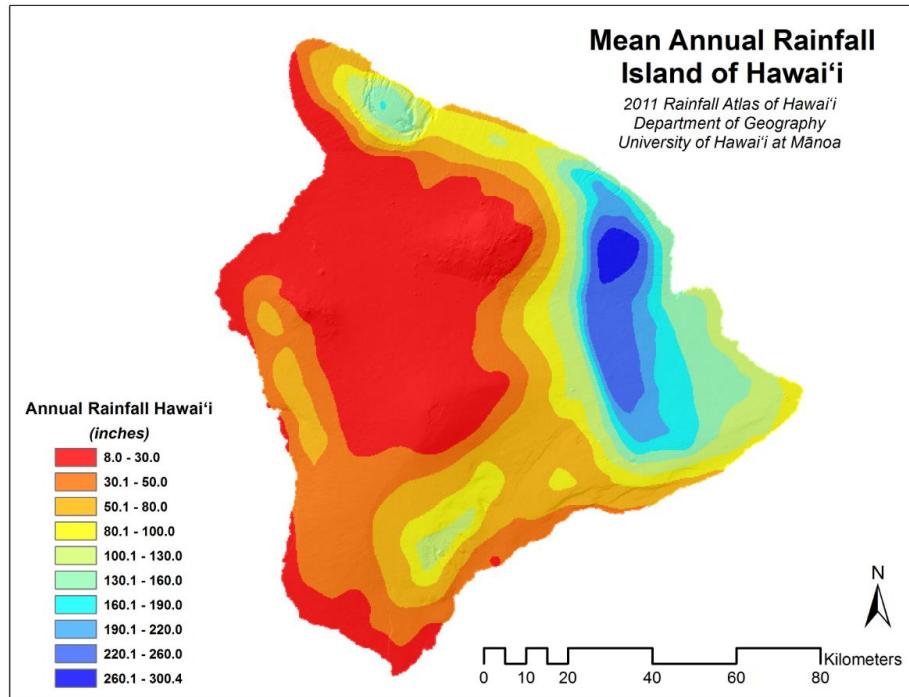


Figure 6-2: Mean Annual Rainfall for Island of Hawai'i

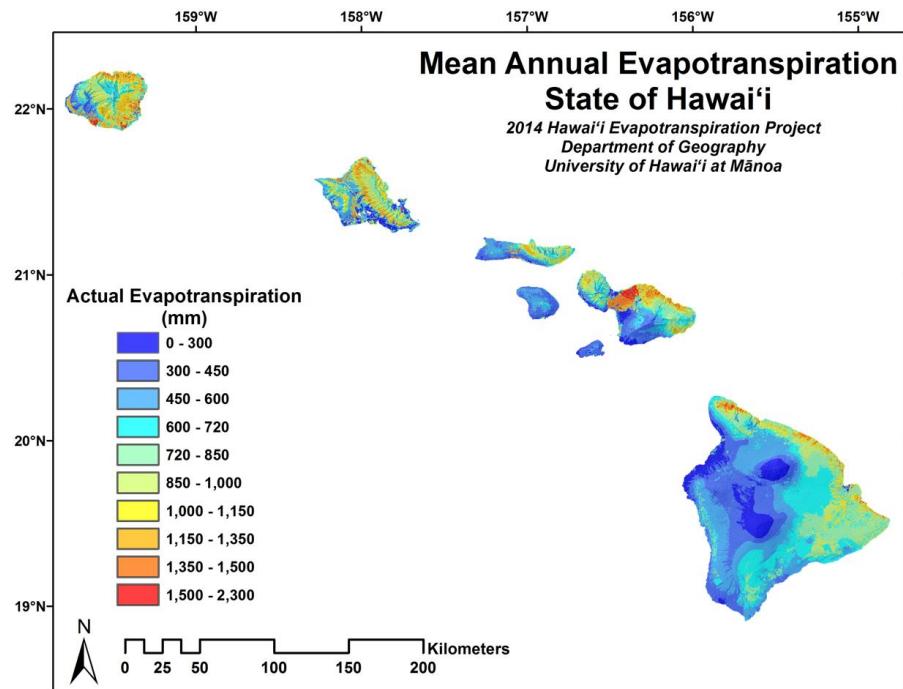
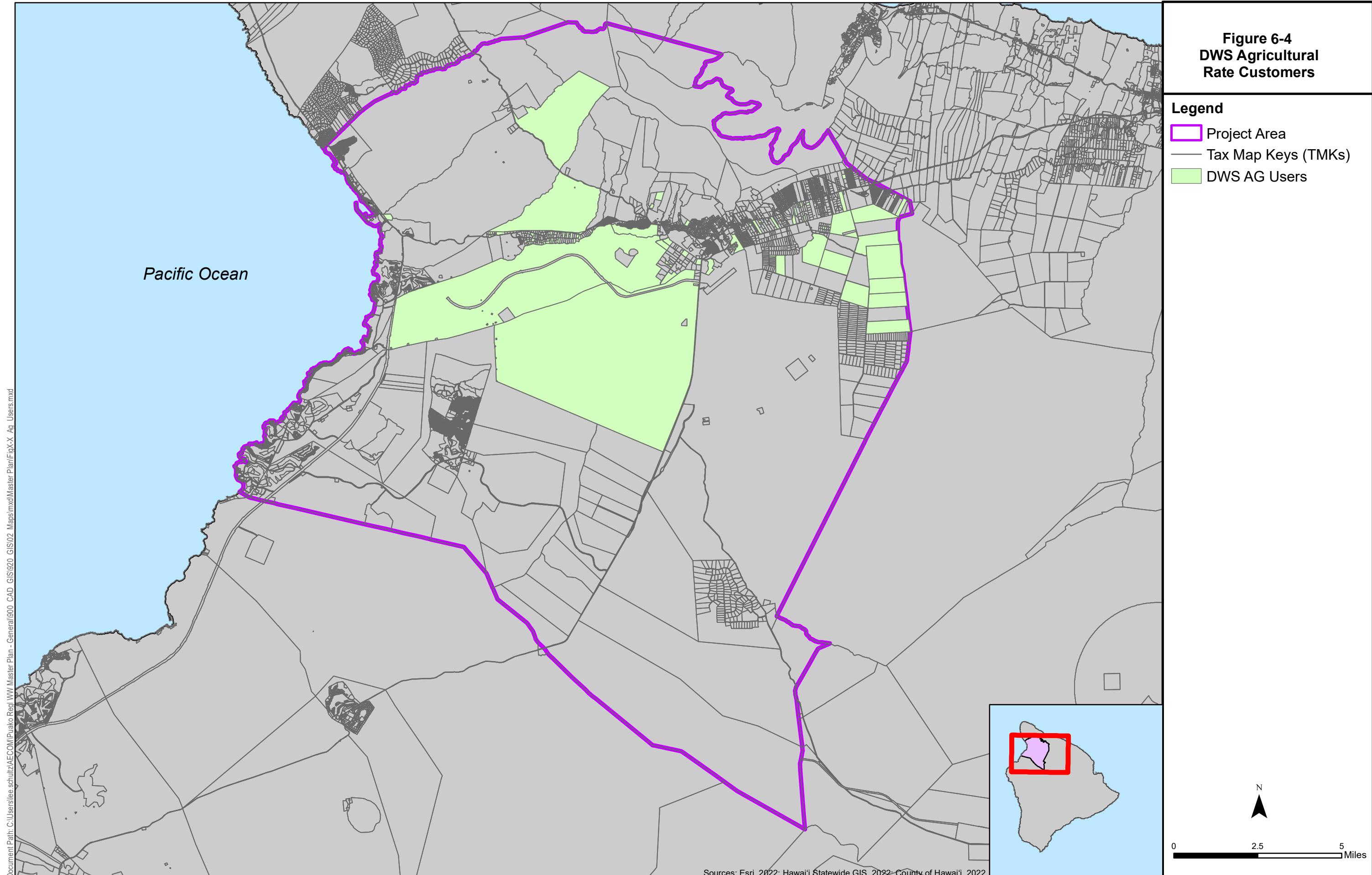


Figure 6-3: Mean Annual Evapotranspiration for State of Hawai'i

Currently there are 91 COH DWS water users using drinking water for agricultural irrigation in the project area. These DWS agricultural irrigation water users are potentially the future recycled water users if recycled water source is available for the area. See Figure 6-4 for location of these agricultural irrigation water users. It can

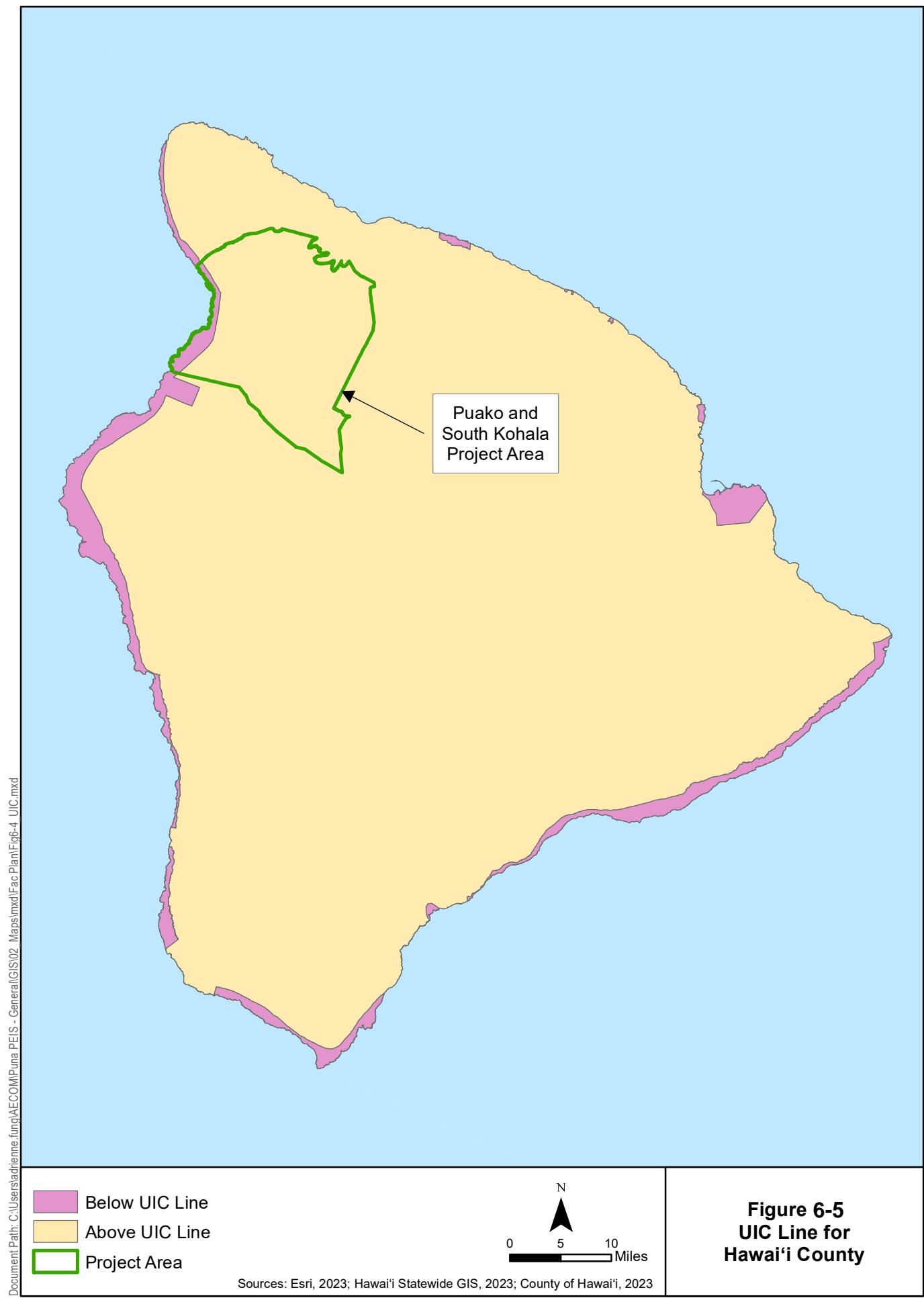
be seen from Figure 6-2 and Figure 6-3 that these agricultural irrigation areas have annual rainfall from 8.0 inch to 30.0 inch and actual evapotranspiration from 300 mm (12 inch) to 600 mm (24 inch). A water balance could be achieved without groundwater recharge and surface runoff if recycled water irrigation is applied.



6.3.1.3 INJECTION WELLS/GROUNDWATER DISCHARGE

Underground injection wells are used for injecting water or other fluids into a groundwater aquifer. HAR 11-23 regulates the location, construction, and operation of injection wells so that injected fluids do not migrate and pollute underground sources of drinking water. Section 4 of HAR 11-23 describes the criteria for classifying aquifers as those that are designated as underground sources of drinking water and those that are not. The boundary between exempted aquifers and underground sources of drinking water is generally referred to as the "UIC Line". Aquifers designated as sources of drinking water are above the UIC line and are not allowed to have underground injection wells. Additional regulatory information is provided in Section 2.2.4.

Figure 6-5 shows the UIC line for the island of Hawai'i. Most of Puakō and South Kohala Project Area is located mauka of the UIC line, which is approximately 1 mile inland. Therefore, the associated aquifer below Puakō and South Kohala is considered a source of drinking water. Underground injection wells could technically be located near the coastal areas of Kawaihae, Puakō, and Waikoloa, but the proposed WWTPs are situated further inland in order to receive flow from other South Kohala neighborhoods. In addition, HDOH recommends exhausting options for reuse or other disposal methods before considering injection wells. Therefore, injection wells or groundwater discharge are unlikely to be applicable to the project area.



6.3.2 Solids Disposal or Reuse

Options for WW sludge disposal or reuse for the centralized system alternatives are discussed in this section. It may also be economical for biosolids to be hauled to another WWTP for further processing.

Processed biosolids can be either disposed of by landfill or reuse with land application of Class A or Class B biosolids.

EPA's 40 Code of Federal Regulations Part 503, Standards for the Use and Disposal of Sewage Sludge, (the Part 503 Rule) defines two types of biosolids with respect to pathogen reduction: Class A (no detectable pathogens) and Class B (a reduced level of pathogens). Both classes are considered safe, but additional requirements are necessary with Class B biosolids. Class A biosolids are not subject to use restrictions and can generally be used like any commercial fertilizer [28].

Biosolids landfilling options include disposal in a monofill (a landfill that accepts only WWTP biosolids), or in a co-disposal landfill (a landfill that combines biosolids with municipal solid waste) [29].

If reused with land application, biosolids may be utilized in home gardening, commercial agriculture, silviculture, greenways, recreational areas and reclamation of drastically disturbed sites such as those subjected to surface mining [30]. Biosolids are often rich in nutrients such as nitrogen and phosphorus, and contain valuable micronutrients.

For centralized WWTPs, the master plan assumes biosolids stabilization to meet Class B criteria, followed by thickening and dewatering. This will allow the material to be beneficially reused on restricted sites or disposed in a landfill. For decentralized WWTPs, cost estimates include thickening and hauling of sludge to the WWTP for stabilization and dewatering.

6.4 PROJECTED 2052 DESIGN AVERAGE FLOW

For the alternatives involving centralized systems, two different flow scenarios were used to size the collection system: urban sewerage and full flow sewerage.

6.4.1 Urban Sewering

As recommended in the Puakō and South Kohala PDR, sewerage is proposed for these zoning areas (Figure 6-6) [2] :

- Lot sizes 1 acre and smaller
- Institutional (schools, hospitals, etc.)
- Commercial
- Industrial
- Beach parks including Hāpuna Beach Park, Spencer Beach Park, and Holoholokai Beach Park

In the alternatives with urban sewerizing, sewer lines were conceptually routed to serve those areas listed above. The later descriptions of the alternatives (Section 6.5) will include the estimated 2052 design average flows per subregion.

Due to their lower development density, the following zones are likely more appropriate for using IWS and are not included in urban sewerizing: forest reserve, community parks, and agricultural zoning larger than 1 acre.

6.4.2

Full Flow Sewering

In the full flow scenario, all Puakō and South Kohala residences are assumed to connect to a sewer line. Therefore, there would be no IWS. In this situation, the zones mentioned above as excluded from “urban sewerizing” are included in “full flow sewerizing.” In this Puakō and South Kohala WW Master Plan, the interceptor sewers were sized to account for full flow. Trunk and interceptor sewers along highways are included in this WW Master Plan and are assumed to be constructed by COH.

Below are assumptions for full flow sewerizing alternative service areas:

- All areas that were covered by urban sewerizing alternatives are included in full flow sewerizing.
- Sewer capacities for trunk and interceptor sewers are provided to non-urban sewerizing areas with the following exceptions:
- No branch sewers are planned for future developments in non-urban sewerizing areas by assuming future developers will construct branch sewers and request connection to COH trunk or interceptor sewers.
- Branch sewers and a treatment plant are planned for Waiki‘i area since there is no other adjacent trunk sewer or interceptor sewer in the immediate vicinity.
- No branch sewers are planned for future development ‘Ōuli Farms, which is located within a non-urban sewerizing area (see Area 8 in Figure 4-4).
- For the eight (8) new future development areas as shown in Figure 4-4:
- No branch sewers are planned for development areas 1, 2, 3, 5, 6, and 7 in Figure 4-4 since these new developments are located within private sewerizing areas.
- Branch sewers are planned for development area 4 in Figure 4-4 since this area will be mostly zoned for urban sewerizing.
- No branch sewers are planned for Area 8 in Figure 4-4 since this area will be zoned for non-urban sewerizing.

6.4.3

Urban Sewering and Full Flow Design Average Flows

A summary of 2052 design average flows is presented in Table 6-2. The total design population has been determined to be 31,025 in Section 1.1 and the total flow has been determined to be 3.26 in Section 4.9. Project area future WW flow will be served by four (4) categories of service areas: existing private WWTPs, urban sewerizing area, non-urban sewerizing area, and future developer developments.

- Existing private WWTPs: 10 existing private WWTPs receive an estimated 0.35 mgd WW flow, see Section 3.7.4.11.
- Future Urban Sewering Area: total flow generated by future urban sewer area is 1.06 mgd. Urban sewer area population was estimated based on ratio of existing OSDS within urban sewer area to total OSDS within project area, and then further adjusted by accounting for population served by existing private WWTPs and future developer development.
 - No information is available for the SE Waikoloa area which is zoned urban. Assumed future population of 237 with a flow of 0.25 mgd
- Future Non-Urban Sewering Area (w/o New Development): Total flow generated by non-urban sewer area is estimated to be 0.96 mgd. Population within non-urban sewer area was estimated based on ratio of existing OSDS within non-urban sewer area to total OSDS within project area, and then further adjusted by accounting for population served by existing private WWTPs and future developer development.
- Future Developer Development: there are eight (8) future developments located primarily within private sewer area, see Figure 4-4. Total flow was estimated to be 0.90 mgd. Population for these developments was estimated based on total units planned by each development with following assumptions:
 - 0.7 full buildout ratio by 2052
 - 0.9 occupancy rate
 - 2 persons for timeshare units, 2.5 persons for multi-family units, and 3 persons for single-family units
 - Further adjusted by considering current flow to existing private WWTPs and SE Wakaloa expansion.

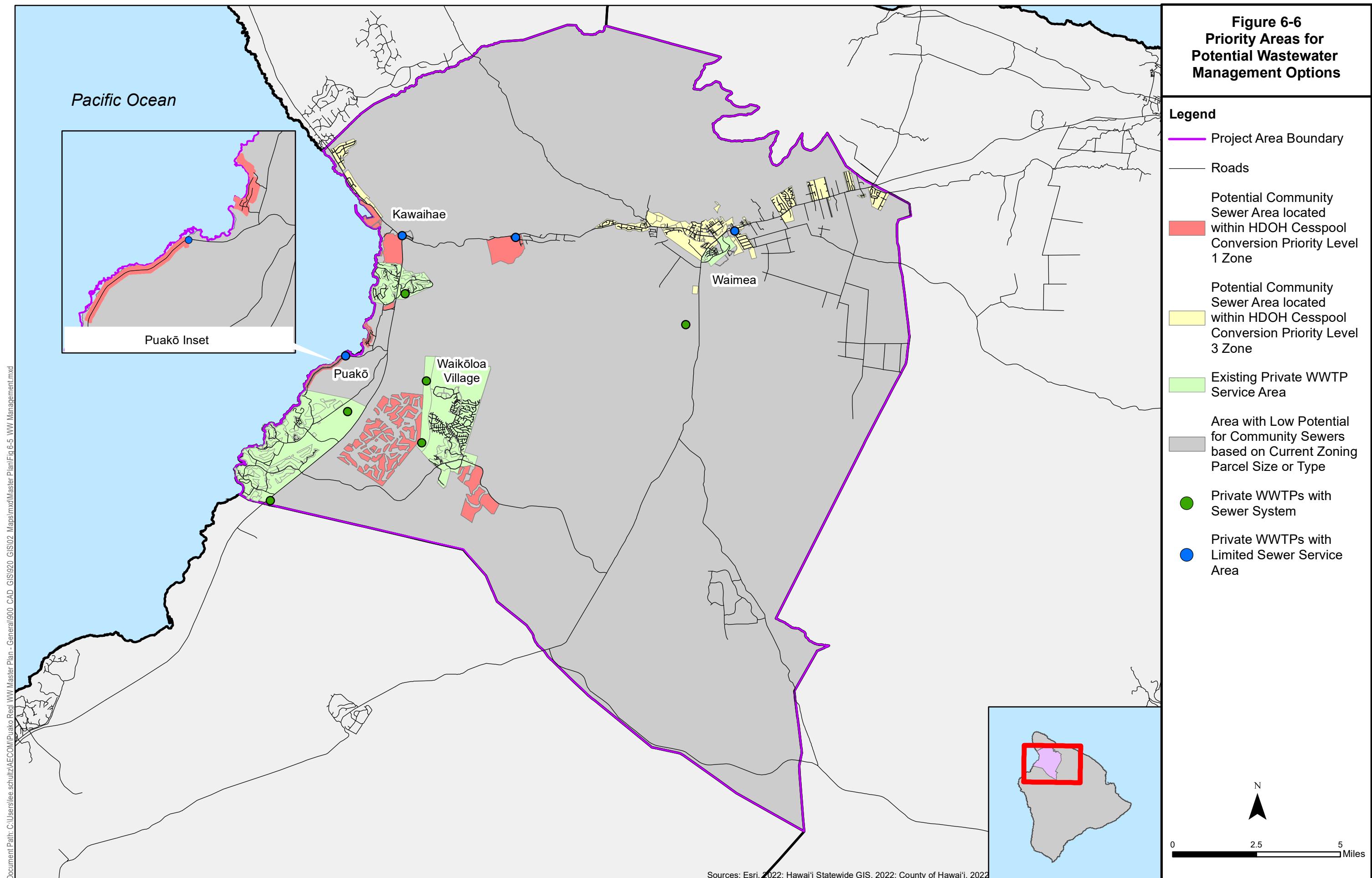
Table 6-2: Future Project Area Sewering Categories and Design Average Flows

Service Area	Estimated Census Population Served	Estimated Design Average Flow, mgd
Future Total	31,076 ^a	3.26
Served by Existing Private WWTPs	3,316	0.35
Future Urban Sewering Area Total	10,052	1.06
Future urban sewer area (w/out new dev.)	9,815	1.03
SE Waikoloa Expansion	237	0.025
Future Non-Urban Sewering Area (w/o New Development)	9,121	0.96
Future Developer Development Total	8587	0.90
Development 1 – Kamakoa Nui	1,842	0.19
Development 2 – Kumu Hou	1,065	0.11
Development 3 – Lofts at Waikoloa	424	0.04
Development 4 – Aina Lea	2,170	0.23

Final Regional Wastewater Master Plan for Puakō and Other Communities within South Kohala

Service Area	Estimated Census Population Served	Estimated Design Average Flow, mgd
Development 5 – Ainamalu	298	0.03
Development 6 – Ke’olalani	2,337	0.25
Development 7 – Waikoloa Family	151	0.02
Development 8 – ‘Ōuli Farms	300	0.03

^a Projected future 2052 population is 31,025. 31,076 was used in flow calculations.



6.5 DESCRIPTIONS OF ALTERNATIVES

This section describes the different alternatives listed at the beginning of Section 6.0. It should be noted that alternatives proposed in this WW master plan are planning level and locations of WW facilities are approximate and not specifically sited. Prior to developing alternatives previous planning documents were reviewed. This included WW report prepared by Aqua Engineering dated December, 2015 (amended in January, 2017) titled “Puakō Hawai‘i Community Feasibility Study & Preliminary Engineering Report”. Alternatives developed for this Master Plan are consistent with prior planning work.

6.5.1 Alternative 1 – All IWS or Decentralized Systems

In this alternative, there would be no publicly owned WW collection, treatment, and disposal system (i.e., the “no project” alternative in Section 4.1). WW generated within Puakō and South Kohala would continue to be treated and disposed of through the current and future (cesspool conversions) onsite residential IWS and current and future decentralized clustered WWTPs. These decentralized package plants are based on existing and potential future locations of schools, hospitals, and malls; and commercial or industrial zoning.

There are 2 variations of Alternative 1: Alternatives 1A and 1B. In Alternative 1A (Figure 6-7), all residential lots will use IWS for on-site treatment and disposal and 14 decentralized package plants are proposed for commercial areas and schools. The decentralized package plant locations are approximate at planning level and shown for illustration purpose, detailed locations should be evaluated during design. Alternative 1A can be considered as “no action” because there are no COH capital improvement projects. There are currently approximately 5,400 OSDS in the project area, with about 4,500 of which are Class IV (cesspools) (brown dots in Figure 6-7). Under this alternative, these Class IV OSDS would need to be decommissioned and converted to a HDOH-approved system (see HAR 11-62) by 2050 to comply with Acts 125 and 87. Current cesspools may or may not qualify for conversion to seepage pits, depending on HDOH approval. Requirements include justification to show that there is insufficient land space for a leach field, slopes exceeding 12 percent, or percolation rates slower than 60 minutes per inch.

To prevent cumulative impacts of cesspool conversions, the HAR 11-62 requirements should be followed. These include limiting IWS to no more than one per acre. Additionally, in areas with high cesspool density, approved IWS systems other than septic tanks shall be used, such as ATUs, to conform with the recommendations of the Cesspool Conversion Technology Research Summary Report. This is captured in the cost estimates because Alternative 1A’s high end septic tank cost is comparable with typical ATU costs that were reviewed. In practice, the technology selection by the homeowner’s engineer would meet the recommendations of the Cesspool Conversion Technologies Research Summary Report, and/or it would be scrutinized by the Department of Health during their review process. If a development has a maximum of 50 dwellings, then each dwelling may have an IWS if there is at least 10,000 square feet of land area per dwelling lot. For an existing lot less than 10,000

square feet and created and recorded before August 30, 1991, one IWS is allowed per lot.

In the future, WW flows generated by the future developer developments have to be conveyed to new or existing WWTPs, which will cover a substantial amount of population growth. Additional IWS or private decentralized treatment systems would be required to support population growth. It is anticipated that the number of additional IWS or decentralized treatment systems will increase proportional to the population growth. Therefore, in the future approximately 460 additional IWS or decentralized treatment systems would be needed, for a total of about 5,850 IWS (red dots in Figure 6-7).

In Alternative 1B (Figure 6-8), both LPS and decentralized treatment plants (package plants) are proposed across the project area. The decentralized package plant locations are approximate at planning level and shown for illustration purpose, detailed locations should be evaluated during design. LPS collection systems are proposed to convey WW from residential and commercial properties to a total of 19 package plants with flows ranging from 15,000 gpd to 200,000 gpd. The HAR 11-62-31.1 sets 15,000 gpd as the threshold, below which, an IWS would be allowed. Above this flow, a package plant would be needed. The typical maximum flow for a package plant is approximately 250,000 gpd.

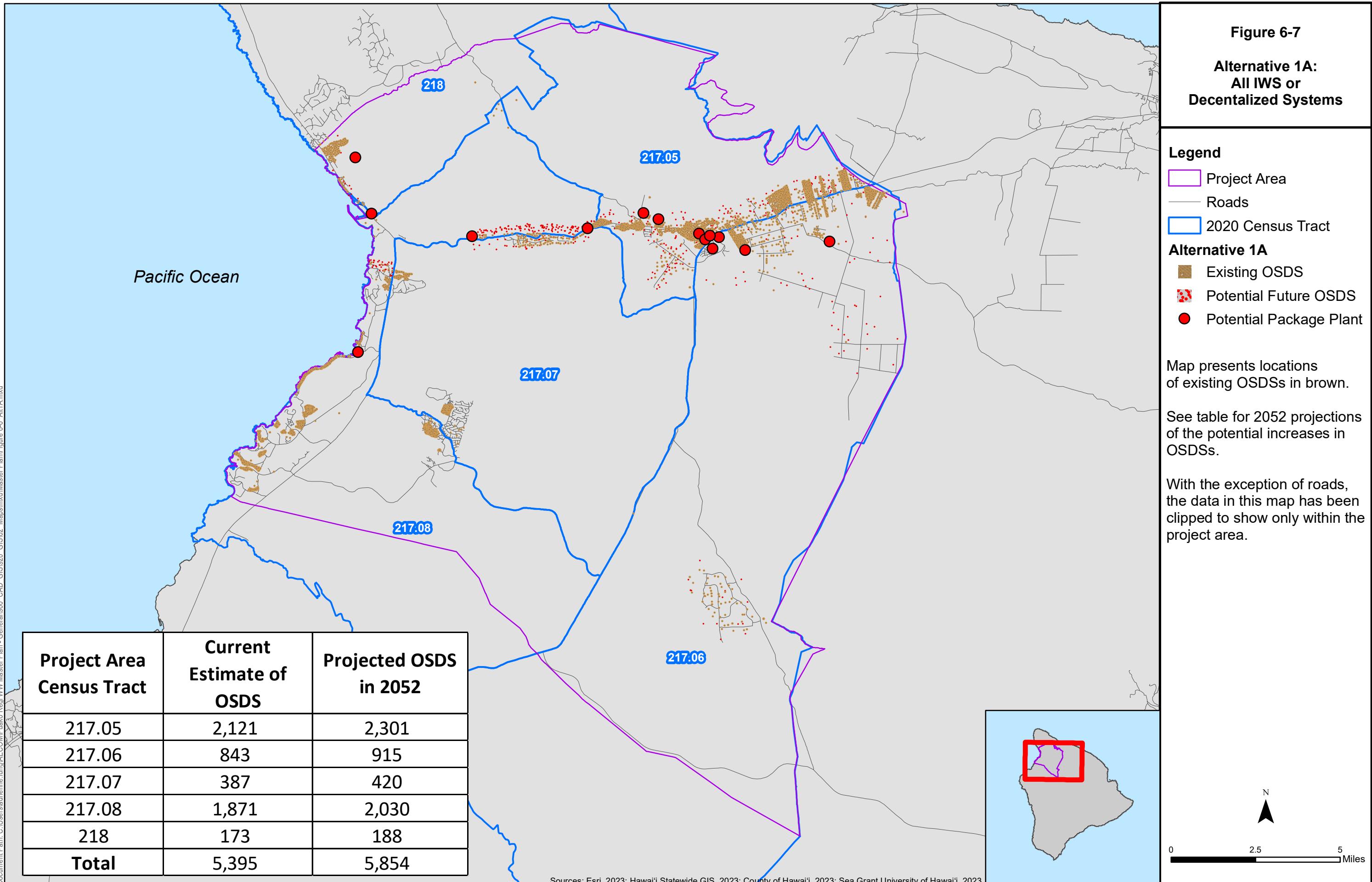
By using the LPS system, Alternative 1B avoids the need for neighborhood WWPSs and force mains, regional WWPSs and force mains, and large interceptor sewers between subregions communities and subregional WWTPs. However, the COH construction and maintenance requirements of the in-street low pressure pipes, valves and package treatment plants are expected to be more involved than conventional gravity sewers and pump stations. The benefit of Alternative 1B is that treated effluent will be higher quality compared to IWS disposal on each lot. Since the treated effluent from the package plants would be of higher quality than septic tank effluent it may be suitable for recycling/water reuse. LPSs are also more accommodating of lots that are too small for an IWS and can help mitigate negative cumulative impacts of cesspool conversions for the project area.

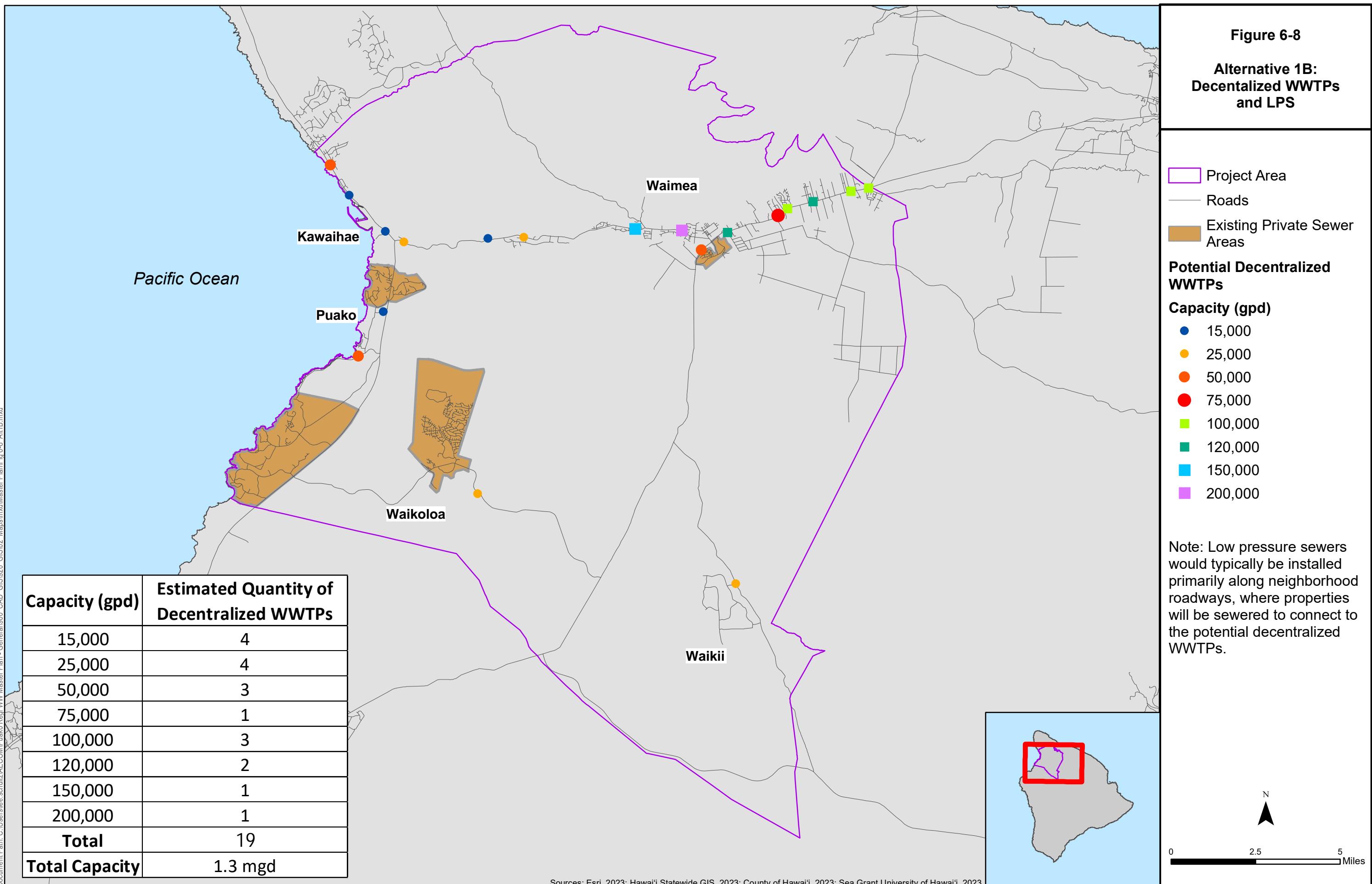
Table 6-3 shows the collection and treatment components for Alternatives 1A and 1B.

Table 6-3: Collection and Treatment System Comparison for Alternative 1

Alternative	Sewer Type	Length (ft)	Decentralized Treatment	
			# of IWS	# of Package Plant
1A	N/A	N/A	5,854	14
1B	LPS	322,515	N/A	19

Note: The 14 package plants for Alternative 1A will be constructed by owners of shopping centers, schools, etc. It is “no action” by COH.





6.5.2 Alternative 2 – Three COH WWTPs and Existing Private WWTPs – Urban Sewering

This alternative is based on having a sewer system and three COH centralized WWTPs. These are proposed for the West Waimea, Waimea Town, and East Waimea areas. Flow from other urban sewer areas would be sent to existing private WWTPs, South Kohala WRF and Mauna Lani WWTP. IWS will be used in remaining unsewered areas. Centralized treatment (Section 6.2.3) and effluent and solids disposal or reuse options (Section 6.3) would apply. An overall map is presented in Figure 6-9, with maps of individual areas in Appendices A through D.

The projected 2052 design average flow is based on urban sewer. The estimated flows per subregion are shown in Table 6-4, with a total of 1.2 mgd.

There are 3 variations of Alternative 2: “base” alternative 2A, 2B, and 2C (Table 6-4). Under base Alternative 2A, the collection system would consist of conventional gravity sewers within existing roadways. Neighborhood and regional WWPSs are also proposed where potentially necessary due to land slope.

In Alternative 2B, LPS will be used to replace neighborhood WWPSs. The lengths of gravity sewers and force mains are also reduced using this method.

In Alternative 2C, cross-country sewers in new easements could help with reducing the number of neighborhood and regional WWPSs and associated force mains.

Table 6-4: Collection System Comparison for Alternative 2

Alt.	Sewer Type	Proposed COH WWTP	Existing WWTP		
		Waimea East Waimea WWTP (0.46 mgd) Waimea Town WWTP (0.45 mgd) West Waimea WWTP (0.014 mgd)	Kawaihae South Kohala WRF (0.06 mgd add'l) ^a	Puakō WWTP (0.05 mgd add'l) ^b	Waikoloa Village WWTP (0.025 mgd add'l) ^c
2A	Gravity Sewer (ft)	207,694	31,353	17,791	21,269
	Force Main (ft)	47,320	23,440	12,266	2,237
	Neighborhood WWPS	33	8	3	1
	Regional WWPS	4	7	3	0
2B	Gravity Sewer (ft)	160,407	23,833	0	19,032
	LPS (ft)	47,288	7,490	18,493	2,237
	Force Main (ft)	15,652	19,564	8,925	0
	Neighborhood WWPS	0	0	1	0
	Regional WWPS	4	7	1	0
2C	Gravity Sewer (ft)	220,026	31,031	17,791	22,875
	Force Main (ft)	18,594	18,989	12,266	0
	Neighborhood WWPS	2	3	3	0
	Regional WWPS	4	7	3	0

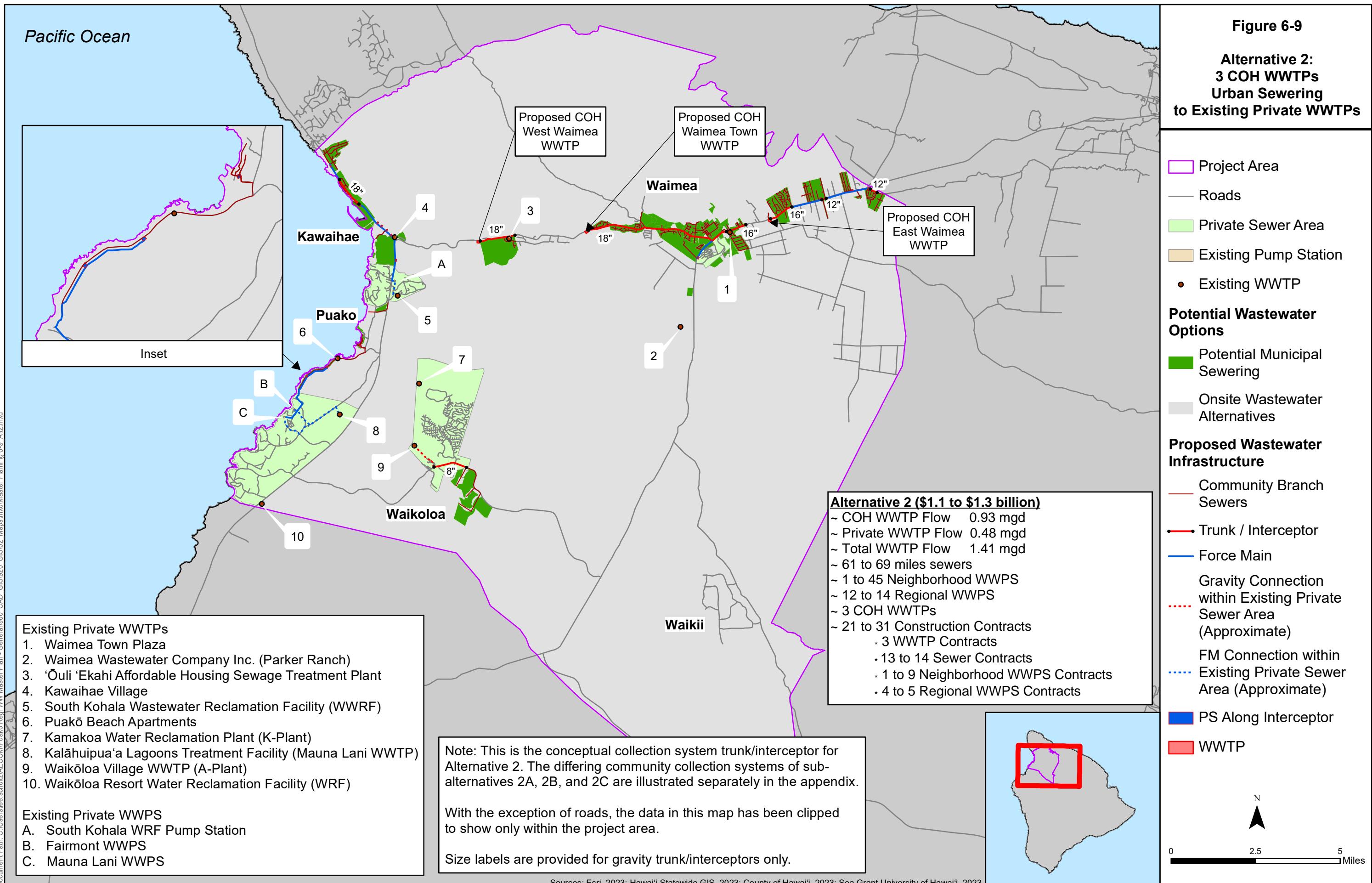
Note: If an area does not have a collection system variation with LPS or cross-country sewers, the “base” variation of conventional gravity sewers is used.

^a Existing capacity is 0.60 mgd with current average flow of 0.21 mgd. Alternative 2 assumes that additional 0.06 mgd will be sent to this plant.

^b Existing capacity is 0.75 mgd with current average flow of 0.26 mgd. Alternative 2 assumes that additional 0.054 mgd will be sent to this plant.

^c Existing capacity is 0.5 mgd with current average flow of 0.24 mgd. Alternative 2 assumes that additional 0.025 mgd will be sent to this plant.

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6.5.3 Alternative 3 – Two COH WWTPs and Existing Private WWTPs – Full Flow Sewering

This scenario is similar to Alternative 2, but with the projected 2052 design average flow based on full flow, for a total of 3.26 mgd. There would be no IWS, and each residential or commercial unit would be connected to the sewer.

This alternative is based on having a sewer system and two COH centralized WWTPs. These are proposed for the Waimea and Waiki'i areas. Flow from other sewerizing areas would be sent to nearby existing private WWTPs: South Kohala WRF, Kamakoa Water Reclamation Plant, Mauna Lani WWTP, Waikoloa Village WWTP, and Waikoloa Resort WRF. Centralized treatment (Section 6.2.3) and effluent and solids disposal or reuse options (Section 6.3) would apply. An overall map is presented in Figure 6-10, with maps of individual areas in Appendix A.

There are 3 variations of Alternative 3: “base” alternative 3A, 3B, and 3C (Table 6-5). Under base Alternative 3A, the collection system would consist of conventional gravity sewers within existing roadways. Neighborhood and regional WWPSs are also needed depending on land slope.

In Alternative 3B, LPS will be used to reduce the number of neighborhood WWPSs and associated force mains. In Alternative 3C, cross-country sewers in new easements will lower the number of neighborhood and regional WWPSs and associated force mains.

Table 6-5: Collection System Comparison for Alternative 3

Alt.	Sewer Type	Proposed COH WWTP		Existing WWTP		
		Waimea West Waimea WWTP	Waiki'i Waiki'i WWTP (0.033 mgd) (1.21 mgd)	Kawaihae South Kohala WRF(0.08 mgd add'l) ^a	Puakō WWTP (0.05 mgd add'l) ^c	Waikoloa Kamakoa WRF (0.25 mgd add'l) ² Waikoloa Village WWTP (0.08 mgd add'l) ^d Waikoloa Resort WRF (0.23 mgd add'l) ^e
3A	Gravity Sewer (ft)	223,210	44,407	31,323	17,791	168,997
	Force Main (ft)	47,320	1,403	28,407	12,266	8,828
	Neighborhood WWPS	33	1	8	3	7
	Regional WWPS	4	0	7	3	1
3B	Gravity Sewer (ft)	175,933	0	23,833	0	145,363
	LPS (ft)	47,288	44,407	12,357	18,360	23,635
	Force Main (ft)	15,652	0	19,564	17,508	1,973
	Neighborhood WWPS	0	0	0	1	0
	Regional WWPS	4	0	7	3	1
3C	Gravity Sewer (ft)	235,551	46,361	31,031	17,791	172,355
	Force Main (ft)	18,594	0	18,989	12,266	3,417
	Neighborhood WWPS	2	0	3	3	1
	Regional WWPS	4	0	7	3	1

If an area does not have a collection system variation with LPS or cross-country sewers, the “base” variation of conventional gravity sewers is used.

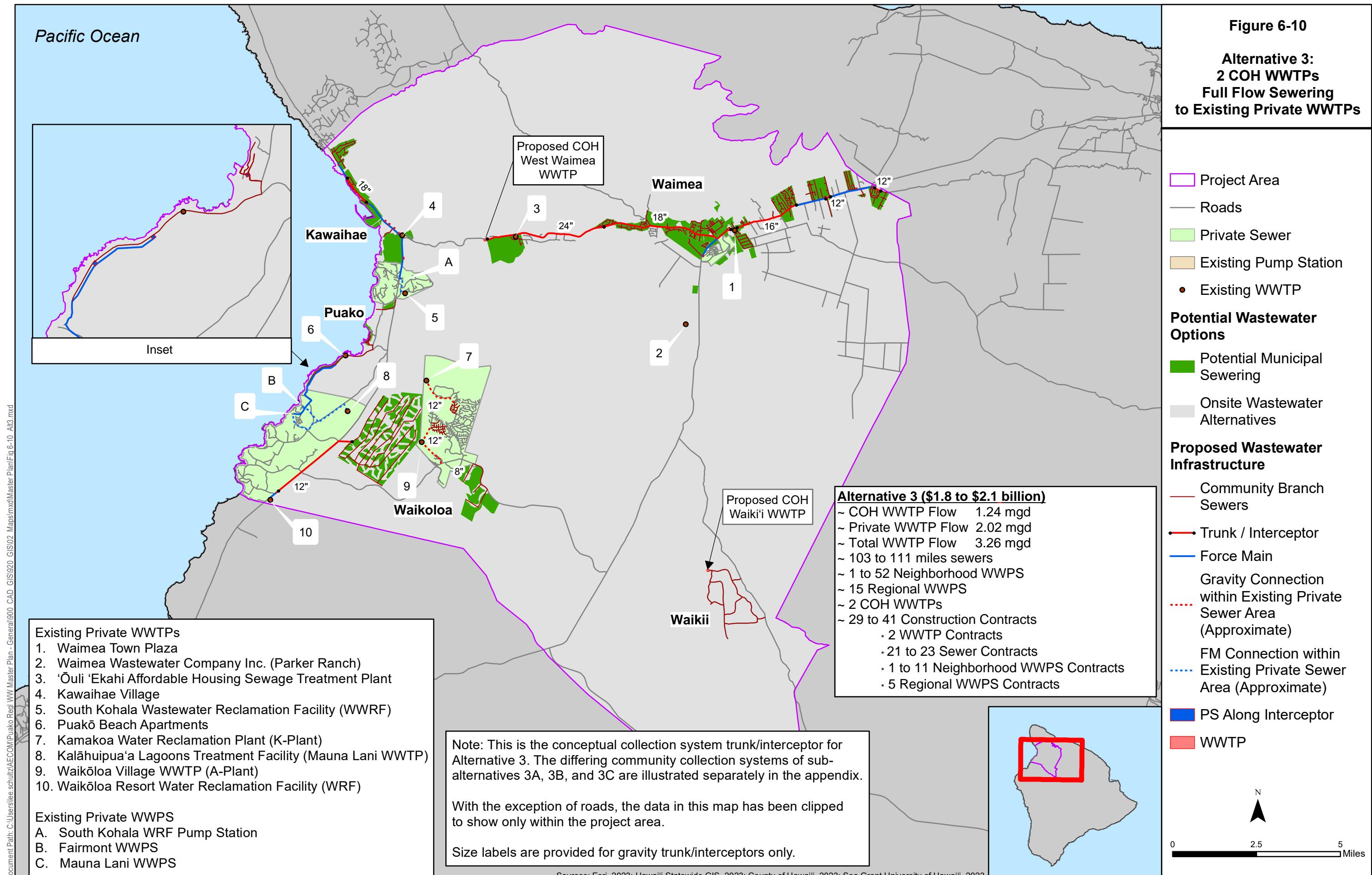
^a Existing capacity is 0.60 mgd with current average flow of 0.21 mgd. Alternative 3 assumes that additional 0.08 mgd will be sent to this plant.

^b Existing capacity is 0.40 mgd with current average flow of 0.09 mgd. Alternative 3 assumes that additional 0.25 mgd will be sent to this plant.

^c Existing capacity is 0.75 mgd with current average flow of 0.26 mgd. Alternative 3 assumes that additional 0.05 mgd will be sent to this plant.

^d Existing capacity is 0.50 mgd with current average flow of 0.24 mgd. Alternative 3 assumes that additional 0.08 mgd will be sent to this plant.

^e Existing capacity is 1.00 mgd with current average flow of 0.65 mgd. Alternative 3 assumes that additional 0.23 mgd will be sent to this plant.



6.5.4 Alternative 4 – Five COH WWTPs – Urban Sewering

This scenario is like Alternative 2, but with flow only going to proposed COH WWTPs instead of including existing private WWTPs. Within this alternative, there would be five centralized WWTPs, covering the East Waimea, Waimea Town, West Waimea, East Waikoloa, and makai areas. Centralized treatment (Section 6.2.3) and effluent and solids disposal or reuse options (Section 6.3) would apply. An overall map is presented in Figure 6-11, with maps of individual areas in Appendix A.

The projected 2052 design average flow is based on urban sewerage. The estimated flows per subregion are shown in Table 6-6, with a total of 1.06 mgd.

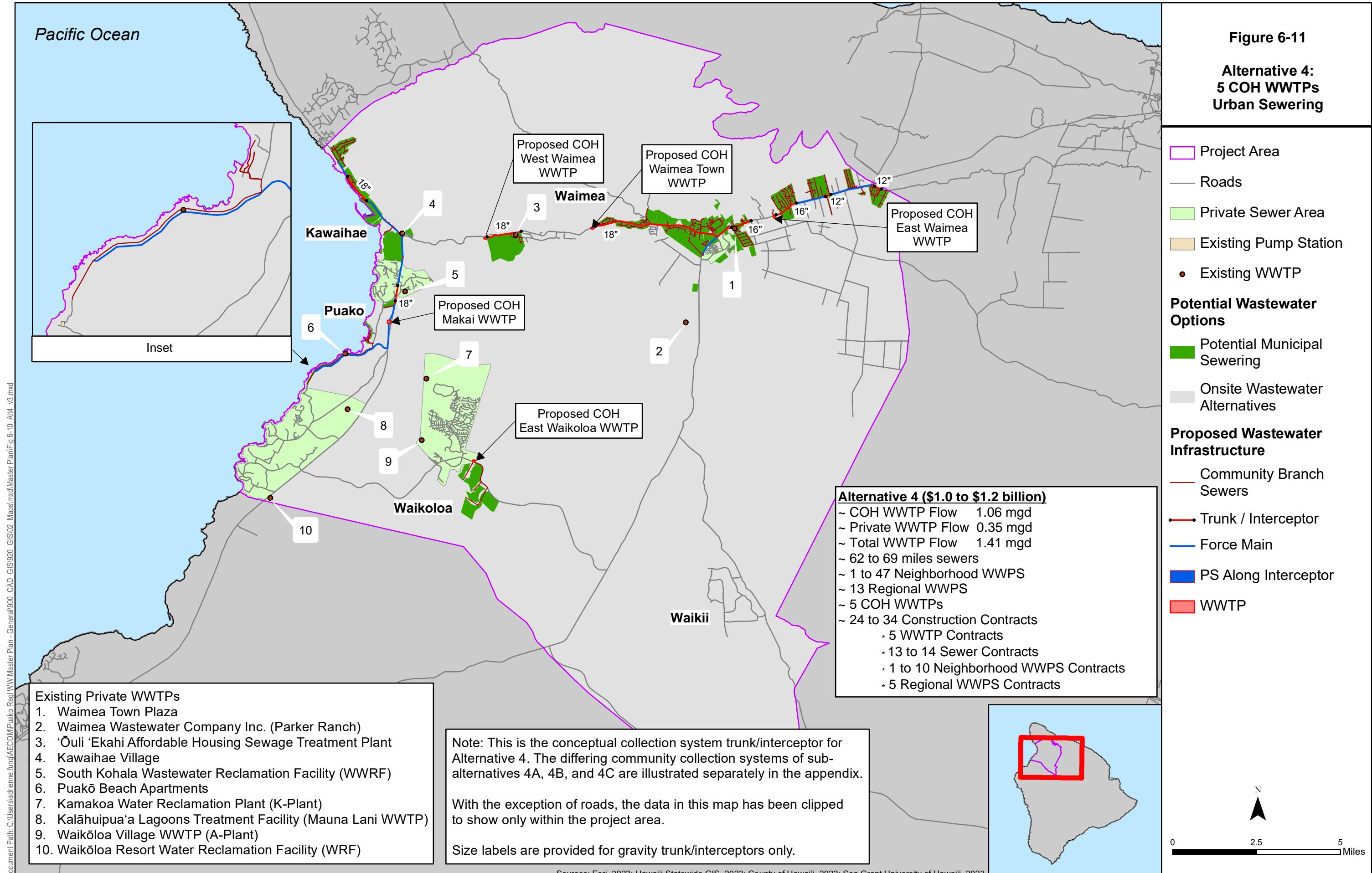
There are 3 variations of Alternative 4: “base” alternatives 4A, 4B, and 4C (Table 6-6). Under base Alternative 4A, the collection system would consist of conventional gravity sewers within existing roadways. Neighborhood and regional WWPSs are also needed depending on land slope.

In Alternative 4B, LPS will be used to reduce the number of neighborhood WWPSs and associated force mains. In Alternative 4C, cross-country sewers in new easements will lower the number of neighborhood and regional WWPSs and associated force mains.

Table 6-6: Collection System Comparison for Alternative 4

Alt.	Sewer Type	Proposed COH WWTP			
		Waimea	Kawaihae	Puakō	Waikoloa
	East Waimea WWTP (0.46 mgd)	0.06 mgd	0.05 mgd	0.05 mgd	0.025 mgd
	Waimea Town WWTP (0.45 mgd)				
	West Waimea WWTP (0.014 mgd)				
Makai WWTP (0.11 mgd)					
4A	Gravity Sewer (ft)	207,695	34,090	12,852	15,967
	Force Main (ft)	47,320	29,380	16,276	2,237
	Neighborhood WWPS	33	8	5	1
	Regional WWPS	4	7	2	0
4B	Gravity Sewer (ft)	160,407	26,600	0	13,730
	LPS (ft)	47,288	9,422	14,251	2,237
	Force Main (ft)	15,652	23,573	13,730	0
	Neighborhood WWPS	0	0	1	0
	Regional WWPS	4	7	2	0
4C	Gravity Sewer (ft)	220,026	33,797	12,852	17,572
	Force Main (ft)	18,594	22,998	16,276	0
	Neighborhood WWPS	2	3	5	0
	Regional WWPS	4	7	2	0

Note: If an area does not have a collection system variation with LPS or cross-country sewers, the “base” variation of conventional gravity sewers is used.



6.5.5 Alternative 5 – Four COH WWTPs – Full Flow Sewering

This scenario is like Alternative 3, but with flow only going to proposed COH WWTPs instead of including existing private WWTPs. Within this alternative, there would be four centralized WWTPs, covering the Waimea, makai, Waikoloa, and Waiki'i areas. Centralized treatment (Section 6.2.3) and effluent and solids disposal or reuse options (Section 6.3) would apply. An overall map is presented in Figure 6-12, with maps of individual areas in Appendix A.

The projected 2052 design average flow is based on full flow sewerage, for a total of 3.26 mgd. There would be no IWS, and each residential or commercial unit would be connected to the sewer.

There are 3 variations of Alternative 5: “base” alternative 5A, 5B, and 5C (Table 6-7). Under base Alternative 5A, the collection system would consist of conventional gravity sewers within existing roadways. Neighborhood and regional WWPSs are also needed depending on land slope.

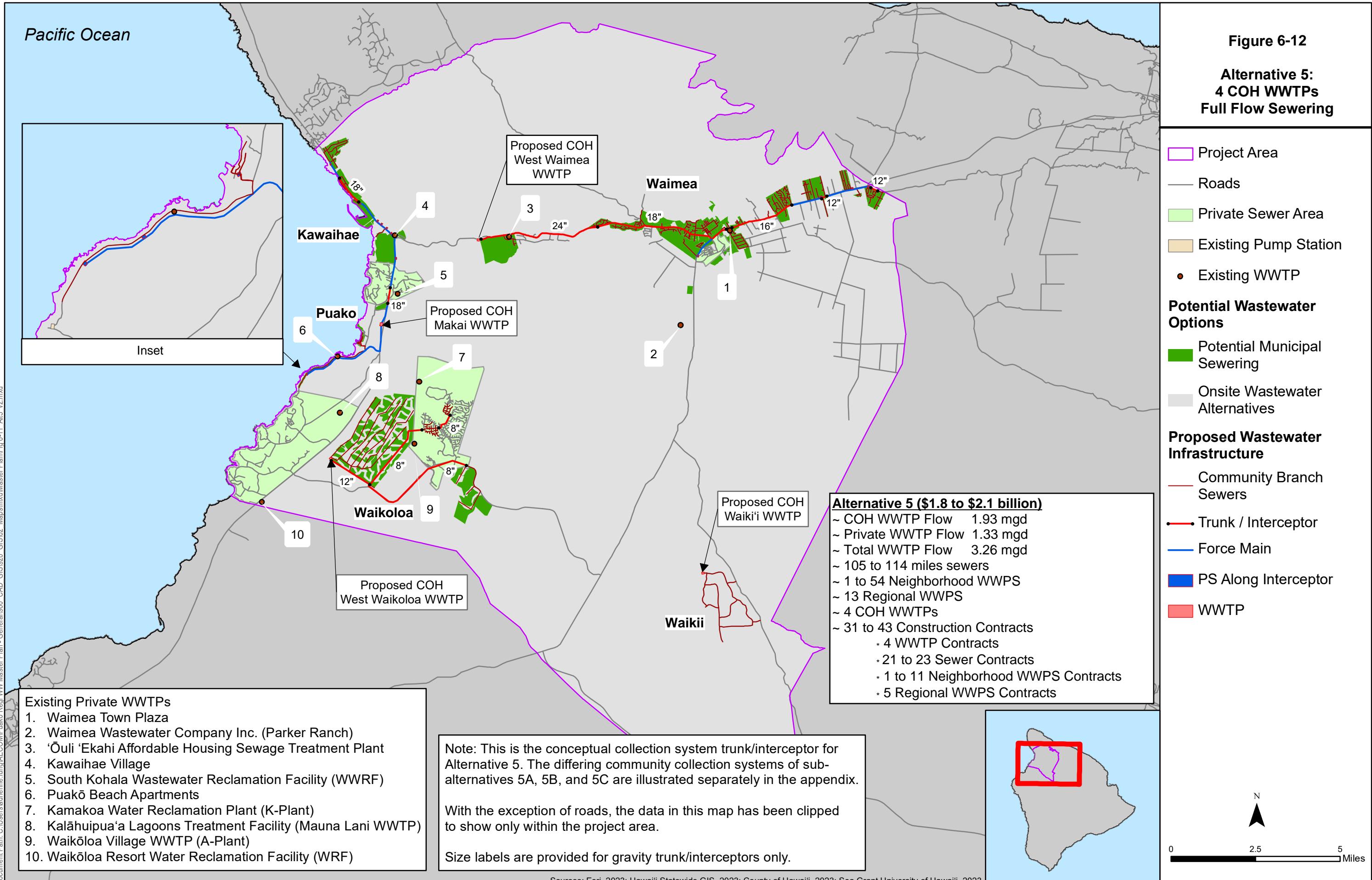
In Alternative 5B, LPS will be used to reduce the number of neighborhood WWPSs and associated force mains. In Alternative 5C, cross-country sewers in new easements will lower the number of neighborhood and regional WWPSs and associated force mains.

Table 6-7: Collection System Comparison for Alternative 5

Alt.	Sewer Type	Proposed COH WWTP				
		Waimea West Waimea WWTP	Kawaihae 0.08 mgd (1.21 mgd)	Puakō 0.05 mgd	Waikoloa West Waikoloa WWTP WWTP (0.56 mgd)	Waiki'i Waiki'i WWTP (0.033 mgd)
Makai WWTP (0.13 mgd)						
5A	Gravity Sewer (ft)	223,210	34,090	12,852	185,741	44,407
	Force Main (ft)	47,320	27,449	16,276	6,855	1,403
	Neighborhood WWPS	33	8	5	7	1
	Regional WWPS	4	7	2	0	0
5B	Gravity Sewer (ft)	175,923	26,600	0	162,106	0
	LPS (ft)	47,288	7490	14,251	23,635	44,407
	Force Main (ft)	15,652	23,573	13,730	0	0
	Neighborhood WWPS	0	0	1	0	0
	Regional WWPS	4	7	2	0	0
5C	Gravity Sewer (ft)	235,541	33,797	12,852	189,099	46,361
	Force Main (ft)	18,594	22,998	16,276	1,444	0
	Neighborhood WWPS	2	3	5	1	0
	Regional WWPS	4	7	2	0	0

Note: If an area does not have a collection system variation with LPS or cross-country sewers, the “base” variation of conventional gravity sewers is used.

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6.6 SCHEDULE CONSIDERATIONS

The work related to all South Kohala WW alternatives would need to be executed in the following steps:

- Preliminary design
- Environmental assessments/EISs
- Final design and permitting
- Right-of-way acquisition
- Bidding and award
- Construction of WW improvements
- Startup and commissioning

The preliminary design and environmental assessments/EISs would typically require approximately 2 years to complete. Final design, permitting, and right-of-way acquisition would begin after the preliminary design is complete and require approximately 2-3 years to complete.

Alternative 1A implementation schedules would be managed by each individual property owner. Alternative 1B on-lot LPS implementation schedules would be managed by each individual property owner, while in-street LPS and WWTPs implementation schedules would be managed by the COH. The implementation schedules for Alternatives 2 to 5 would be managed by the COH and may be impacted by the following items:

- The time needed to procure, fabricate, and deliver major systems and equipment
- The ability to receive the shop drawings from the Contractor in a timely manner for the review and approval of the major equipment
- Any site clearing, demolition and renovation work required for the new facilities
- The number of project/contract estimates for each alternative are based on the following assumptions:
 - 1 WWTP project/contract for each Subregional WWTP
 - An average of 3 regional WWPS for each regional WWPS project/contract
 - An average of 5 neighborhood WWPS for each neighborhood WWPS project/contract
 - An average of 5 miles of pipeline/sewer for each pipeline project/contract
 - A completion time ranging from 3 to 5 years for each project/contract
 - Based on the above assumptions each project/contract would be estimated to be in the \$30 to \$50 million (M) range.

- Assuming the first construction contracts start around 2027 and the last contracts are awarded around 2047 (20 years) COH would need to bid and award 1 or 2 contracts every year from year 2027 to year 2048 for all construction to be completed by the year 2052.
- Capital outlay would range from \$50M to \$100M per year for the 21-year period from year 2027 through year 2048 with the last 1 or 2 contracts completed by year 2052.
- The schedules for various alternatives discussed below are not synchronized with other active projects in the area such as the Puakō water main replacement or the Hapuna Beach water main replacement. Coordination of work between water and sewer projects (if any) would occur during the design after the Master Plan is completed.

6.6.1

Alternative 1A – All IWS or Decentralized Systems

Based on the State of Hawai‘i GIS data there are currently nearly 5,400 IWS (of these, about 4,500 are cesspools) within the South Kohala project area that would require replacement with new IWS. Replacements are for either cesspool conversions or other IWS at the end of their service life (typically 30 to 50 years). The projected future population projections indicate that nearly 450 additional IWS would be needed by year 2052. If Alternative 1A is implemented, about 5,850 new IWS are estimated within the South Kohala project area by year 2052 (5,400 replacements plus about 460 new IWS).

Implementation of Alternative 1A – IWS or Decentralized Systems is anticipated to be spread over the 27-year period from now until the Year 2050 Act 125 deadline. Based on this, approximately 150 to 200 cesspool conversions per year would be required. In addition, all new development would need to incorporate IWS into the construction. An estimate of approximately 15 to 20 new IWS per year would be needed in the South Kohala project area during the planning period through year 2052. Note that the more densely developed areas (retail/commercial, schools etc.) would utilize decentralized treatment plants serving the properties. Alternative 1A is considered as “no action” because there are no COH capital improvement projects.

6.6.2

Alternative 1B – Both LPS and Decentralized Treatment Systems

The Preliminary Construction Schedule for Alternative 1B is based on the following assumptions:

- There would be a preliminary engineering/environmental assessment phase requiring approximately 2 years
- Final design bid packages would be prepared for the following types of improvements:
 - 19 decentralized WWTPs (assumes 3 WWTP per contract or approximately 7 contracts) The final design and permitting for each bid package would require approximately 1 year

- LPS force mains (assumes 16 contracts with approximately 20,000 LF of LPS in each contract). Each LPS final design package would require approximately 2 years including permitting and right of way acquisition.
- 1 neighborhood WWPS (assumes 1 contract).
- 6,000 LF WWPS force mains (assumes 1 contract).
- It is anticipated that the on-site grinder pumps for each property would be included in the design of each LPS subarea. Approximately 360 grinder pumping units and on-site piping connections would be included in each LPS contract.
- Bids for the decentralized treatment for each subarea would be advertised and awarded first. One decentralized WWTP contract per year (3 WWTP in each) are anticipated.
- After the decentralized treatment plant construction for each subarea has begun the pressure sewer contracts for these subareas would be bid/awarded. Approximately 1 to 2 pressure sewer and grinder pump contracts would be bid/awarded each year.
- All of the construction contracts would be planned to have a 2 to 3 year time of completion.

It is anticipated that the implementation of this program would require approximately 15 to 20 years based on the above-mentioned assumptions.

6.6.3 Alternative 2 – Urban Sewering (1.41 mgd) w/ Three Subregional COH Plants (0.93 mgd) and Extend COH Sewers to Private Plants (0.35 mgd current, 0.13 mgd additional)

The Preliminary Construction Schedule for the Alternative 2 – Urban sewer (1.41 mgd) with COH sewers connecting to private WW treatment facility (WWTF) (0.35 mgd current, 0.13 mgd additional) and three other COH subregional WWTPs (0.93 mgd) is based on the following assumptions:

- There would be an initial preliminary engineering/environmental assessment phase requiring approximately 2 years
- The final design, permitting and right of way acquisition for each bid package would require approximately 2 years
- Multiple final design bid packages would be prepared for the following types of improvements:
 - Approximately 61 to 69 miles of sewers and force mains (13 to 14 contracts based on contracts that are approximately 5 miles each)
 - 12 to 14 regional WWPS (4 to 5 contracts)
 - 1 to 45 neighborhood WWPS (assumes 1 to 9 contracts). The low-pressure sewer alternative eliminates all of the neighborhood WWPS except 1
 - WW Treatment (assumes 3 contracts)

- Total of approximately 21 to 31 contracts
- One or two bids would be advertised/awarded each year for the 25-year construction program
- All of the bid packages would have a 3-to-5-year time of completion

It is anticipated that execution of the construction program would require approximately 25-years to fully complete based on the above-mentioned assumptions.

6.6.4 Alternative 3 – Full Sewering (3.26 mgd) w/ Two Subregional COH Plants (1.24 mgd) and Extend COH Sewers to Private Plants (2.02 mgd total, 0.69 mgd additional)

The Preliminary Construction Schedule for Alternative 3 – Full Sewering (3.26 mgd) with COH sewers connecting to private WWTF (2.02 mgd total, 0.69 mgd additional) and two COH subregional WWTPs (1.24 mgd) is based on the following assumptions:

- There would be an initial preliminary engineering/environmental assessment phase requiring approximately 2 years
- The final design, permitting and right of way acquisition for each bid package would require approximately 2 years
- Multiple final design bid packages would be prepared for the following types of improvements:
 - Approximately 103 to 111 miles of sewers and force mains (21 to 23 contracts based on contracts that are approximately 5 miles each)
 - 15 regional WWPS (5 contracts)
 - 1 to 52 neighborhood WWPS (assumes 1 to 11 contracts). The low-pressure sewer alternative eliminates all of the neighborhood WWPS except 1
 - WW Treatment (assumes 2 contracts)
 - Total of approximately 29 to 41 contracts
- All of the bid packages would have a 3 to 5 year time of completion
- One or two bids would be advertised/awarded each year for the 25-year construction program

It is anticipated that execution of the construction program would require approximately 25 years to fully complete based on the above-mentioned assumptions.

6.6.5 Alternative 4 – Urban Sewering (1.41 mgd) w/ Five Subregional COH Plants (1.06 mgd) and Existing Private WWTPs (0.35 mgd)

The Preliminary Construction Schedule for Alternative 4 – Urban Sewering (1.41 mgd) with four COH subregional WWTPs and existing private WWTPs (0.35 mgd current flow) is based on the following assumptions:

- There would be an initial preliminary engineering/environmental assessment phase requiring approximately 2 years
- The final design, permitting and right of way acquisition for each bid package would require approximately 2 years
- Multiple final design bid packages would be prepared for the following types of improvements:
 - Approximately 62 to 69 miles of sewers and force mains (13 to 14 contracts based on contracts that are approximately 5 miles each)
 - 13 regional WWPS (5 contracts)
 - 1 to 47 neighborhood WWPS (assumes 1 to 10 contracts). The low-pressure sewer alternative eliminates all of the neighborhood WWPS except 1
 - WW Treatment (assumes 5 contracts)
 - Total of approximately 24 to 34 contracts
- All of the bid packages would have a 3 to 5 year time of completion
- One or two bids would be advertised/awarded each year for the 25-year construction program

It is anticipated that execution of the construction program would require approximately 25 years to fully complete based on the above-mentioned assumptions.

6.6.6 Alternative 5 – Full Sewering (3.26 mgd) w/ Four Subregional COH Plants (1.93 mgd) and Existing Private WWTPs (1.33 mgd)

The Preliminary Construction Schedule for Alternative 5 – Full sewer (3.26 mgd) with four COH subregional WWTPs(1.93 mgd) and private WWTPs (1.33 mgd) is based on the following assumptions:

- There would be an initial preliminary engineering/environmental assessment phase requiring approximately 2 years
- The final design, permitting and right of way acquisition for each bid package would require approximately 2 years
- Multiple final design bid packages would be prepared for the following types of improvements:
 - Approximately 105 to 114 miles of sewers and force mains (21 to 23 contracts based on contracts that are approximately 5 miles each)
 - 13 regional WWPS (5 contracts)
 - 1 to 54 neighborhood WWPS (assumes 1 to 11 contracts). The low-pressure sewer alternative eliminates all of the neighborhood WWPS except 1
 - WW Treatment (assumes 4 contracts)
 - Total of approximately 31 to 43 contracts

- All of the bid packages would have a 3 to 5 year time of completion
- One or two bids would be advertised/awarded each year for the 25-year construction program

It is anticipated that execution of the construction program would require approximately 25 years to fully complete based on the above-mentioned assumptions.

7.0 EVALUATION OF ALTERNATIVES

The text below outlines the cost and non-monetary considerations for evaluating the WW management alternatives described in Section 6.5.

7.1 EVALUATION CRITERIA

Evaluation criteria for the WW collection and treatment options include costs and non-monetary factors. Alternatives with low initial construction cost may merit higher consideration, but it is also important to consider non-monetary factors. These include O&M challenges and social and environmental impacts of the alternatives that may actually favor another alternative.

7.2 BASIS OF CONCEPTUAL LEVEL CONSTRUCTION COST ESTIMATES

The American Association of Cost Engineers (AACE) guidelines were used for development of opinions of probable project and construction costs (referred to as cost estimates). A conceptual level construction cost estimate and a 30-year life cycle cost (LCC) analysis were conducted for the alternatives evaluated in Section 6.5. The Master Plan cost estimates are AACE Class 4, which are typically used for project screening, determination of feasibility, concept evaluation, and preliminary budget approval. These estimates include all costs for the alternatives, although they may not be borne by the same funder. This is to allow an overall alternative comparison.

Main cost assumptions are listed below, with additional ones provided in Appendix G-1. These apply to each of the alternatives. Parameters that are more specific to the type of WW system (e.g., decentralized or centralized) are described in the following sections.

- 10-year average discount rate (nominal) of 3.11 percent (based on 30-year Treasury interest rates for different maturities, as of 2023)
- Annual escalation rate (nominal) of 3.37 percent (based on 10-year average of Engineering News Record [ENR] cost index)
- Effective interest rate (real) of -0.26 percent was calculated from nominal discount rate and nominal escalation rate
- 30-year period of analysis
- Estimated power cost based on \$0.44 per kilowatt-hour [31]
- Estimated O&M costs including inflation (see subsections below for specific components)

A 20 percent contingency was applied to the estimated construction cost estimates to account for uncertainties and undefined work that will be quantified as the project proceeds. A 20 percent allowance for project services was also included in the project cost estimates to cover engineering and other implementation costs as follows:

- Preliminary design +/- 2 percent
- Final design and permitting +/- 8 percent
- Construction engineering and inspection +/- 9 percent
- Legal and fiscal expenses +/- 1 percent

7.2.1 Cost Estimating for Decentralized Treatment System

Conceptual level costs were used for the following components of a decentralized treatment system: IWS, LPS, and package plants. The values are detailed in Appendix G, so a summary of their basis is presented here.

7.2.1.1 COST ESTIMATES OF CESSPOOL CONVERSIONS

From the Hawai'i Cesspool Conversion Working Group (CCWG)'s Final Report to the 2023 Regular Session Legislature, costs of cesspool upgrades range from "\$9,000 to \$60,000 or more depending on the WW system capacity (based on bedroom count), technology, and location or site constraints" [32]. These cited costs are in 2020 dollars, so escalating to 2023 dollars, the range becomes \$11,000 to \$69,000.

To determine which estimate to use for the Puakō and South Kohala Master Plan, the geological conditions of Puakō and South Kohala were considered. The U.S. Geological Survey maps depict roughly 45 percent of the Puakō and South Kohala project area as having hydraulic conductivity (which affects soil percolation rates) between 0 to 2 feet per day. This can be translated to 60 minutes/inch or slower. Although a basic septic system in suitable soil would be in the low to middle of the range of costs, many cesspool conversions would require higher technology systems than a basic septic system, requiring imported soils, and/or other improvements. Using this information, cesspool conversions in Puakō and South Kohala may be closer to the higher end of \$69,000 in the cost range as cited by the CCWG and documented by additional data received from HDOH in 2023. This high-end estimate accounts for the more complex cesspool conversions where a basic septic system is not appropriate, such as coastal areas like Puakō, those with shallow underlying lava rock, and/or high groundwater.

It may also be worth mentioning that the Statewide estimate from the CCWG report excludes engineering, permitting, and land acquisition [33]. As described in Section 7.2, the Master Plan cost estimates include project services, land acquisition costs, and contingency to account for uncertainties and undefined work as the project proceeds.

In the cost estimate for O&M of IWS, \$900 was used as the annual basis, which was scaled from the Kapoho feasibility study and confirmed by EPA data. This includes labor, electricity, and maintenance.

7.2.1.2 COST ESTIMATES OF LPS

To estimate the cost for LPS, the Kapoho feasibility study and recent LPS vendor information were used. This resulted in \$25,300 per lot to cover the on-lot costs. To verify this estimate, AECOM obtained quotes in April 2023 for installing LPS from a local Hawai‘i vendor. Their cost estimates closely match with the \$25,300.

Estimated unit costs per linear foot are used for in-street LPS. These range from \$300 to \$600, depending on the pipe size. This WW Master Plan does not determine the specific entity (private or public) that will cover these costs, as this will depend on future coordination among homeowners, developers, and the COH.

In the cost estimate for LPS, the O&M of in-street LPS is included in the unit costs mentioned above. On-lot LPS O&M are roughly \$500 per lateral kit, which includes all components typically needed to connect an on-lot pump to the in-street sewer main. These O&M values were scaled from the Kapoho feasibility study.

The LPS alternatives do not differentiate between standard LPS (grinder pumps) and STEP systems. At this level of planning, the cost difference is negligible. Evaluation of specific LPS configuration and technologies should be conducted in a detailed planning or design phase.

7.2.1.3 COST ESTIMATES OF DECENTRALIZED CLUSTER PLANTS

A cluster plant with a capacity of 15,000 gpd (the starting limit based on 11-62-31.1) was estimated to cost \$2 million, using previous projects in the area, such as the Kapoho feasibility study and Pāhoa’s Puna Kai Shopping Center WWTP. To set the upper capacity limit of a cluster plant, 250,000 gpd is an acceptable industry standard of the breakeven point between a cluster (package) plant and an in-ground constructed WWTP. This was estimated at \$12 million, based on \$40 per gallon of WW treated (from similar previous projects; see Appendix G-2) with another \$2 million for odor control, buffer zone, and other costs. For estimated costs of cluster plants with capacities between 15,000 gpd and 250,000 gpd, interpolation calculations between the \$2 million (for 15,000 gpd) and \$12 million (for 250,000 gpd) were used.

The estimated O&M costs for decentralized cluster plants include power costs, labor and materials. Power costs are based on \$0.44 per kilowatt hour and depend on how much plant capacity needs to be pumped. Labor and materials costs are based on historical local WWTP costs.

7.2.2 Cost Estimating for Centralized Treatment System

Preliminary conceptual site plans were prepared for sewers, force mains, WWPS and WWTPs using available GIS topography. Field observations of the project area were conducted to observe conditions of roads and identify existence of potential existing utilities.

Sewer and force main cost estimates are based on available bidding costs for recent water, sewer, and force main projects in Hawai‘i, including ones in Pauka‘a, Lono Kona, and Puakō (Appendix G-1). Average costs from within the last ten years for seven COH bids and five CCH bids were used. COH projects had smaller pipe diameters, and CCH projects involved larger pipe diameters. Estimated costs were prorated for sizes that were not used in those past projects.

The cost estimates also account for an outer island factor. COH costs include fewer large contractors and less competition, higher costs for shipping and material delivery, and more rural project settings with less traffic control requirements. On the other hand, CCH cost factors account for more large-scale contractors with more competition, lower costs for shipping and material delivery, and urban project sites with rigorous traffic control and utility relocations. In summary, the CCH costs were lower than COH in terms of competition and shipping factors, but higher than COH costs in terms of traffic control. These effects may cancel each other out, so the CCH costs for these particular projects could be used as they were without further adjustment.

Estimated costs were escalated from the bid date to present (year 2023) using the ENR Construction Cost Index (CCI). The ENR CCI used for the cost estimates is 13,473 (August 2023). Estimated construction costs for the overall project are summarized below (details are in Appendix G-2):

- Gravity sewer project cost estimates range from \$1,600 to \$8,700 per linear foot depending on the sizes, which range from 8-inch to 24-inch diameter pipes.
- Force main project cost estimates range from \$600 to \$4,430 per linear foot for pipe sizes of 4-inch to 14-inch diameter.
- LPS project cost estimates range from \$300 to \$600 per linear foot for 2-inch to 4-inch diameter pipes.

Treatment plant cost estimates include treatment to produce undisinfected secondary effluent for land application or R-3 recycled water, and do not include recycled water pumping and distribution systems.

Estimated O&M costs for a centralized treatment system include inspections, cleaning, and maintenance of the collection system sewer lines and WWTP and WWPS equipment and materials. These differ depending on the alternative’s design, average flow, and plant capacities.

7.2.3

Validation of Costs with CCWG Report

The CCWG report presents some of the latest and most comprehensive cost estimates for Hawai‘i. These values were used to validate the cost estimates used in this Master plan.

- Overall cesspool conversion cost
 - CCWG Report: \$9,000 to \$60,000 per conversion

- Puakō and South Kohala WW Master Plan: \$60,000, based on scaling the CCWG report costs to 2023 dollars and accounting for Puakō and South Kohala geology (see Section 7.2.1.1). This is close to the higher end of the CCWG Report range, due to the shallower depth to bedrock in Puakō and South Kohala.
- Additionally, HDOH records of 90 recent cesspool conversions were obtained and analyzed, which further supports the overall cesspool conversion cost used in this study. See Appendix G-2 for the overall range of costs of the 90 recent cesspool conversions.
- O&M cost estimate of IWS
 - CCWG Report: \$400 to \$1,300
 - Puakō and South Kohala WW Master Plan: \$900, based on historical cost estimates in the COH. This is close to the average of \$850 from the CCWG Report.
- Sewering cost estimate
 - CCWG Report: While specific costs are not identified, the report notes the following regarding feasibility of sewerizing:
 - "...there are significant capital investments required by counties of private developers, and connections to centralized systems may not be feasible for many cesspool conversions."
 - "Within the rural areas of Hawai'i, which are extensive, the costs to dig and construct long sewer systems from remote locations to a centralized treatment facility are substantial."
 - "Since many of the cesspools are in rural areas without centralized WW systems, conversion to Onsite WW Treatment System and disposal may still be the most cost-effective option for some homeowners, as long as permitted engineering for disposal is possible."
 - The CCWG report also compares typical average monthly sewer bills (\$40 for a single family in the COH) to monthly cesspool conversion costs (between \$94 and \$339 for low and high cost scenarios, respectively). From this, it appears that monthly cesspool conversion costs are higher than monthly sewer bills. However, it is key to consider that the monthly sewer bills are for areas that already have sewers in place, many funded by grants. The construction cost for new sewers would not be reflected in the current sewer bills. Therefore, it does not mean that sewerizing would cost less than cesspool conversions. As the CCWG report mentions, it would be "reasonable to assume that additional funding will be required to make conversions affordable for most residents."
 - Puakō and South Kohala Master Plan: while there are no CCWG Report costs to compare with, sewerizing costs for this Master Plan are based on local Hawai'i utility construction bids, including projects in Pauka'a, Lono Kona, and Puakō.

7.3 COMPARISON OF COST ESTIMATES

A summary of the LCC analysis for the alternatives is shown in Table 7-1. Supporting calculations are included in Appendix G. Findings from comparing the alternatives' cost estimates are summarized below.

The estimated LCC is calculated by estimated Total Capital Cost plus Net Present Value of O&M minus the Residual Value. The Total Capital Cost is the estimated construction and installation cost of the IWS, sewer lines, WWPS, and/or WWTP. Net Present Value of O&M is the 30-year period total of estimated O&M in present day dollars. Residual Value is the remaining value in today's dollars of the equipment, materials, and/or sewer lines at the end of the 30-year period. (30 years is used as this Master plan's period of analysis; see Section 4.2.) Therefore, the LCC is the cost of a system over its full life. It is only realized at the end of the system's life, hence its name as "life cycle."

7.3.1 Breakdown of Estimated Capital Costs between Collection and Treatment Costs

Table 7-2 is a summary of the estimated initial capital cost distribution between different types of WW infrastructure (piping, pump station, and WWTP). Additional details are included in Appendix G. For decentralized Alternative 1A (all IWS for residential and decentralized treatment for commercial areas and schools), 100 percent of the estimated initial capital cost is for WW treatment. For all Alternatives 2 through 5, the collection system makes up the vast majority of the initial capital cost, with WWTP costs making up just a small portion.

7.3.2 Breakdown of Estimated Life Cycle Costs between Homeowners and Managing Entities

The estimated costs in Table 7-1 are broken down in Table 7-3 to show potential costs to homeowners and the managing entities (e.g., COH or a neighborhood association). In general, homeowners would be responsible for what is on their lot, and managing entities would be responsible for the collection system and treatment. It is also possible for a managing entity to cover what is on a homeowner's lot as well, but the costs here assume the former case.

In Alternative 1A, the LCC per homeowner includes installation and O&M of their IWS, while the LCC to managing entities is to cover the decentralized plants. In Alternative 1B, homeowners are assumed to pay for the on-lot portion of the LPS. The LCC to the managing entities would be for the in-street LPS network and decentralized package plants. Since Alternatives 2 through 5 are based on having a sewer collection system and centralized WWTPs, the costs to homeowners would be for initial connection and their monthly sewer bill. Estimated costs to the managing entities would be those listed in Table 7-1.

7.3.3 Alternative with the Lowest Estimated Costs

Alternative 1B, the decentralized on-site treatment and LPSs alternative, has the lowest estimated capital cost and LCC. The estimated cost for Alternative 1B in Table 7-1 assumes 19 decentralized WWTPs with over 320,000 LF of in-street LPS ranging in size from 2-inch to 4-inch and nearly 6,000 on-lot LPS systems.

Alternative 1A, with all IWS or decentralized on-site treatment systems, also has relatively low estimated capital cost and LCC. This agrees with the CCWG report's finding that cesspool conversions may be the most cost-effective solution, given that most cesspools are in rural areas without centralized WW systems. The CCWG report states, "Hawai'i County also has the greatest proportion of households, without centralized sewers than any other county (71 percent), indicating that connection to a centralized sewer system is unlikely to be available for most properties. Without options to connect to an existing sewer, the only option for many cesspool owners in Hawai'i County is likely the installation of an approved onsite system." Alternative 1A is also considered as "no action" because there are no COH capital improvement projects. The estimated cost for Alternative 1A in Table 7-1 assumes replacement of about 6,000 existing IWS (either cesspool conversions or replacement of IWS at the end of their service life) and 14 cluster treatment plants serving commercial, institutional, and industrial sites with flows greater than 15,000 gpd.

7.3.4 Impact of Collection System Option on Cost Estimates

Comparing the collection system options within each alternative (A, B, and C variations), the highest LCC results from the A variation (all conventional gravity sewers/forcemains in existing roadways). Urban sewer alternatives (2 and 4) have the lower LCCs from the C variation (cross country sewers in new easements, while full flow sewer alternatives (3 and 5) have lower LCCs from the B variation (both conventional gravity sewers/forcemains and LPSs in existing roadways). See Sections 6.1 and 6.5 for details on comparing the different collection systems within each alternative.

Higher LCCs for the base alternatives are mainly due to high excavation costs for deep sewers within lava rock and also construction of multiple pump stations to account for the rolling terrain in South Kohala. For this size project, the WWTP costs in the centralized system alternatives are a relatively small percentage of the overall WW program cost. The majority of the costs are from laying the sewer collection network.

Compared to the A variations, the cross-country sewer options (variation C) have lower estimated capital costs and LCCs. The cross-country sewers would run in new easements, helping to reduce the number of neighborhood pump stations and associated force mains.

Compared to the A variations, the LPS options (variation B) have lower estimated capital costs and LCCs due to the smaller sizes and shallower depths of LPS and elimination of additional neighborhood pump stations. These sewer options do have

higher estimated O&M cost due to maintenance of pressure pumps and valves within each lot.

7.3.5 Impact of Design Average Flow on Cost Estimates

Comparing urban seweraging and full flow seweraging alternatives, the LCCs are higher for the latter. Larger pipes are needed to accommodate the increased flow in the full flow seweraging alternatives. The estimated capital costs do not include the additional sewers and pump stations required to serve the areas outside the urban seweraging areas, as these are assumed to be paid by the area developer.

7.3.6 Impact of Number of WWTPs on Cost Estimates

Alternatives that use existing private WWTPs (Alternatives 2 and 3) have fewer new COH WWTPs than Alternatives 4 and 5, which only use new COH WWTPs for treatment. There appears to be little or no cost benefit to using existing private WWTPs, particularly if it results in longer collection systems. See Section 7.3.1 for breakdown of cost estimates between collection system and treatment.

A difference between the urban seweraging vs. full flow alternatives is that Waimea is served by three WWTPs for Alternatives 2 and 4 and one WWTP for Alternatives 3 and 5. This configuration is used because it provides an interceptor sewer along all of Waimea town for full flow seweraging. As a result, this alternative has the largest pipelines, which contributes to the high estimated capital cost and LCC.

7.3.7 Impact of Additional Treatment for R-2 and R-1 Water Recycling

All cost estimates are based on providing secondary treatment with no disinfection (HDOH R-3 effluent) using land application for effluent disposal. The estimated treatment costs would increase by approximately 7 percent to add disinfection to produce R-2 effluent meeting HDOH requirements. The estimated treatment costs would increase by an additional 30 percent to add filtration and enhanced disinfection to produce R-1 effluent meeting HDOH requirements.

7.3.8 Estimated Cost Summary Tables

Table 7-1: Puakō and South Kohala WW Management Alternatives LCC Analysis Summary (Level of Treatment – R3)

Alternative No.	Description	Capital Cost	NPV of O&M Cost	Residual Value	Total LCC
1A	IWS for All Residential + Decentralized Treatment for Commercial/Institutions	\$0.6B	\$0.2B	\$0.2B	\$0.6B
1B	Both Decentralized On-Site Treatment and LPS	\$0.6B	\$0.2B	\$0.2B	\$0.6B
	Waimea	\$34B	\$0.09B	\$0.12B	\$31B
	Kawaihae	\$0.06B	\$0.01B	\$0.02B	\$0.05B
	Puakō	\$0.04B	\$0.01B	\$0.02B	\$0.03B
	Waikoloa	\$0.02B	\$0.00B	\$0.01B	\$0.02B

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Alternative No.	Description	Capital Cost	NPV of O&M Cost	Residual Value	Total LCC
1B (cont'd)	Waiki'i	\$0.04B	\$0.00B	\$0.02B	\$0.03B
	Other non-urban and private seweraging area	\$1.14B	\$0.07B	\$0.05B	\$1.16B
2A	Urban Sewering, All Gravity Sewers (3 COH WWTPs, 2 Existing Private WWTPs)	\$1.3B	\$0.1B	\$0.6B	\$0.8B
	Waimea	\$0.95B	\$0.04B	\$0.41B	\$0.58B
	Kawaihae	\$0.22B	\$0.02B	\$0.09B	\$0.15B
	Puakō	\$0.09B	\$0.01B	\$0.04B	\$0.06B
	Waikoloa	\$0.05B	\$0.00B	\$0.02B	\$0.03B
	Waiki'i	---	---	---	---
2B	Urban Sewering, Both Gravity Sewer and LPS (3 COH WWTPs, 2 Existing Private WWTPs)	\$1.1B	\$0.1B	\$0.5B	\$0.8B
	Waimea	\$0.82B	\$0.06B	\$0.35B	\$0.53B
	Kawaihae	\$0.20B	\$0.02B	\$0.08B	\$0.14B
	Puakō	\$0.05B	\$0.01B	\$0.02B	\$0.04B
	Waikoloa	\$0.05B	\$0.00B	\$0.02B	\$0.03B
	Waiki'i	---	---	---	---
2C	Urban Sewering, Cross Country Sewer (3 COH WWTPs, 2 Existing Private WWTPs)	\$1.2B	\$0.1B	\$0.5B	\$0.8B
	Waimea	\$0.89B	\$0.03B	\$0.39B	\$0.53B
	Kawaihae	\$0.21B	\$0.02B	\$0.08B	\$0.14B
	Puakō	\$0.09B	\$0.01B	\$0.04B	\$0.06B
	Waikoloa	\$0.05B	\$0.00B	\$0.02B	\$0.03B
	Waiki'i	---	---	---	---
3A	Full Flow Sewering, All Gravity Sewers (2 COH WWTPs, 3 Existing Private WWTPs)	\$2.1B	\$0.1B	\$0.9B	\$1.3B
	Waimea	\$1.16B	\$0.04B	\$0.50B	\$0.69B
	Kawaihae	\$0.23B	\$0.02B	\$0.09B	\$0.16B
	Puakō	\$0.09B	\$0.01B	\$0.04B	\$0.06B
	Waikoloa	\$0.47B	\$0.01B	\$0.20B	\$0.27B
	Waiki'i	\$0.12B	\$0.00B	\$0.05B	\$0.07B
3B	Full Flow Sewering, Both Gravity Sewer and LPS (2 COH WWTPs, 3 Existing Private WWTPs)	\$1.8B	\$0.1B	\$0.8B	\$1.1B
	Waimea	\$1.03B	\$0.06B	\$0.45B	\$0.64B
	Kawaihae	\$0.21B	\$0.02B	\$0.08B	\$0.15B
	Puakō	\$0.08B	\$0.01B	\$0.03B	\$0.06B

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Alternative No.	Description	Capital Cost	NPV of O&M Cost	Residual Value	Total LCC
3B (cont'd)	Waikoloa	\$43B	\$0.02B	\$19B	\$26B
	Waiki'i	\$0.04B	\$0.00B	\$0.02B	\$0.03B
3C	Full Flow Sewering, Cross Country Sewer (2 COH WWTPs, 3 Existing Private WWTPs)	\$2.0B	\$0.1B	\$0.9B	\$1.2B
	Waimea	\$1.09B	\$0.03B	\$48B	\$64B
	Kawaihae	\$0.21B	\$0.02B	\$0.08B	\$0.14B
	Puakō	\$0.09B	\$0.01B	\$0.04B	\$0.06B
	Waikoloa	\$0.46B	\$0.00B	\$0.20B	\$0.26B
	Waiki'i	\$0.12B	\$0.00B	\$0.05B	\$0.07B
4A	Urban Sewering, All Gravity Sewers (5 COH WWTPs)	\$1.2B	\$0.1B	\$0.5B	\$0.8B
	Waimea	\$0.81B	\$0.04B	\$0.35B	\$0.51B
	Kawaihae	\$0.27B	\$0.02B	\$0.11B	\$0.18B
	Puakō	\$0.08B	\$0.01B	\$0.03B	\$0.05B
	Waikoloa	\$0.05B	\$0.00B	\$0.02B	\$0.03B
	Waiki'i	---	---	---	---
4B	Urban Sewering, Both Gravity Sewer and LPS (5 COH WWTPs)	\$1.0B	\$0.1B	\$0.4B	\$0.7B
	Waimea	\$0.69B	\$0.06B	\$0.29B	\$0.45B
	Kawaihae	\$0.25B	\$0.02B	\$0.10B	\$0.17B
	Puakō	\$0.06B	\$0.01B	\$0.02B	\$0.05B
	Waikoloa	\$0.04B	\$0.00B	\$0.02B	\$0.03B
	Waiki'i	---	---	---	---
4C	Urban Sewering, Cross Country Sewer (5 COH WWTPs)	\$1.1B	\$0.1B	\$0.5B	\$0.7B
	Waimea	\$0.75B	\$0.03B	\$0.32B	\$0.45B
	Kawaihae	\$0.25B	\$0.02B	\$0.10B	\$0.17B
	Puakō	\$0.08B	\$0.01B	\$0.03B	\$0.05B
	Waikoloa	\$0.05B	\$0.00B	\$0.02B	\$0.03B
	Waiki'i	---	---	---	---
5A	Full Flow Sewering, All Gravity Sewers (4 COH WWTPs)	\$2.1B	\$0.1B	\$0.9B	\$1.3B
	Waimea	\$1.16B	\$0.04B	\$0.50B	\$0.69B
	Kawaihae	\$0.25B	\$0.02B	\$0.10B	\$0.17B
	Puakō	\$0.08B	\$0.01B	\$0.03B	\$0.06B
	Waikoloa	\$0.49B	\$0.01B	\$0.21B	\$0.28B
	Waiki'i	\$0.12B	\$0.00B	\$0.05B	\$0.07B

Alternative No.	Description	Capital Cost	NPV of O&M Cost	Residual Value	Total LCC
5B (cont'd)	Full Flow Sewering, Both Gravity Sewer and LPS (4 COH WWTPs)	\$1.8B	\$0.1B	\$0.8B	\$1.2B
	Waimea	\$1.03B	\$.06B	\$.45B	\$.64B
	Kawaihae	\$.23B	\$.03B	\$.09B	\$.17B
	Puakō	\$.06B	\$.01B	\$.02B	\$.05B
	Waikoloa	\$.45B	\$.02B	\$.20B	\$.28B
	Waiki'i	\$.04B	\$.00B	\$.02B	\$.03B
5C	Full Flow Sewering, Cross Country Sewer (4 COH WWTPs)	\$2.0B	\$0.1B	\$0.9B	\$1.2B
	Waimea	\$1.09B	\$.03B	\$.48B	\$.64B
	Kawaihae	\$.23B	\$.02B	\$.09B	\$.16B
	Puakō	\$.08B	\$.01B	\$.03B	\$.06B
	Waikoloa	\$.48B	\$.01B	\$.21B	\$.27B
	Waiki'i	\$.12B	\$.00B	\$.05B	\$.07B

Note: Collection system options for Alternative 2 thru 5: alternatives ending with "A" use conventional gravity sewers in existing roadways; alternatives ending with "B" use both gravity sewers and LPS; and alternatives ending with "C" use cross-country sewers in new easements.

B billion

NPV net present value

Table 7-2: Breakdown of Estimated Capital Costs between Collection and Treatment Costs

Alternative	Collection System Costs as Percent of Capital Cost	Treatment Costs as Percent of Capital Cost
1A	0%	100%
1B	73%	27%
2 through 5	94–98% ^a	2–6%

Note:

^a Within the collection system costs, piping costs range from 78% to 91% of the capital cost, and WWPS costs range from 7% to 17% of the capital cost.

Table 7-3: Breakdown of Estimated Costs between Homeowners and Managing Entity

Alternative	Capital Cost to Homeowners		Capital Cost to Other Entities ^c	Capital Cost to COH	Total Capital	Notes
	Total ^a	Per Homeowner ^b				
1A	\$351M	\$60K	\$59M	\$0	\$591M	IWS Conversion
1B	\$219M	\$49K	\$372M	\$0	\$563M	Low Pressure Sewers
2 through 5	\$29M	\$5K for Gravity Sidesewers	\$0	Varies depending on alternative	\$1.0B to \$2.1B	Varies depending on alternative
	\$296M	\$51K for LPSs	\$0			

B billion

M million

K thousand

^a Includes all costs for treatment and collection systems^b To estimate the total cost per homeowner, the total cost to homeowners is divided by 5,854, which is the total of existing and projected number of IWS in 2052.^c Entities may include institutions (schools) or private commercial developments.**Table 7-4: Alternative 1A Estimated Costs of Only Existing Cesspool Conversions (no growth)**

Capital Cost	Capital Cost per Homeowner ^a
\$272M	\$60K

^a Capital cost is based on 4,530 existing cesspools.

7.3.9

Ranking Based on Estimated Costs

The alternatives evaluated in Section 6.5 are compared and listed in Table 7-5 based on the conceptual level capital cost and O&M costs. The alternatives are listed from low to high based on total lifecycle cost. With the lowest capital and lifecycle cost, Alternative 1B with decentralized onsite treatment and LPSs is ranked highest as the most favorable alternative in terms of estimated cost, followed by Alternative 1A with IWS and decentralized treatment for commercial/institutional uses. Note that Alternative 1B LPS was for urban sewerage and Waiki'i area flow only. A full flow sewerage scenario for Alternative 1B LPS will have higher cost than Alternative 1A and would be ranked lower than Alternative 1A.

Table 7-5: Puakō Wastewater Management Alternatives Estimated LCC Ranking

Alternative No.	Description
1B	Both Decentralized On-Site Treatment and LPS
1A	IWS for All Residential + Decentralized Treatment for Commercial/Institutions
4B	Urban Sewering, Both Gravity Sewer and LPS (5 COH WWTPs)
4C	Urban Sewering, Cross Country Sewer (5 COH WWTPs)
2B	Urban Sewering, Both Gravity Sewer and LPS (3 COH WWTPs, 2 Existing Private WWTPs)
2C	Urban Sewering, Cross Country Sewer (3 COH WWTPs, 2 Existing Private WWTPs)
4A	Urban Sewering, All Gravity Sewers (5 COH WWTPs)
2A	Urban Sewering, All Gravity Sewers (3 COH WWTPs, 2 Existing Private WWTPs)
3B	Full Flow Sewering, Both Gravity Sewer and LPS (2 COH WWTPs, 3 Existing Private WWTPs)
5B	Full Flow Sewering, Both Gravity Sewer and LPS (4 COH WWTPs)
3C	Full Flow Sewering, Cross Country Sewer (2 COH WWTPs, 3 Existing Private WWTPs)
5C	Full Flow Sewering, Cross Country Sewer (4 COH WWTPs)
3A	Full Flow Sewering, All Gravity Sewers (2 COH WWTPs, 3 Existing Private WWTPs)
5A	Full Flow Sewering, All Gravity Sewers (4 COH WWTPs)

7.4

ALTERNATIVES RATING

A relatively simple six criteria rating system Table 7-6 has been prepared to evaluate the alternatives and assist with the selection of a preferred treatment alternative. The rating system allows the comparison of each alternative. The following rating scale is used:

- 3 = Excellent
- 2 = Good
- 1 = Fair

7.5

RATING CRITERIA

The following criteria were identified and reviewed to compare the various WW treatment and collection system alternatives for Puakō and other communities within South Kohala described in Section 6.0. The six criteria are:

- Estimated Construction Cost

- Estimated Annual O&M Cost
- Operational Ease and Maintainability
- Flexibility to meet Potential Future Requirements
- Utilization and Acquisition of Land
- Environmental Concerns/Regulatory Permitting

The following sections describe each criterion. Ratings are discussed based on the COH DEM perspective. The unweighted scoring is shown in Table 7-6. Potential weighting is discussed in Section 7.5.7.

Table 7-6: South Kohala Wastewater Management Alternatives Rating Matrix

Criteria	Alternatives					
	Alt 1A: All IWS or Decentralized Systems	Alt 1B: Decentralized On- Site Treatment and LPS	Alt 2: Urban Sewering, (3 COH WWTPs, 2 Existing Private WWTPs)	Alt 3: Full Flow Sewering (3 COH WWTPs, 2 Existing Private WWTPs)	Alt 4: Urban Sewering (5 COH WWTPs)	Alt 5: Urban Sewering (4 COH WWTPs)
	Score	Score	Score	Score	Score	Score
Estimated Construction Cost	3	3	2	1	2	1
Estimated Annual O&M Cost	3	3	2	1	2	1
Operational Ease and Maintainability	3	3	2	1	2	1
Ability to meet Potential Future Requirements	1	1	2	2	2	2
Utilization and Acquisition of Land	3	2	2	2	2	2
Environmental/Regulatory Permitting	1	3	3	3	3	3
Total Score	14	15	13	10	13	10

Notes:

3 is the most favorable alternative, 1 is the least favorable alternative.

The highest total score is the most favorable alternative.

Scores shown are based on review by DEM and input received from other project stakeholders.

7.5.1 Estimated Construction Cost

This criterion includes the estimated cost of the capital improvement, including labor and materials as well as indirect costs to design and construct the WW system, constructability (ease or efficiency that the facility can be built) which makes it more economical and construction implementation schedule.

The most favorable Alternatives are Alternative 1A: All IWS or Decentralized Systems and Alternative 1B: Both Decentralized On-Site Treatment and LPS because they have the lowest estimated construction cost of all alternatives. Of the gravity sewer collection system options, Alternatives 2B and 4B are the lowest cost alternatives which provide urban seweraging.

7.5.2 Estimated Annual O&M Cost

This criterion is the annual cost of labor, consumables, and energy to operate the WW system. This criterion includes a comparison of how much energy is required for different options to provide the same service. Smaller treatment facilities would require less energy to operate than larger treatment facilities. However, factors such as the length of pipe between structures and the difference in topography would also have an impact on the energy efficiency of the facilities.

The most favorable alternatives based on lowest O&M cost are Alternatives 2C and 4C, both of which use cross country sewers in new easements to reduce the number of pump stations.

From the DEM perspective, the county's responsibility would be for O&M of collection systems, pumping stations, and related subregional or regional plants treating WW from the public. The county would likely not provide O&M for Alternative 1A: All IWS or Decentralized Systems because individual IWS would be operated and maintained by each individual homeowner or commercial/institutional entity.

7.5.3 Operational Ease and Maintainability

This criterion is the ease with which the WW system can be kept functioning in a safe and reliable manner. Operational ease is the capability to keep the WW treatment equipment and systems functioning in a safe and reliable manner in accordance with the prescribed operating requirements. Systems that are more complex or have more processes and/or functions are more difficult to operate than simpler systems.

This criterion includes operator availability (if certified operators are required), and the level of skills needed to operate and maintain systems. For example, maintenance of IWS will be handled by each homeowner and maintenance of a centralized WWTP will be handled by the County.

Maintainability is the probability that a successful repair action can be performed within its designated allowable time schedule. Maintainability measures the ease and/or speed with which a system can be restored to operational status after a failure occurs. Systems that have more equipment or devices are more difficult to

maintain than smaller scale systems. Maintainability is also impacted by the work setting, lighting, size, and available space around the equipment. One factor is the concept of “carry your own kuleana”. This refers to the maintenance responsibility to keep a WW system functioning if it is kept closer to the user versus the flushing of problems “away” and some other community handling it.

From the COH’s perspective, the most favorable alternative are Alternative 1A: All IWS or Decentralized Systems and Alternative 1B: Decentralized Onsite Treatment and LPS. Maintenance would be managed by each individual property owner not the county. The WW/septic waste would still require COH participation for treatment (example: trucking septage to the Kealakehe WWTP, which is the closest facility to the project area).

7.5.4 Flexibility to Meet Potential Future Requirements

This criterion is the ability to meet potential future regulation changes including WW treatment levels and effluent disposal/use; sustainable solids handling strategy; ability to meet future demands and ability to meet future water quality requirements. All WW treatment options will produce additional quantities of solids compared to the current situation of using cesspools as the primary method of handling WW in South Kohala. The quantity of additional solids, along with the operating complexity of solids producing processes, are considered.

The resilience of an alternative to climate change is a consideration. Resiliency is the ability of an infrastructure system to adapt to and withstand various climate-related stressors: which may include lava, earthquakes, floods, droughts, and wildfires. Resilient infrastructure is planned, designed, built, and operated in a way that anticipates, prepares for, and adapts to changing climate conditions. It can also withstand, respond to, and recover rapidly from disruptions caused by these climate conditions.

“Recycled water” is treated WW that is intended, or used, for beneficial purposes. HDOH advocates the use of recycled water if public health and water resources are not compromised. The use of recycled water may become more significant due to COH’s growing population, limited potable water resources, and WW disposal issues. The ability to produce recycled water and the operating complexity of the recycled water treatment systems impact the comparison of the alternatives.

Having separate decentralized treatment plants would make it easier to distribute and reuse the water throughout the Project Area. The alternatives with a single WRF would make it more difficult to distribute the water to the more remote areas away from the facility.

In 2016, the HRS were amended by Act 248, which added a new section related to WW treatment. The new section prohibits the discharge of treated or raw sewage into state waters after December 31, 2026, unless the WW treatment systems produce “clean energy.” Therefore, the quantity of clean energy and the operating complexity of energy producing systems play a role in comparing alternatives if the alternative discharges into state waters.

The flexibility to meet and adapt to future regulations, along with resilience and ability to handle solids favors all alternatives except Alternative 1A: all IWS or Decentralized Systems and Alternative 1B: Both Decentralized On-Site Treatment and LPS. The alternatives with COH or private treatment plants have more flexibility to adjust to future regulatory requirements than the all IWS alternative.

If the potential use and distribution of recycled water is given more importance, then Alternative 1B is the most favorable alternative, since the decentralized treatment units would be located throughout the community, allowing reuse distribution networks to be smaller and able to adjust for each area.

7.5.5

Utilization and Acquisition of Land

This criterion considers site acquisition; site layout efficiency; availability of county land; ability to obtain easements for collection system; impact on land use during construction; ease in meeting security requirements to prevent unauthorized entry and vandalism.

One factor is the difficulty in obtaining easements over private lands for the collection system. Some of the subdivisions in South Kohala are on private lands, including private roadways where the trunk lines may be located.

From the COH's perspective, the most favorable Alternative is Alternative 1A: All IWS or Decentralized Systems because it does not require COH property acquisition, thus making this alternative more easily implementable.

7.5.6

Environmental Concerns/Regulatory Permitting

This criterion evaluates the environmental concerns and regulatory permitting requirements for each alternative. The alternative ranking evaluates the difficulty in permitting the project for construction, implications for the design and construction, and ability to mitigate impacts such as odor and vector control. The environmental concerns include evaluation of the State prioritization of areas for cesspool, potential impact on drinking water due to existing cesspools and future use of effluent. Other environmental impacts include air quality, water quality, biological resources, archaeological, historic and cultural resources, aesthetic resources, noise and vibration, transportation, other public services, and socioeconomic factors.

This criterion includes competing concerns. The ease of permitting and environmental review (from the COH's perspective) for Alternative 1A: All IWS or Decentralized Systems, and Alternative 1B: Both Decentralized On-Site Treatment and LPS is offset by the potential environmental impacts of the higher number of discharge points and in the case of Alternative 1A, the potential for IWS failures. The construction impacts of small discrete IWS may be less concerning than impacts due to larger treatment plants and the attendant air, water, biological, archaeological, historical and cultural resources. All alternatives other than Alternative 1A would likely require environmental assessments for the treatment plant(s) and collection systems.

There are environmental concerns associated with IWS related to both the potential for failing systems or lack of maintenance and the potential for groundwater pollution from these systems. A requirement to track and inspect systems and document regular system maintenance could address the first concern. Existing regulations do not address the second concern, but this should be monitored over time.

7.5.7

Criteria Weighting

In the above ranking, each criterion had equal ranking, with the result that Alternative 1B: Decentralized On-Site Treatment and LPS Systems was ranked highest. During the public input and review portion of the project, COH asked attendees (virtually and in person) to indicate their ranking of the priority of the criterion, using two methods. The virtual public presentation was held March 14, 2024. The input received is shown in Table 7-7.

Table 7-7: Virtual Meeting Criterion Weighting Input

Criterion	Votes
Estimated Construction Cost	3
Estimated Annual O&M Costs	7
Operational Ease and Maintainability	3
Flexibility to meet potential future requirements	2
Utilization and acquisition of land	3
Environmental Concerns and Regulatory Permitting	3

The table shows that the Estimated Annual O&M Cost received more than twice the votes of the other criterion.

The following were the answers to the question asked in the virtual meeting: Are there any other factors that should be considered in evaluation the WW Master Plan Alternatives?

- Burden on the home owner
- Affordability of service
- Sustainable financing
- Prioritization of areas with younger porous soil and areas with greater potential to pollute nearshore waters or drinking water
- Substrate and potential of waste/sludge dispersion into groundwater table
- Staff to maintain
- Rates increases countywide
- Time it takes for development based on design complexity and supply chains

- Help for lower moderate income people to convert

An in person public meeting was held on April 8, 2024, at Waikoloa Elementary and Middle School. The public attendees were given three marbles to vote for their top three criterion. The results are shown in Table 7-8.

Table 7-8: Public Meeting Criterion Weighting Input

Criterion	Votes
Estimated Construction Cost	3
Estimated Annual O&M Costs	4
Operational Ease and Maintainability	6
Flexibility to meet potential future requirements	11
Utilization and acquisition of land	4
Environmental Concerns and Regulatory Permitting	17

The table shows that Environmental Concerns and Regulatory Permitting was highest priority and Flexibility to meet potential future requirements was next highest, all significantly higher than the other priorities.

These potential weighting factors can be applied to the criterion to see whether the total rankings are changed. Table 7-9 shows the results for unweighted as well as the two weighting options from the public meetings and one option showing the sensitivity of the results to weighting. To change the Alternative with highest ranking from Alternative 1B would require weighting the Flexibility criterion 3 times the other criteria.

Table 7-9: Weighted Criterion Results

Weighting Options	Alternatives					
	Alt 1A: All IWS or Decentralized Systems	Alt 1B: Decentralized On-Site Treatment and LPS	Alt 2: Urban Sewering,	Alt 3: Full Flow Sewering	Alt 4: Urban Sewering	Alt 5: Urban Sewering
	(3 COH WWTPs, 2 Existing Private WWTPs)	(3 COH WWTPs, 2 Existing Private WWTPs)	(5 COH WWTPs)	(4 COH WWTPs)		
Weighted Scores						
Unweighted	14	15	13	10	13	10
Weighted Based on 3/14/24 Input	53	56	45	32	45	32
Weighted Based on 4/8/24 Input	79	109	107	94	107	94
Weighted with Flexibility 3x others	16.0	17.0	17.0	14.0	17.0	14.0

7.5.8 Overall Rating Results

The ranking from DEM reflects the assumption that for Alternatives 1A and 1B the cost and responsibility is with landowners, not the county. However, COH favors the highest level of treatment and values lowest impact on the environment.

The above criteria have been used to evaluate the alternatives for South Kohala; however, the selection of an alternative or combination of alternatives also needs to include countywide assessments of the improvements required to meet the cesspool conversion and other required improvements. The County is currently in the process of planning for multiple areas and beginning a countywide plan for implementation. Selection of the best alternative for South Kohala should include input from this countywide process.

8.0 FUNDING AND FINANCING CONSIDERATIONS

This section covers institutional and financial support for implementing cesspool conversions, and recommends strategies to consider.

8.1 INSTITUTIONAL STRUCTURE

To allow development of a plan of operation for this master plan, the existing institutional arrangement should be reviewed, and a financial program should be developed after selection of a plan and design. The plan of operation should include preliminary allocation of the costs among various users of the WW system. Feasibility of the plan requires agreement among participating entities and stakeholders on the plan implementation. Preparation of a plan of operation is critical, which should include the staffing, management, training, operation, maintenance, and analysis to ensure effective operation of the infrastructure.

8.1.1 Existing Regulations

In the State of Hawai‘i, there are currently 81,425 documented cesspools. Hawai‘i island is estimated to have 48,596 cesspools releasing an estimated 27.3 million gallons of effluent daily [34]. Property owners and operators must comply with all federal and state requirements for cesspools. Act 125, which came into effect in 2017, mandates that all cesspools in Hawai‘i must be upgraded, converted, or closed by January 1, 2050. Act 132, established in 2018, created a CCWG attached to the HDOH, which will develop a plan for cesspool conversion statewide by 2050. The final report was required to be provided to the State of Hawai‘i legislature no later than 60 days before the 2023 legislative session. The CCWG submitted it November 2022.

The HDOH WW Branch oversees and permits all onsite WW systems, including cesspools. Act 125 directed HDOH to evaluate residential cesspools in the state, develop a Report to the Legislature that includes a prioritization method for cesspool upgrades, and work with the Department of Taxation on possible funding options to reduce the financial burden on homeowners. As the CCWG continued to develop a conversion plan, additional research and planning progressed, including reports on conversion or upgrade alternatives, prioritization of locations, and financing options.

Act 87 was passed in 2022, amending Act 125 by broadening the upgrade or conversion options that are available for cesspools.

COH DEM oversees sewer O&M. See Section 0 for more information.

8.2 PRIORITY AREAS

Understanding prioritization of areas for cesspool conversions may help with formulating a plan for funding and scheduling WW projects. HDOH has prioritized cesspools for

corrective action based on the risk the cesspools pose and existing infrastructure such as nearby sewer mains to receive WW flows. Also considered are the density of cesspools in an area; soil characteristics; proximity to drinking water sources, streams, and shorelines; other groundwater inputs including agriculture and injected WW; and the physical characteristics of coastal waters that may compound the impacts of WW on bays and inlets. In the 2017 Report to the Twenty-Ninth Legislature, the HDOH proposed that cesspool replacement efforts be focused by geographic area, and prioritized using four broad categories [34]: Priority 1: Significant risk of human health impact, drinking water impacts, or draining to sensitive water; Priority 2: Potential to Impact Drinking Water; Priority 3: Potential Impacts on Sensitive Waters; and Priority 4: Impacts not Identified.

In 2021, the Hawai‘i Cesspool Prioritization Tool (HCPT) was released, which provided the CCWG and its Data and Prioritization Subgroup with updated information and data to help make informed decisions. An updated HCPT was published in 2022. The HCPT identifies a comprehensive list of factors that assisted in the creation of a new cesspool prioritization and hazard assessment. Every cesspool in the state was assessed and prioritized. The tool is designed for the purpose of categorizing cesspools based on potential or realized harm to humans and the environment. A site-based process was used to evaluate factors, determining if a cesspool at a given location has a higher or lower potential to cause negative social and environmental impacts. It is a GIS tool and examined and categorized previously uncategorized (i.e., Priority Level 4 from the previous 2017 prioritization) cesspools.

The HCPT uses the following criteria (risk factors) to calculate a geographic prioritization score:

1. Distance to municipal or domestic drinking water wells;
2. Well capture zones;
3. Distance to streams and wetlands;
4. Distance to coastline;
5. Sea level rise zones;
6. Precipitation;
7. Depth to groundwater;
8. Groundwater flow paths;
9. Soil characteristics;
10. Cesspool density;
11. Coral cover;
12. Fish biomass/recovery potential;
13. Beach user-days;
14. Proximity to lifeguarded beach; and
15. Coastal ocean circulation proxy

The HCPT prioritization method places each geographic area into three Prioritization Categories that include:

1. Priority Level 1: Greatest contamination hazard.
2. Priority Level 2: Significant contamination hazard.
3. Priority Level 3: Pronounced contamination hazard.

In Puakō and South Kohala, there are 4,530 cesspools and over 2,000 of them are Priority 1 with the balance Priority Level 3. The tract name and ID along with the cesspool count from the HCPT is shown in Table 8-1. Every cesspool in the inventory was assigned a priority ranking, on the basis that none were exempt from conversion. However, rather than reviewing every single system individually, the tool results are consolidated into prioritization areas using census boundaries at multiple resolutions.

Table 8-1: Cesspools by Census Tract

Census Tract	OSDS Class IV (HDOH Priority Level 1)	OSDS Class IV (HDOH Priority Level 3)	OSDS Class IV Total
217.05 Waimea – Kohala	0	1,648	1,648
217.06 Waimea – Pu’u Anahulu	0	727	727
217.07 Waikōloa – South Kohala	346	0	346
217.08 Kawaihae – ‘Anaeho’omalu	1,679	1	1,680
218 North Kohala (Partial)	0	129	129
Total	2,025	2,505	4,530

The HCPT tool is a starting point for assessing the areas with the most significant hazards and is meant to support the development of a cesspool conversion plan. The tool is not meant to inform cesspool conversion prioritization timelines. However, the hazard categories provide a framework to prioritize cesspool conversions by the CCWG.

8.3 CESSPOOL CONVERSION IMPLEMENTATION

Generally, options for upgrade or closure include:

- Closure and connection to an existing nearby sewer system with available capacity.
- Closure and connection to a new private or public sewer system.
- Closure and connection to a community-scale package WW treatment system.
- Upgrade to an onsite septic tank and/or ATU system.

Regarding resources required, this is from the 2017 HDOH Report to the Legislature [34]:

Replacement of each existing cesspool with an improved treatment method could cost \$20,000 or more per system, for a total cost around \$1.75 billion for the 87,900 currently inventoried cesspools (an average construction investment of \$54.7

million per year from 2018 through 2049). However, costs may vary from this amount if other options such as connecting to existing sewage treatment systems, joining multiple homes in small-scale community package sewer or joint septic systems, or constructing new larger-scale sewage treatment systems are considered.

A subsequent 2021 report prepared by Carollo Engineers for HDOH stated the following [35]:

Historical costs of cesspool upgrades to approved systems range widely from approximately \$9,000 to \$60,000 or more depending on the wastewater system capacity (based on bedroom count), technology, and location or site constraints. Assuming an average conversion cost of \$23,000, the potential magnitude of the financial burden to convert all 88,000 cesspools is over two billion dollars. (2020 dollars)

Cesspool conversion costs will be a financial burden to many residents in Hawai‘i. The Legislature tasked the CCWG to develop a strategy to aid the funding and financing of the cesspool upgrades.

8.3.1

Financing Available to Individual Homeowners

Opportunities for cesspool conversion funding mechanisms include tax credits or rebates, federal, state, or county grants, and private/mortgage loans (affordability is described in Section 8.4) [36]:

- Private/Mortgage Loans
- State Tax Credits or Rebate Programs: Act 120, the temporary tax credit program, expired on December 31, 2020
- Grants and Loans: most programs require a public entity or agency as the applicant, but sub loans may be possible.
- Clean Water State Revolving Fund (CWSRF) Program: low interest loans provided to public entities. The State of Hawaii’s program allows for funding to be provided to individuals via the counties, other federal/state agencies, non-profits, or financial institutions. A specific administrative mechanism would need to be set up for an intermediary to funnel funding to individuals.

In June 2022, the following bills related to financing were adopted into law:

- Act 183 HB2088 HD3 SD2: creates the commercial property assessed financing program. The Counties may authorize the Hawai‘i green infrastructure authority to offer commercial property assessed financing utilizing a non-ad valorem special tax assessment to pay the cost of qualifying improvements.
- Act 153 HB2195 HD2 SD1 CD1: establishes a Cesspool Compliance Pilot grant project to assist low- and moderate-income property owners to upgrade or convert a cesspool (in priority levels 1 or 2). HDOH shall grant awards not to exceed \$20,000.

The Bill also appropriated \$5 million from the general fund for the fiscal year 2022-2023.

In March, 2023, the HDOH communicated procedures and held informational meetings to assist the public in applying for the Cesspool Compliance Pilot Grants. A flowchart describing the process is included in Appendix H.

8.3.2

Financing Alternatives for County of Hawai‘i

Potential funding options, recommendations, and benefits and limitations are included in the following table, and further information on funding opportunities can be found in the Cesspool Conversion Finance Research Summary Report [36].

8.3.2.1

BONDS

General obligation (GO) bonds are backed by the general revenue of COH. Revenue bonds are supported by a specific revenue source, such as income from sewer fees.

8.3.2.2

GRANTS

Economic Development Administration

The U.S. Economic Development Administration (EDA) grants help to fulfill regional economic development strategies designed to accelerate innovation and entrepreneurship, advance regional competitiveness, create higher-skill, living-wage jobs, generate private investment, and fortify and grow industry clusters. COH received an EDA Grant in 2021 for Puna, and utilized it for a Programmatic EIS and WW System Master Plan for the area. Grants cover economic adjustment assistance, short term planning, and technical assistance programs under Sections 203, 207 and 209 of the Public Works and Economic Development Act of 1965, as amended, 42 U.S.C. §§ 3143, 3147 and 3149.

USBR

The U.S. Bureau of Reclamation (USBR) awards grants to water districts and other project sponsors seeking to reuse water and add to water supplies. From 1992 through 2017, it awarded about \$715 million. About \$703 million went towards construction projects that recycled water. The DEM is currently submitting a USBR Grant application to fund some of the Kealakehe WWTP R-1 improvements.

EPA Technical Assistance

The EPA has several programs to provide technical assistance. The following describes examples of programs that may be available for COH.

- Urban Waters Small Grants program: fund research, investigations, experiments, training, surveys, studies, and demonstrations that will advance the restoration of urban waters by improving water quality through activities that also support community revitalization and other local priorities.
- Water Infrastructure and Resiliency Finance Center: works with on-the-ground partners to provide financial technical assistance to communities. The organization

provides financial advice to help communities make informed decisions on funding drinking water, WW, and stormwater infrastructure projects. Utilities may also access tools for help with financing decisions to meet local infrastructure needs.

USDA Rural Development Loan and Grant Assistance

The U.S. Department of Agriculture (USDA) forges partnerships with rural communities, funding projects that bring housing, community facilities, business guarantees, utilities, and other services to rural America. USDA provides technical assistance and financial backing for rural businesses and cooperatives to create quality jobs in rural areas. USDA Rural Development works with low-income individuals, State, local and Indian tribal governments, as well as private and nonprofit organizations and user-owned cooperatives.

Bipartisan Infrastructure Framework and the Build Back Better Act

The Bipartisan Infrastructure Framework and the Build Back Better Act allocate funding for various types of WW infrastructure. These include: Upgrades to WWTPs, adoption of green infrastructure solutions, strengthening of WW infrastructure to withstand climate change impacts, and prioritization of underserved communities to ensure equal access to sanitation and clean water. Monitoring should be conducted of the mechanisms to execute these programs and which specific programs the COH may be able to utilize.

8.3.2.3 LOANS

State Revolving Fund

The CWSRF Program assists in financing the construction of water pollution control projects necessary to prevent contamination of our groundwater and coastal water resources and to protect and promote the health, safety, and welfare of the citizens of the State of Hawai‘i. The CWSRF Program provides low interest loans to county and state agencies to construct point source and nonpoint source water pollution control projects.

WIFIA

The Water Infrastructure Finance and Innovation Act of 2014 (WIFIA) established the WIFIA program, a federal credit program administered by EPA for eligible water and WW infrastructure projects. Eligible borrowers are:

- Local, state, tribal, and federal government entities
- Partnerships and joint ventures
- Corporations and trusts
- Clean Water and Drinking Water State Revolving Fund (SRF) programs

The WIFIA program can fund development and implementation activities for eligible projects such as projects that are eligible for the CWSRF.

Special Improvement Financing

COH has several regulations enabling creation of Special Improvement Districts or Community Facility Districts. A district may be established to finance the purchase,

construction, installation, expansion, improvement, or rehabilitation of any real or other tangible property with a useful life estimated by the council to be five years or longer. WW systems are an example of special improvements that may be financed by a district. The infrastructure could subsequently be dedicated to the COH so therefore must meet standards to qualify for dedication to the COH. The district is formed through a very specific Council process and then bonds are sold on behalf of the district and billed for the next 20 or 30 years to pay the debt service. A lien is placed on the properties until the debt is paid off. The cost to be paid includes the costs, such as bond council and underwriters, to issue the bonds as well as the ongoing cost to administer the district, bill the owners and make the debt service payments.

An example of this is the Lono Kona Sewer Improvement District in North Kona [37]. It was a Special Improvement District specifically created to address the EPA's requirement to close large-capacity cesspools. This program funded the connection of 110 parcels to the COH WW system. A similar funding mechanism could be employed for funding a neighborhood's cesspool conversions.

8.3.2.4 NEW SOURCES OF REVENUE

New Fees

Current COH WW rates are in 5 user categories:

1. *Single Unit Residential*: Monthly charge per unit
2. *Multi-Unit Residential*: Monthly charge per unit
3. *Nonresidential*: Monthly base rate charge per unit plus monthly usage charge per 1000 gallons
4. *Private Haulers Discharge Fee*: Fee per 500 gallons, with a minimum charge per load
5. *Gang Cesspools*: Monthly charge per unit

Possible fees to consider adding would include pumping of septic tanks, repair and maintenance of the customer's system, impact fees, high-strength and industrial WW surcharges, and outside-city rate differentials. Customer service charges like connection fees, late payment penalty, and account activation fees could be considered. It could be possible to add fees to all usage charges that are costs incurred by COH DEM and benefit the entire community like environmental protection fee and fuel surcharge fee.

Consider changing the rate structure by billing on a flat base rate plus volumetric basis depending on the amount of water the customer has used. This two-part billing includes: a sewer base charge (based on fixed cost associated with operating and maintaining the municipal sewer system) and a sewer usage charge (based on water consumption and representing the variable cost of transporting and treating the WW). Honolulu has a flat base charge plus a usage-based charge, and the usage-based charge collects the costs to collect and treat an average return of 80 percent of the water used back to the sewer system.

It is our understanding that COH has a rate study underway to determine if these changes will recover all the costs of COH DEM.

Reclaimed Water

DEM has prepared a Feasibility Study for Kealakehe WWTP R-1. A plan is under preparation for funding the proposed water reclamation project's construction, operation, maintenance, and replacement costs. According to the 1999 Kealakehe Effluent Reuse Master Plan, typical funding sources that support a water reuse program are reclaimed water rates, WW discharge fees, developer fees, and potable water sales revenue. Currently, COH has determined that O&M costs would be funded through user fees; R-1 user fees will be projected between 80 percent to 90 percent of the current water supply charges (of the agricultural rate). COH will need to adopt administrative rules to obtain the authority and framework to charge fees for reuse water.

8.4 AFFORDABILITY

8.4.1 Water Affordability and Clean Water Act Implementation

Investments to meet federal WW requirements can impose a significant financial burden on the community. The intent of the EPA's affordability criteria is to indicate when mandates would cause economic distress in a community. This is from the Affordability Assessment Tool for Federal Water Mandates prepared for the U.S. Conference of Mayors [38]:

With the intention of providing a mechanism for relieving undue economic stress in the face of wastewater-related mandates, EPA has developed "affordability" criteria to indicate when such mandates would cause substantial and widespread economic distress in the community. In the case of undue economic stress caused by wastewater requirements, the Agency might be willing to exercise some flexibility in the mandate by allowing a longer timeframe to achieve compliance or by relaxing compliance standards. (from Affordability Assessment Tool for Federal Water Mandates, Stratus Consulting, Boulder, Colorado, c. 2013, U.S. Conference of Mayors, AWWA and WEF)

EPA's view is that EPA would consider a combined annual water and WW bill of less than 4.5 percent of median household income (MHI) to be "affordable." The breakdown is 2.5 percent for water plus 2 percent for WW services and combined sewer overflow controls [39].

EPA issued its Proposed 2022 CWA Financial Capability Assessment (FCA) Guidance for public comment in February 2022. The proposed guidance outlines strategies for communities to support affordable utility rates, while planning investments in water infrastructure that are essential for CWA implementation.

There are two alternatives that communities can use under the FCA. Alternative 1 involves evaluating a NPDES permittee's financial capability to fund CWA controls by calculating Residential Indicator and Financial Capability Indicators. Another metric, the Lowest Quintile Poverty Indicator (LQPI) Score, was added. Alternative 2 involves analyzing

financial and rate models in addition to calculating the LQPI Score and performing a Financial Alternatives Analysis.

The FCA Guidance is used by municipalities when devising plans to dramatically reduce discharges. During that process, municipalities and EPA negotiate schedules with specific timeframes for implementation. The 2023 FCA Guidance describes the financial information and formulas the agency intends to use to evaluate the financial resources a community has available to implement control measures and timeframes associated with implementation.

The Final 2023 FCA replaced the 1997 FCA Guidance to evaluate a community's capability to fund CWA control measures in both the permitting and enforcement context. The 2023 FCA also supplements the public sector sections of the 1995 WQS Guidance to assist states and authorized tribes in assessing the degree of economic and social impact of potential WQS decisions.

Under the FCA guidance, if a municipality is concerned that clean water compliance costs would drive unaffordable rate increases for low-income households, it must seek to mitigate cost burdens on low-income households without dragging out compliance.

EPA provides a checklist of "financial alternatives" for utilities to consider, which can reduce burdens on low-income households. These include creating "lifeline" rates with a low charge for an initial amount of usage to meet essential needs; capping water bills for low-income households at a percentage of income; offering bill discounts to low-income households; helping low-income customers repair plumbing leaks and replace old, water-guzzling toilets; charging non-residential properties for their fair share of stormwater costs; securing grants and subsidized loans to reduce the costs of capital improvements for all ratepayers; and ensuring that ratepayer revenues aren't diverted to non-utility purposes.

8.4.2 Statewide Affordability

A homeowner is financially burdened if the average monthly cost of installing and operating their OSDS exceeds 2 percent of their annual income [36]. The HDOH Cesspool Conversion Finance Research Report [36] calculated the potential monthly financial impacts to homeowners to convert cesspools. The estimated average total monthly cost was \$210, assuming the following: 1) using information from HDOH on historical installation costs for septic tank and ATU treatment and disposal; 2) a 20-year loan at 4.0 percent annual interest rate, and 3) estimated monthly O&M costs for various onsite treatment options. Assuming \$210 (capital and O&M) is the estimated average monthly cost to convert a cesspool to an approved OSDS, homeowners with an annual income of less than \$126,000 would realize a financial hardship by the cost to convert. If a hypothetical \$10,000 rebate for the conversion were provided to homeowners, the estimated average monthly cost to convert would drop to \$150. This would lower the threshold so that homeowners with an annual income of less than \$90,000 per year would be financially burdened. (CCWG Final Report).

Approximately 97 percent of all residents with cesspools in Hawai'i have an income less than \$126,000 and thus would be financially burdened by the cost to convert. If a \$10,000

rebate were provided to each household, approximately 85 percent would be financially burdened. The 2021 estimated MHI for the State of Hawai'i was \$84,857.

COH, with the most cesspools of all counties, has the greatest affordability challenges.

8.4.3

Affordability in the COH – Puakō and South Kohala

With approximately 48,596 cesspools, the COH has the largest number of cesspools in the State [36]. The COH also has the most residents facing affordability challenges. It has the greatest proportion of households without centralized sewers than any other county (71 percent).

The median income of households in COH was \$65,401 (2020 Census) and \$69,473 per the Census 2021 estimates. The Census 2021 estimates showed 7.6 percent of households had income below \$10,000 a year and 10 percent had income over \$200,000 or more. There were 72,194 households in COH.

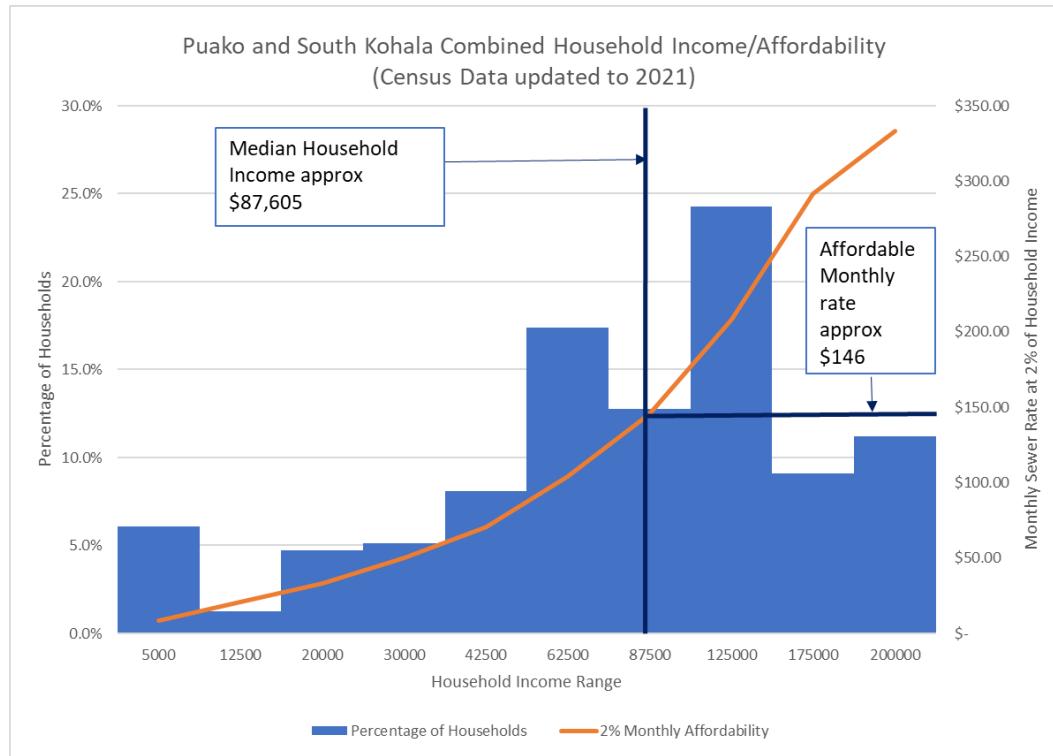
The Puakō and South Kohala District cesspool count totals 4530. The total number of households in Puakō and South Kohala from the 2021 Census estimates is 9,141. The combined median income for the Puakō and South Kohala area is approximately \$87,605. The median incomes for the 5 subareas (Census Designated Places) that are within the Puakō and South Kohala Study area range from a low of \$79,701 to a high of \$97,375. The median incomes for all tracts in Puakō and South Kohala are shown in Table 8-2.

Table 8-2: Median Household Incomes by Census Designated Place

Tract Name	Total # Households	2021 Estimated MHI
217.05 Waimea – Kohala	2,221	\$79,701
217.06 Waimea – Pu'u Anahulu	1,322	\$97,375
217.07 Waikōloa – South Kohala	1,491	\$81,138
217.08 Kawaihae – ‘Anaeho’omalu	1,836	\$94,500
218 North Kohala (Partial)	2,281	\$85,313

A homeowner is financially burdened if the average monthly cost of installing and operating their OSDS exceeds 2% of their annual income [36].

Figure 8-1 shows the variability in income for the combined Puakō and South Kohala area, the 2 percent affordability for each income level and the median household affordability level. Table 8-3 shows the calculated affordable monthly rates (using the 2 percent threshold) for the State, County and Puakō and South Kohala district based on the MHI data (calculations shown in Appendix B).

Figure 8-1: Puakō and South Kohala Combined Income and Affordability (2021)**Table 8-3: Median Household Incomes and Affordable Monthly Rates**

Area	2021 Census Estimated Median Household Income	Affordable Monthly Sewer Rate
State of Hawai‘i	\$84,857	\$141.29
COH	\$69,473	\$115.79
Puakō and South Kohala	\$87,605	\$146.00

8.5

COUNTY OF HAWAII RATE IMPACTS

Ordinance No. 19-21, effective April 1, 2019, amended the Hawai‘i County Code to establish WW service charges for the years 2019 through 2023. Current COH WW rates are in 5 user categories: single-family residential units, multi-unit residential, nonresidential, private haulers discharge fee, and gang cesspools.

Current rates assume debt service for capital improvements were carried by the county through the issuance of GO bonds and the debt paid by all community members. The rates cover just operating cost of the department’s activities. There currently is no connection fee.

DEM could consider an enterprise-fund type of system like the CCH. An enterprise fund is a *self-supporting government fund that sells goods and services to the public for a fee*. CCH Department of Environmental Services can issue revenue bonds and establish sewer rates to cover the cost of the enterprise. Revenues are segregated into a sewer fund that

can be used only for that purpose, with financial statements separate from other government activities.

A rate model was developed by DEM and was used to calculate options for rates for WW alternatives described in this Master plan. Alternative 1A would not incur COH costs as these would likely be fully borne by each homeowner. However, this alternative is included in the rate analysis to enable comparison of financial impacts as one factor which will ultimately be borne by COH residents. This analysis does not replace the comprehensive rate study being performed by others for COH. Table 8-4 shows the results of this analysis performed for this study.

Scenarios were run for a range of the lowest and highest cost alternatives described in Section 4.0 using the costs as described in Section 7.0. The scenarios included:

1. Options which would treat the Puakō and South Kohala area separately (independent) from the rest of the county using only the future rate payers from the Puakō and South Kohala area
2. Options which included all the existing COH costs and rate payers

For each of these options, options were developed addressing capital costs in two different ways:

1. Rates to carry O&M only for the lowest and highest alternatives with no debt service (assuming the County continues with the County carrying CIP thru GO bonds)
2. Rates for the lowest and highest alternatives (assuming an enterprise fund model and all capital and O&M costs are carried)

Each of the above was also analyzed with a variety of potential funding mechanisms:

1. Monthly Flat Rate
2. PAYGO Method followed by Monthly Rate (based on option discussed by CCWG) where monthly payments will be collected for a period of time before connection and following connection the monthly flat rate would be charged
3. All of the above with and without a grant of 80 percent covering Capital Costs (to determine potential impact of grant funding)

The preliminary rate analysis is based on number of connections, which were assumed based on the population projections in Section 4.0. The Puakō and South Kohala area does include some nonresidential zoned properties that could be higher water users, and therefore could be charged a higher sewer rate with monthly usage charges per Hawai'i County Code Section 21-36.1. The small percentage of non-residential users is unlikely to be significant in this preliminary rate analysis but should be considered in formal rate analysis. Previous analyses found that the addition of an initial connection fee to monthly rates did not significantly reduce the monthly rates so that funding mechanism was not calculated for this study.

Table 8-4: Preliminary Rate Analysis Results

Countywide		Puako Alt 1A	Puako Alt 1B	Puako Alt 2A	Puako Alt 2B	Puako Alt 2C	Puako Alt 5A	Puako Alt 5B	Puako Alt 5C
Affordability		\$146							
No Debt Service		\$119	\$115 to \$116	\$107 to \$108	\$113 to \$114	\$107 to \$108	\$108 to \$110	\$117 to \$119	\$108 to \$125
With Debt Service (no Grant)		\$310	\$308 to \$321	\$768 to \$777	\$675 to \$684	\$729 to \$738	\$1151 to \$1166	\$1027 to \$1043	\$1110 to \$1146
With Debt Service and 80% Grant		\$157	\$155 to \$159	\$238 to \$240	\$227 to \$229	\$231 to \$233	\$315 to \$319	\$301 to \$306	\$308 to \$333
PAYGO with 80% Grant	Monthly Sewer Fee	\$146	\$146	\$146	\$146	\$146	\$146	\$146	\$146
	Monthly Paygo Fee (10 Years)	\$200	\$115 to \$149	\$324 to \$337	\$749 to \$772	\$824 to \$844	\$695 to \$729	\$1443 to \$1489	\$1563 to \$1740
Independent		Puako Alt 1A	Puako Alt 1B	Puako Alt 2A	Puako Alt 2B	Puako Alt 2C	Puako Alt 5A	Puako Alt 5B	Puako Alt 5C
Affordability		\$146							
No Debt Service		\$146	\$91 to \$95	\$22 to \$32	\$95 to \$105	\$19 to \$28	\$36 to \$56	\$143 to \$163	\$32 to \$236
With Debt Service (no Grant)		\$1,300	\$1106 to \$1175	\$20130 to \$20380	\$17382 to \$17661	\$18973 to \$19252	\$31760 to \$32180	\$28099 to \$28589	\$30523 to \$31748
With Debt Service and 80% Grant		\$345	\$292 to \$310	\$4044 to \$4102	\$3779 to \$3886	\$3853 to \$3940	\$6380 to \$6483	\$6076 to \$6239	\$6206 to \$7102
PAYGO with 80% Grant	Monthly Sewer Fee	\$146	\$146	\$146	\$146	\$146	\$146	\$146	\$146
	Monthly Paygo Fee (10 Years)	\$220	\$171 to \$189	\$654 to \$664	\$1051 to \$1069	\$1089 to \$1105	\$1022 to \$1062	\$1732 to \$1762	\$1782 to \$1848
Green shading is at or below monthly affordable rate of \$146									

The results from these preliminary rate analyses indicate that very few of the options will be affordable based on the 2 percent of MHI criteria especially if they need to cover the debt service for the capital costs. It should be noted that these are preliminary results but provide an indication of the need to address the gaps between affordability and the high capital costs of these alternatives.

The key to a solution for the COH will be to search out funds from a variety of sources, but especially grants or legislative funds that will not require repayment. The high costs of any WW alternative and the affordability estimates for the county residents necessitate financial assistance.

8.6 IMPLEMENTATION STRATEGY

The feasibility of sewer projects in Puakō and South Kohala should consider the following:

- Whether cost should be the highest priority criterion for prioritization of alternatives or should other environmental and social considerations be used to prioritize alternatives.
- Consider setting rate increases at some percentage of median income, and funding only the CIP within the allowable rate increase (e.g., if the cost per household is limited to 75 percent of median, x percent of the households could manage it, although the rest would need to be subsidized with \$y per month).
- Thorough assessment of all financing options for sewer systems and for IWS to lower costs to each household as much as possible. For example, evaluate if financing by an agency like HDOH's SRF could be transformed into per household financing for individual cesspool conversion.
- Work to obtain EPA or HDOH support for grants to assist residential homeowners. Support HDOH in promulgating rules to administer the grant program in Act 153 to assist COH and/or residential homeowners.
- Assess funding opportunities for the County to pilot projects utilizing alternative treatment systems with non-standard options for reuse of solids and water with lower impacts.
- Discuss with EPA and HDOH extending the Act 87 deadline for Priority 3 (Section 8.4.1) cesspool conversions by using the FCA guidance applied to individual small communities.
- Revise the rate structure to better match the cost of service. Consider establishing a connection fee.
- Develop a plan to maximize the use of all funding and financing options. Optimize the application of financing options for the municipality as well as individual cesspool owners to maximize benefits for all.

9.0 SUMMARY AND CONCLUSIONS

9.1 SUMMARY OF FINDINGS

This Master plan evaluated various WW management alternatives for Puakō and South Kohala, differing by decentralized or centralized treatment systems, projected 2052 design average flows, and collection system methods:

- 1A: IWS for All Residential + Decentralized Treatment for Commercial/Institutions
- 1B: Both Decentralized Treatment and LPS
- 2A: Urban Sewering, All Gravity Sewers (3 COH WWTPs, 2 Existing Private WWTPs)
- 2B: Urban Sewering, Both Gravity Sewer and LPS (3 COH WWTPs, 2 Existing Private WWTPs)
- 2C: Urban Sewering, Cross Country Sewer (3 COH WWTPs, 2 Existing Private WWTPs)
- 3A: Full Flow Sewering, All Gravity Sewers (2 COH WWTPs, 3 Existing Private WWTPs)
- 3B: Full Flow Sewering, Both Gravity Sewer and LPS (2 COH WWTPs, 3 Existing Private WWTPs)
- 3C: Full Flow Sewering, Cross Country Sewer (2 COH WWTPs, 3 Existing Private WWTPs)
- 4A: Urban Sewering, All Gravity Sewers (5 COH WWTPs)
- 4B: Urban Sewering, Both Gravity Sewer and LPS (5 COH WWTPs)
- 4C: Urban Sewering, Cross Country Sewer (5 COH WWTPs)
- 5A: Full Flow Sewering, All Gravity Sewers (4 COH WWTPs)
- 5B: Full Flow Sewering, Both Gravity Sewer and LPS (4 COH WWTPs)
- 5C: Full Flow Sewering, Cross Country Sewer (4 COH WWTPs)

The components of each alternative (e.g., collection, treatment, and disposal) are described in Section 6.0. Estimated costs were compared between collection and treatment costs (Section 7.3.1), and between homeowners and managing entities (Section 7.3.2). The cost impacts of the collection system option, design average flow, and number of WWTPs were also evaluated (Sections 7.3.4 through 7.3.6, respectively).

Alternative 1A with IWS and decentralized treatment for commercial areas and large institutional properties (example: schools, hospitals etc.) and Alternative 1B Both Decentralized Treatment and LPS are the alternatives with the lowest estimated capital and O&M costs. The majority of the costs for the centralized sewer

Alternatives 2 through 5 are from laying the sewer collection network, compared to the WWTP costs. Therefore, the higher costs are primarily from excavation for sewers within rocky soils or lava rock.

Public input from two community engagement meetings and comments was mixed, but overall favored the following:

- Environmental Concerns/Regulatory Permitting (i.e., systems that reduce pollution that could impact the reefs)
- Flexibility to meet Potential Future Requirements (i.e., systems/approach that would not require modification in the near term)
- Estimated Annual O&M Cost (i.e., systems with lower annual operations and maintenance expenses)

Additionally, community members want to know which areas are scheduled to receive sewer infrastructure to avoid unnecessarily investing in an IWS in an area that will receive sewer infrastructure in the near future. Such information is intended to be developed as part of the Integrated WW Master Plan.

9.2

RECOMMENDATIONS

It is recommended that the county consider Alternative 1B Both Decentralized Treatment and LPS for further consideration as they proceed in the development of the Integrated WW Master Plan. As part of that Master Plan, the county will consider which areas would be better served by Alternative 1A (implemented by individual homeowners) and Alternative 1B (implemented by COH).

The following alternatives can be given low priority and deferred from further consideration:

- 2A: Urban Sewering, All Gravity Sewers (3 COH WWTPs, 2 Existing Private WWTPs)
- 2B: Urban Sewering, Both Gravity Sewer and LPS (3 COH WWTPs, 2 Existing Private WWTPs)
- 2C: Urban Sewering, Cross Country Sewer (3 COH WWTPs, 2 Existing Private WWTPs)
- 3A: Full Flow Sewering, All Gravity Sewers (2 COH WWTPs, 3 Existing Private WWTPs)
- 3B: Full Flow Sewering, Both Gravity Sewer and LPS (2 COH WWTPs, 3 Existing Private WWTPs)
- 3C: Full Flow Sewering, Cross Country Sewer (2 COH WWTPs, 3 Existing Private WWTPs)
- 4A: Urban Sewering, All Gravity Sewers (5 COH WWTPs)
- 4B: Urban Sewering, Both Gravity Sewer and LPS (5 COH WWTPs)

- 4C: Urban Sewering, Cross Country Sewer (5 COH WWTPs)
- 5A: Full Flow Sewering, All Gravity Sewers (4 COH WWTPs)
- 5B: Full Flow Sewering, Both Gravity Sewer and LPS (4 COH WWTPs)
- 5C: Full Flow Sewering, Cross Country Sewer (4 COH WWTPs)

As community development occurs in the future, the implementation of Alternative 1A could evolve into Alternative 1B by adding LPS to expand the service area of the commercial/institutional decentralized treatment plants. If further WW collection/treatment needs to occur, Alternative 1B can evolve further into Alternative 2 by expanding the collection system service area using various other alternatives such as gravity sewers (in roads), LPSs, and cross-country sewers. The package plant in the area would also be expanded into a subregional facility if demand for WW collection and treatment in the area is sufficient to support the upgrade/expansion.

When planning for any of these alternatives, it is important to assess future development goals, population and flow forecasts, and potential impacts on the environment (Section 4.0). A fundamental component of implementation is also funding and financing (Section 8.0). The research and findings in this study will be used by COH to assess and later select a WW management plan to support the growth of the South Kohala district and the overall island.

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Appendix A:

Collection System Layout Maps and

Hydraulic Calculations – Kawaihae

Subregion

Appendix A Collection System Layout Maps and Hydraulic Calculations

Kawaihae (north and south)

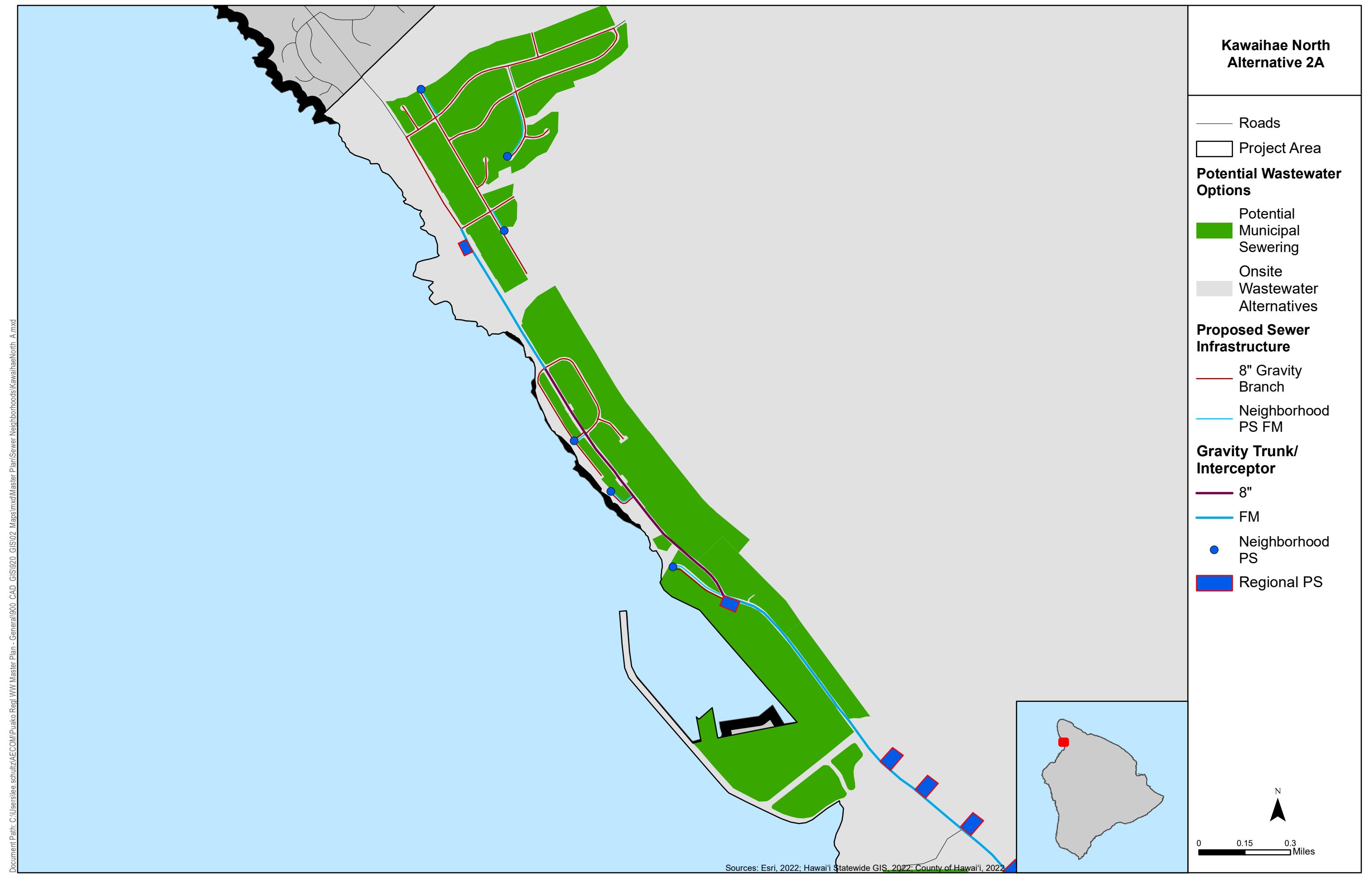
A-1: Community Collection System Layout Maps

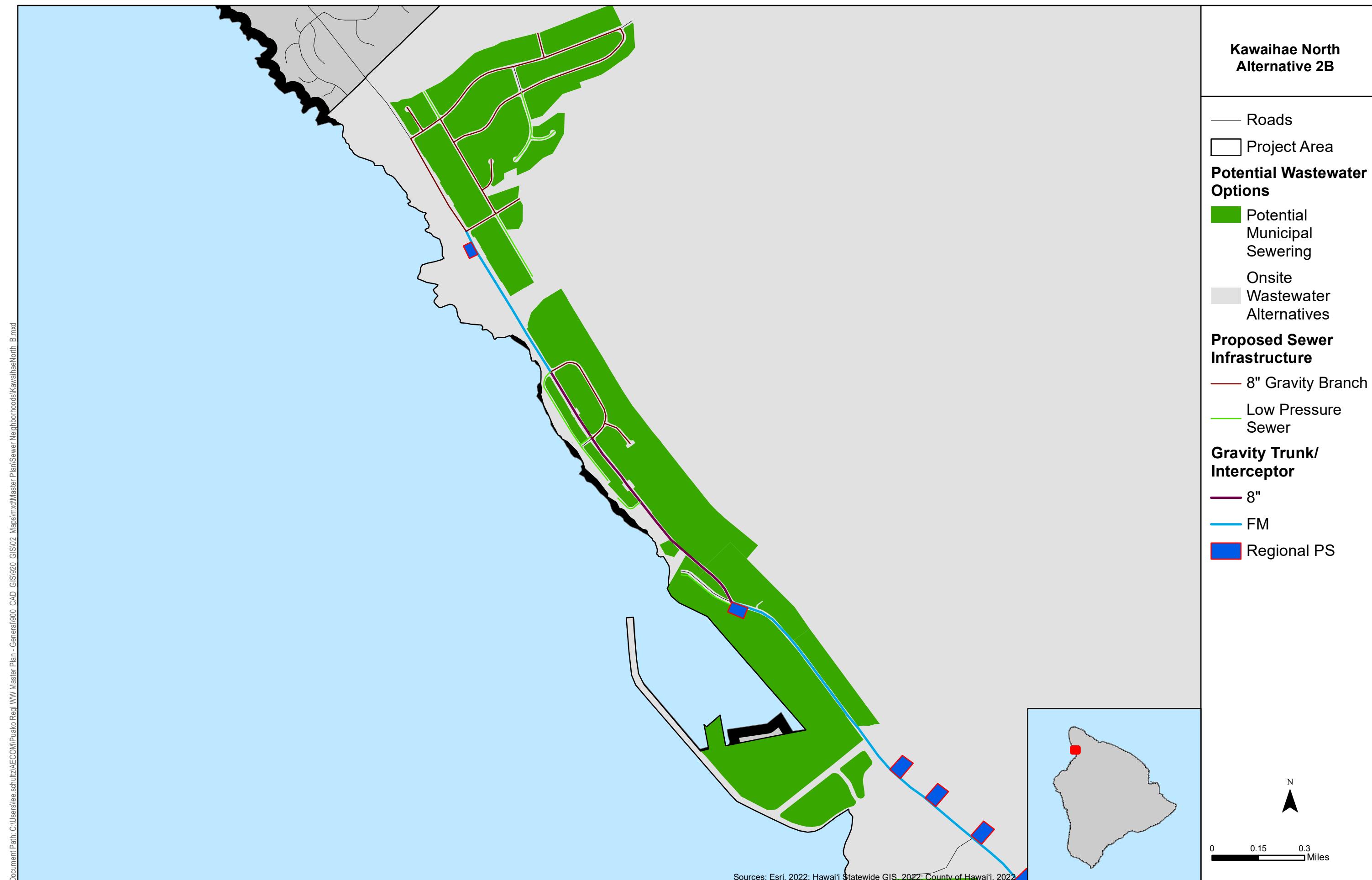
A-2: Sewer Hydraulic Calculations

A-3: Pump Station and Force Main Hydraulic Calculations

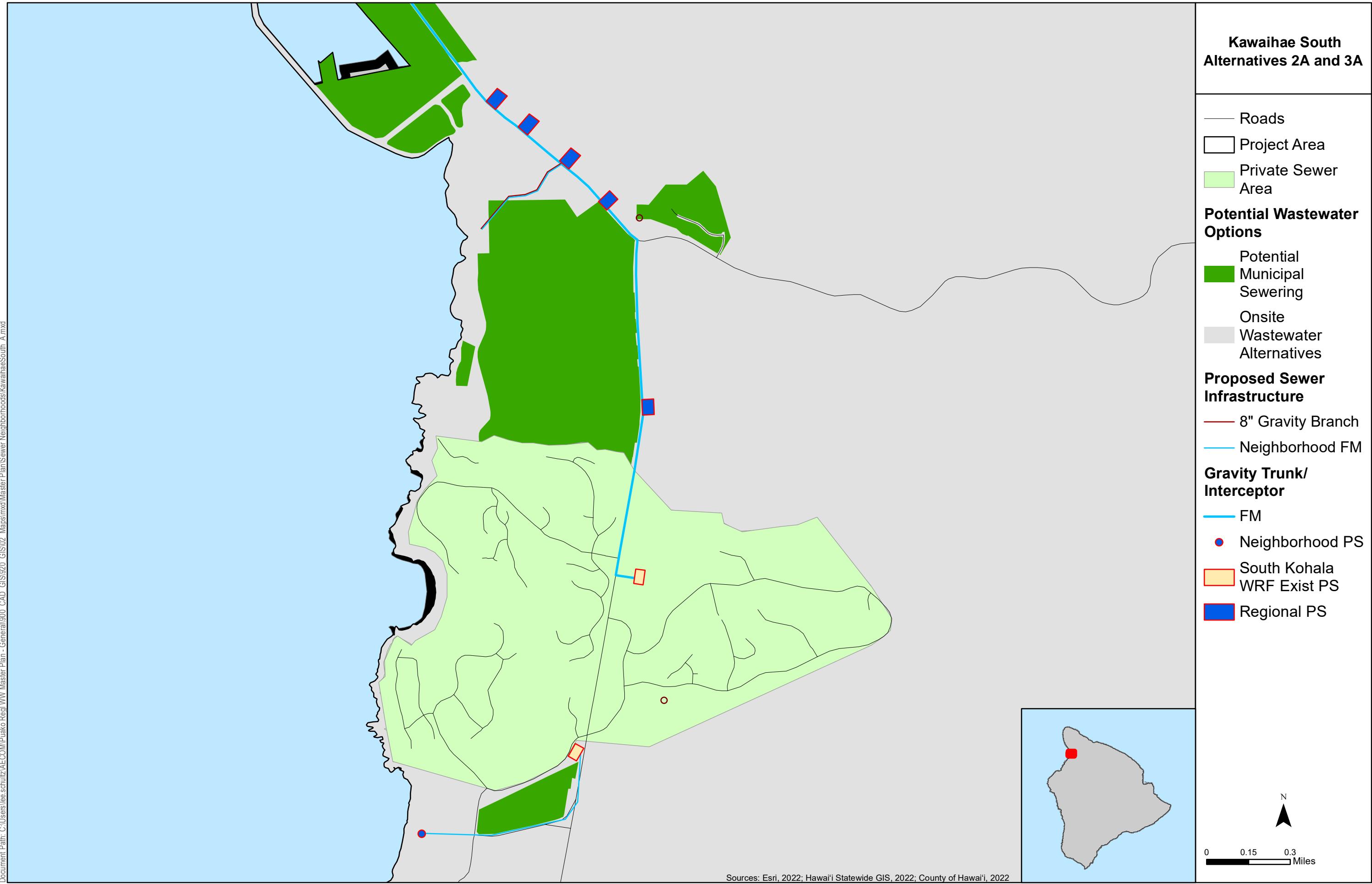
A-4: Contour Maps (Basis for Collection System Layout and calculation)

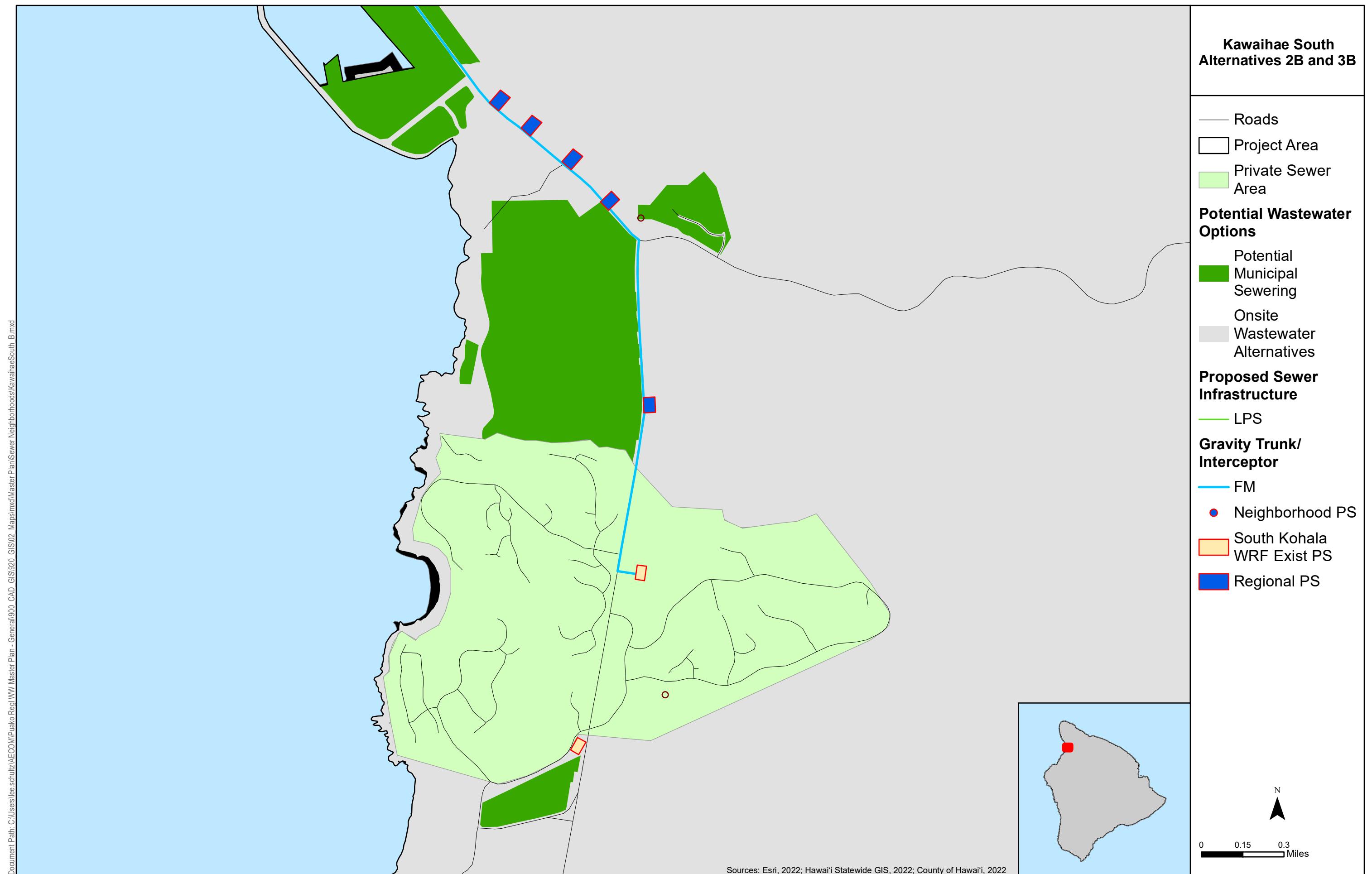
A-1: Community Collection System Layout Map

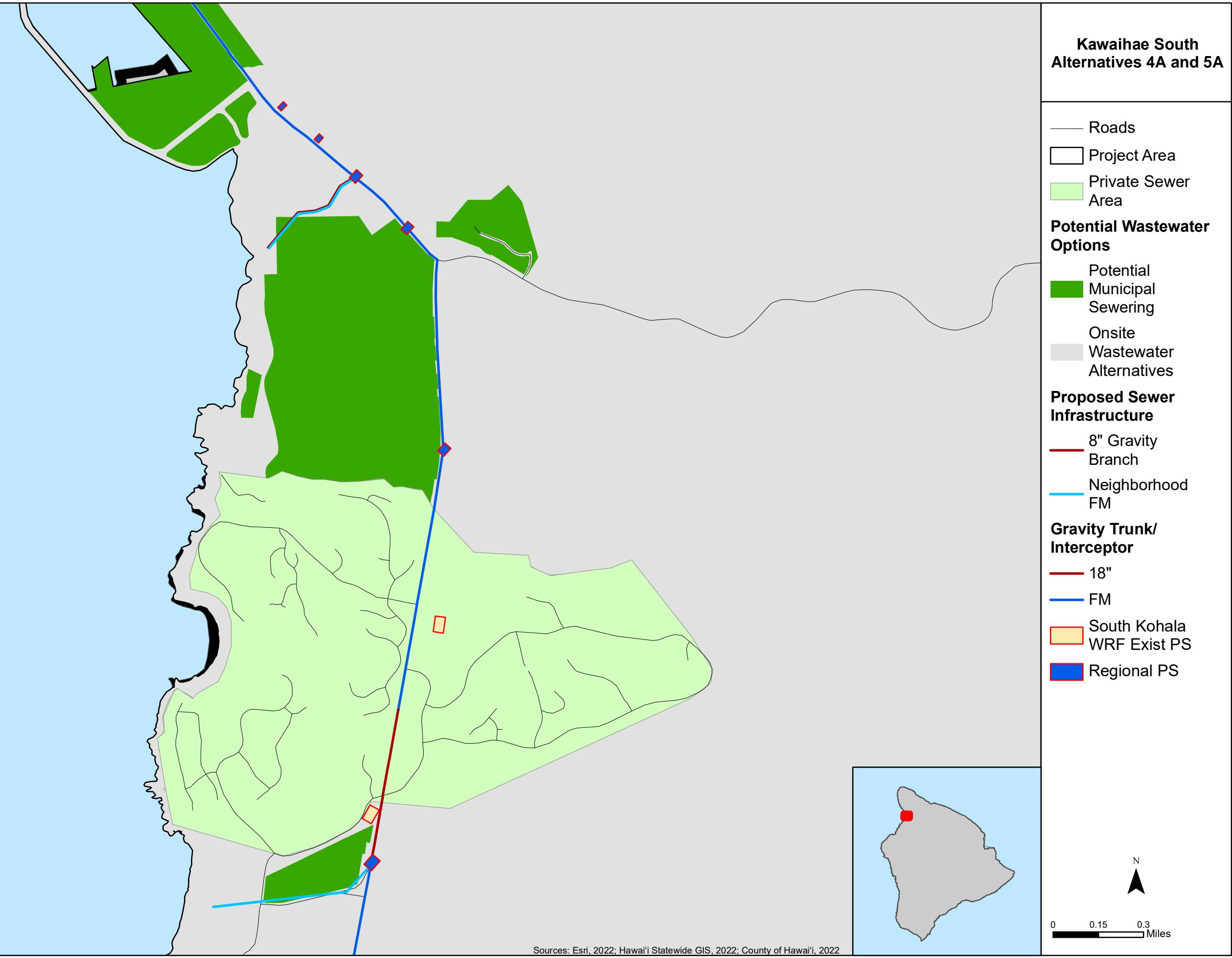


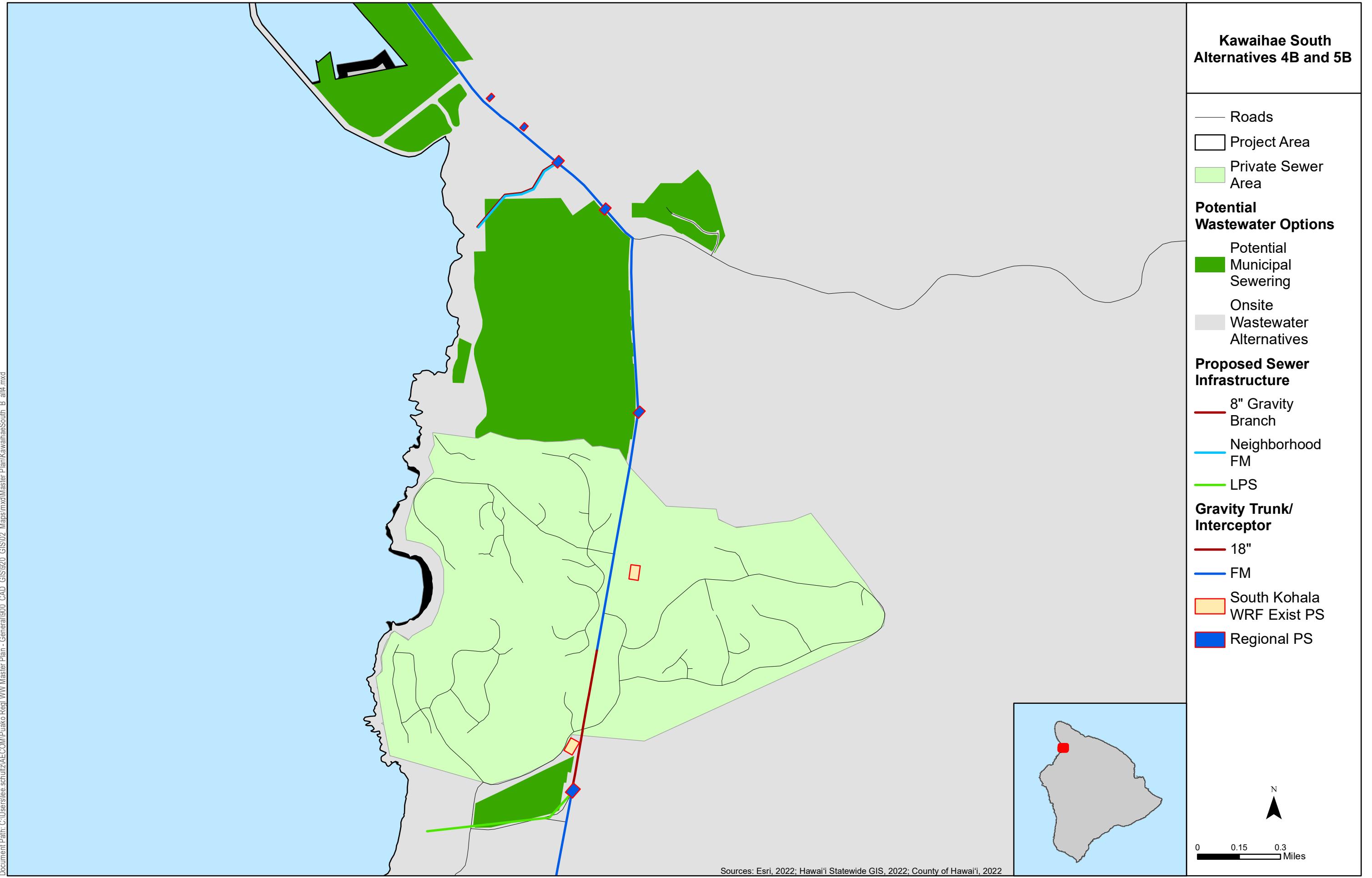












A-2: Sewer Hydraulic Calculations

Computation of Wastewater Flow for Kawaihae North Sewering

Sewer: Kawaihae North districts

District: Kawaihae North

Reference Maps: Hawaii Statewide GIS Program

Page: 1 of 1

Computed by: Adrienne Fung, Tieshi Huang, Lee Schultz

Date: September 15, 2023

Sewer Location	Tributary Area (Acres)	Tributary Equivalent Population										Wastewater Flow Computation										Existing Sewer Study (X) Ultimate Sewer Study					
		Residential				Other		Total																			
		Homes	Apartment	Increment	Total	Increment	Total		Increment	Total	Flow Factor	Peak Base Sanitary Flow - PBSF (MGD)	Ground Water Infiltration - GWI @ 35 gpcd (MGD)	Average Dry Weather Flow - ADWF (MGD)	Peak Dry Weather Flow - PDWF (MGD)	Area Used for Wet Weather I/I Calculation (acres)	Wet Weather I/I @ 3000 gpad (MGD)	Design Peak Flow - Q _{DES} (MGD)	Pipe Diameter (in)	Slope (%)	Velocity at Full Pipe - V _{FULL} (fps)	Full Pipe Flow - Q _{FULL} (MGD)	Design Flow - Q _{DES} (MGD) / Full Pipe Flow - Q _{FULL} (MGD)	Velocity at Design Flow - V _{DES} (fps)	Depth at Design Flow - D _{DES} (in)		
District Zone or Street		Increment	Total	Lots	Increment	Total	Increment	Total	Increment	Total	Base Sanitary Flow - BSF @ 70 gpcd (MGD)																
Kawaihae North																											
Kawaihae North 1	42	42	105	284	284	0	0	0	0	284	284	0.020	2.5	0.05	0.010	0.030	0.06	42	0.125	0.18	8	0.52	2.50	0.56	0.33	2.22	3.1
Kawaihae North 2	22	22	56	152	152	0	0	0	0	152	152	0.011	2.5	0.03	0.005	0.016	0.03	22	0.067	0.10	8	0.52	2.50	0.56	0.18	1.89	2.3
Kawaihae North 3	17	17	44	118	118	0	0	0	0	118	118	0.008	2.5	0.02	0.004	0.012	0.02	17	0.052	0.08	8	0.52	2.50	0.56	0.14	1.77	2.0

Note:

Cells in gray are based on user-input values for population, pipe diameter, pipe slope, or FlowMaster (for velocity and depth at design flow).

1. Minimum slope is used for undulating roadway segments in which sewers are planned to minimize sewer depth.

Computation of Wastewater Flow for Kawaihae South Sewering

Sewer: Kawaihae South districts

District: Kawaihae South

Reference Maps: Hawaii Statewide GIS Program

Page: 1 of 1

Computed by: Adrienne Fung, Tieshi Huang, Lee Schultz

Date: September 14, 2023

Sewer Location	Tributary Area (Acres)	Tributary Equivalent Population										Wastewater Flow Computation										Existing Sewer Study () Existing Sewer Study (X) Ultimate Sewer Study								
		Residential				Other		Total		Increment				Total		Increment				Total										
		Homes		Apartment																										
District Zone or Street	Increment	Total	Lots	Increment	Total	Increment	Total	Increment	Total	Increment	Total	Increment	Total	Increment	Total	Flow Factor	Peak Base Sanitary Flow - PBSF (MGD)	Ground Water Infiltration - GWI @ 35 gpcd (MGD)	Average Dry Weather Flow - ADWF (MGD)	Peak Dry Weather Flow - PDWF (MGD)	Area Used for Wet Weather Calculation (acres)	Wet Weather I/I @ 3000 gpad (MGD)	Design Peak Flow - Q _{DES} (MGD)	Pipe Diameter (in)	Slope (%)	Velocity at Full Pipe - V _{FULL} (fps)	Full Pipe Flow - Q _{FULL} (MGD)	Design Flow - Q _{DES} (MGD) / Full Pipe Flow - Q _{FULL} (MGD)	Velocity at Design Flow - V _{DES} (fps)	Depth at Design Flow - D _{DES} (in)
Kawaihae Road																														
Kawaihae South (Gravity)	1	1	3	33	33	0	0	0	0	33	33	0.002	2.5	0.01	0.001	0.003	0.01	1	0.004	0.01	8	0.52	2.50	0.56	0.02	0.95	0.7			

Note:

Cells in gray are based on user-input values for population, pipe diameter, pipe slope, or FlowMaster (for velocity and depth at design flow).

1. Minimum slope is used for undulating roadway segments in which sewers are planned to minimize sewer depth.

A-3: Pump Station and Force Main Hydraulic Calculations

Pipe Friction Loss Hazen-Williams =>	$h_L = L(\text{ft}) * ((2.314 Q(\text{ft}^3/\text{s})) / (C^* D(\text{ft})^{2.63}))^{1.852}$ (ft)
Pipe & Valve Minor Loss Equation =>	$h_M = K^* V^2 / 2g$ (ft)

Mile to ft 5280

Assumption:

1. pipe length and surface elevation were based on Google Earth profile
2. C value of 140 for PVC pipe
3. station loss of 15 ft at this planning level
4. 10% of FM friction loss to account for minor loss along FM route at this planning level
5. Pipe inside diameter, C900 DR18 (235 psi)

Quick notes to check FM calculation:

1. maintain FM velocity between 3-5 ft to minimize friction loss
2. TDH should be less than 100 ft per CCH Design Standard at this planning level.

DR18 PVC inside diameter		
4"	4.266	in
6"	6.134	in
8"	8.044	in
10"	9.866	in
12"	11.734	in
14"	13.6	in
16"	15.466	in
18"	17.334	in
20"	19.2	in
24"	22.934	in

C900/RJ Certa-Lok® PVC Pressure Pipe | Restrained Joint

Nominal Size (in)	Wall Thickness (in)	Min. Wall Thickness (in)	Internal Diameter (in)	Type				Sleeving				
				S	W	R	F	Weight (lb/ft)	End L	Weight (lb/ft)		
4"	4.800	18	0.207	4.206	3.880	6.375	0.125	0.302	2.1	1.964	9.359	4.6
	6.900	14	0.340	4.114					5.1	0.386	8.258	7.1
6"	6.900	18	0.303	6.134	3.880	6.500	0.125	0.302	6.4	0.386	8.258	7.1
	9.000	14	0.400	5.914					8.7	10.947	10.399	10.5
8"	9.000	18	0.503	6.644	3.183	6.300	0.145	0.604	11.0			
	11.100	14	0.646	7.156					13.2	13.361	11.123	23.9
10"	11.100	18	0.617	8.988	3.825	7.750	0.215	0.604	16.8			
	13.200	14	0.700	9.514					18.8	15.026	12.089	36.1
12"	13.200	18	0.720	11.754	3.825	7.750	0.215	0.604	24.5			
	15.300	14	0.940	11.214					26.3	16.400	12.000	36.9
14"	15.300	21	0.729	13.842	3.810	7.750	0.215	0.604	21.7			
	17.400	18	0.850	13.800					25.0	16.000	12.000	36.8
16"	17.400	21	0.896	15.742	3.810	7.750	0.215	0.604	28.0			
	19.500	18	0.967	15.406					32.4	18.070	12.000	36.8
18"	19.500	14	1.240	14.914	3.823	8.875	0.265	0.604	40.9			
	21.600	21	0.780	17.940					29.8	20.670	13.000	47.0
20"	21.600	21	0.929	17.642	4.035	1.100	0.300	0.750	35.1			
	23.700	18	1.001	17.254					40.6	23.100	13.000	55.7
22"	23.700	21	1.029	18.542	4.035	1.100	0.300	0.750	43.1			
	25.800	18	1.200	19.200					49.8	27.620	13.000	81.3
24"	25.800	21	1.032	23.736	4.035	1.100	0.300	0.750	52.7			
	27.900	18	1.402	22.056					71.1			

Pipe D (in)	Pipe D (ft)	Pipe A (ft ²)	Pipe L (mi)	Pipe L (ft)	PS Surface Ele. (ft)	Incoming Sewer Depth (ft)	Wet Well Ele. (ft)	Discharge Surface Ele. (ft)	Minimum Cover (ft)	Discharge Ele. (ft)	Static H (ft)	Qpeak (mgd)	Q (gpm)	Q (ft ³ /s)	V (ft/s)	C	Friction Slope (ft/ft)	Friction H _L (ft)	Station H _L (ft)	Minor H _L (ft)	TDH (ft)	check
East Waimea																						
PS1																						
6.134	0.51	0.205	0.55	2904	2830	20	2810	2860	10	2850	40	0.61	424	0.94	4.60	140	0.0118	34.4	15	3.4	92.8	ok
PS2																						
9.866	0.82	0.531	0.85	4488	2860	20	2840	2910	10	2900	60	0.95	660	1.47	2.77	140	0.0027	11.9	15	1.2	88.1	ok
PS3																						
9.866	0.82	0.531	0.95	5016	2890	20	2870	2910	10	2900	30	1.51	1,049	2.34	4.40	140	0.0063	31.4	15	3.1	79.6	ok
Waimea Town (Alternative 2A, 2B)																						
PS																						
6.134	0.51	0.205	0.70	3696	2640	20	2620	2670	10	2660	40	0.21	146	0.32	1.58	140	0.0016	6.1	15	0.6	61.7	ok
Kawaihae North																						
PS1																						
6.134	0.51	0.205	0.50	2640	70	20	50	110	10	100	50	0.18	125	0.28	1.36	140	0.0012	3.3	15	0.3	68.6	ok
PS2																						
6.134	0.51	0.205	0.74	3907	10	10	0	60	10	50	50	0.36	250	0.56	2.71	140	0.0045	17.4	15	1.7	84.2	ok
PS3																						
6.134	0.51	0.205	0.18	950</td																		

Note:

Cells in gray are based on user-input values for population, pipe diameter, pipe slope, or FlowMaster (for velocity and depth at design flow).

Pipe Friction Loss Hazen-Williams =>	$h_L = L(\text{ft}) * ((2.314 Q(\text{ft}^3/\text{s})) / (C^* D(\text{ft})^{2.63}))^{1.852}$ (ft)
Pipe & Valve Minor Loss Equation =>	$h_M = K^* V^2 / 2g$ (ft)

Mile to ft 5280

Assumption:

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Quick notes to check FM calculation:

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4"	4.266	in
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C900/RJ Certa-Lok® PVC Pressure Pipe | Restrained Joint

Nominal Size (In.)	Wall Thickness (In.)	Min. Wall Thickness (In.)	Internal Diameter (In.)	Type				Sleeving				
				S	W	R	F	Weight (lb/ft)	End L	Weight (lb/ft)		
4"	4.800	18	0.207	4.206	3.880	6.375	0.125	0.302	2.1	1.964	9.259	4.6
	6.900	14	0.340	4.114					3.1			
6"	6.900	18	0.303	6.134	3.880	6.500	0.125	0.302	5.1	0.386	8.258	7.1
	9.000	14	0.400	5.914					6.4			
8"	9.000	18	0.503	8.044	3.183	6.500	0.145	0.604	8.7	10.947	10.399	10.5
	11.100	14	0.646	7.756					11.0			
10"	11.100	18	0.617	9.988	3.825	7.500	0.215	0.604	13.2			
	13.200	14	0.700	9.514					16.8	13.361	11.123	23.9
12"	13.200	18	0.720	11.754	3.825	7.500	0.215	0.604	18.8			
	15.300	14	0.940	11.214					24.5	15.026	12.009	36.1
14"	15.300	20	0.612	14.076					18.3			
	17.400	21	0.729	13.842	3.810	7.500	0.215	0.604	21.7	16.400	12.000	36.9
16"	17.400	18	0.850	13.800					25.0			
	19.500	25	0.896	16.000					37.7			
18"	19.500	21	0.829	15.742	3.810	7.500	0.215	0.604	38.0			
	21.600	18	0.967	15.406					32.4			
20"	21.600	14	1.240	14.914	3.823	8.025	0.265	0.604	40.9			
	23.700	25	0.780	17.940					29.8			
22"	23.700	21	0.929	17.642	4.035	1.100	0.300	0.750	35.1	20.870	13.000	47.0
	25.800	18	1.031	17.284					40.6			
24"	25.800	25	0.956	19.972					36.9			
	27.900	21	1.029	19.542	4.035	1.100	0.300	0.750	43.1	23.100	13.000	55.7
	29.000	18	1.200	19.200					49.8			
26"	29.000	25	1.032	23.736					52.7			
	31.100	21	1.234	23.342	4.035	1.100	0.300	0.750	61.5	27.620	13.000	81.3
	33.200	18	1.402	22.056					71.1			

Pipe D (in)	Pipe D (ft)	Pipe A (ft ²)	Pipe L (mi)	Pipe L (ft)	PS Surface Ele. (ft)	Incoming Sewer Depth (ft)	Wet Well Ele. (ft)	Discharge Surface Ele. (ft)	Minimum Cover (ft)	Discharge Ele. (ft)	Static H (ft)	Qpeak (mgd)	Q (gpm)	Q (ft ³ /s)	V (ft/s)	C	Friction Slope (ft/ft)	Friction H _L (ft)	Station H _L (ft)	Minor H _L (ft)	TDH (ft)	check
East Waimea																						
PS1																						
6.134	0.51	0.205	0.55	2904	2830	20	2810	2860	10	2850	40	0.61	424	0.94	4.60	140	0.0118	34.4	15	3.4	92.8	ok
PS2																						
9.866	0.82	0.531	0.85	4488	2860	20	2840	2910	10	2900	60	0.95	660	1.47	2.77	140	0.0027	11.9	15	1.2	88.1	ok
PS3																						
9.866	0.82	0.531	0.95	5016	2890	20	2870	2910	10	2900	30	1.51	1,049	2.34	4.40	140	0.0063	31.4	15	3.1	79.6	ok
Waimea Town (Alternative 2C)																						
PS																						
6.134	0.51	0.205	0.25	1320	2455	20	2435	2495	10	2485	50	0.55	382	0.85	4.15	140	0.0098	12.9	15	1.3	79.2	ok
Kawaihae North																						
PS1																						
6.134	0.51	0.205	0.50	2640	70	20	50	110	10	100	50	0.18	125	0.28	1.36	140	0.0012	3.3	15	0.3	68.6	ok
PS2																						
6.134	0.51	0.205																				

Note:

Cells in gray are based on user-input values for population, pipe diameter, pipe slope, or FlowMaster (for velocity and depth at design flow).

Pipe Friction Loss Hazen-Williams =>	$h_L = L(\text{ft}) * ((2.314 Q(\text{ft}^3/\text{s})) / (C^* D(\text{ft})^{2.63}))^{1.852}$ (ft)
Pipe & Valve Minor Loss Equation =>	$h_M = K^* V^2 / 2g$ (ft)

Mile to ft 5280

Assumption:

1. pipe length and surface elevation were based on Google Earth profile
2. C value of 140 for PVC pipe
3. station loss of 15 ft at this planning level
4. 10% of FM friction loss to account for minor loss along FM route at this planning level
5. Pipe inside diameter, C900 DR18 (235 psi)

Quick notes to check FM calculation:

1. maintain FM velocity between 3-5 ft to minimize friction loss
2. TDH should be less than 100 ft per CCH Design Standard at this planning level.

DR18 PVC inside diameter		
4"	4.266	in
6"	6.134	in
8"	8.044	in
10"	9.866	in
12"	11.734	in
14"	13.6	in
16"	15.466	in
18"	17.334	in
20"	19.2	in
24"	22.934	in

C900/RJ Certa-Lok® PVC Pressure Pipe | Restrained Joint

Nominal Diameter (Inch) Size	C900/RJ CERTA-LOK PIPE & COUPLING DIMENSIONS							Weight (lb/ft) W	Weight (lb) L	Weight (lb) G
	Outside Diameter (OD) in	Wall Thickness (T) in	Internal Diameter (ID) in	S	W	R	F			
4"	4.800	0.207	4.296	3.880	6.375	0.125	0.302	2.9	1.964	9.059
	14	0.340	4.114					3.1		4.6
6"	6.900	0.303	6.134	3.880	8.500	0.125	0.302	5.1	3.086	8.258
	14	0.400	5.914					5.4		7.1
8"	9.000	0.303	8.044	3.883	9.300	0.145	0.604	8.7	10.947	10.399
	14	0.466	7.756					11.0		10.5
10"	11.100	0.317	9.988	3.825	9.750	0.215	0.604	13.2		
	14	0.700	9.514					16.8	13.361	23.9
12"	13.200	0.320	11.794	3.825	9.750	0.215	0.604	18.8		
	14	0.940	11.214					24.5	15.026	36.1
14"	15.300	0.612	14.076					18.3		
	21	0.729	13.842	3.810	9.750	0.215	0.604	21.7	16.400	36.9
16"	18	0.850	13.800					25.0		
	25	0.896	16.000					37.7		
18"	17.400	0.829	15.742	3.810	9.750	0.215	0.604	38.0		
	21	0.967	15.406					42.4		
20"	14	1.240	14.914	3.823	9.829	0.265	0.634	48.9		
	25	0.780	17.940					59.8		
22"	19.500	21	0.929	17.642	4.035	1.100	0.300	0.750	35.1	20.870
	18	1.001	17.234					40.6		47.0
25"	21.600	25	0.956	18.972					38.9	
	21	1.029	18.542	4.035	1.100	0.300	0.750	43.1	23.100	55.7
28"	25.800	25	1.032	23.736					52.7	
	21	1.234	23.342	4.035	1.100	0.300	0.750	61.5	27.620	55.0
	18	1.402	22.058					71.1		81.3

Pipe D (in)	Pipe D (ft)	Pipe A (ft ²)	Pipe L (mi)	Pipe L (ft)	PS Surface Ele. (ft)	Incoming Sewer Depth (ft)	Wet Well Ele. (ft)	Discharge Surface Ele. (ft)	Minimum Cover (ft)	Discharge Ele. (ft)	Static H (ft)	Qpeak (mgd)	Q (gpm)	Q (ft ³ /s)	V (ft/s)	C	Friction Slope (ft/ft)	Friction H _L (ft)	Station H _L (ft)	Minor H _L (ft)	TDH (ft)	check
East Waimea																						
PS1																						
8.044	0.67	0.353	0.55	2904	2830	20	2810	2860	10	2850	40	0.72	497	1.11	3.14	140	0.0043	12.3	15	1.2	68.6	ok
PS2																						
9.866	0.82	0.531	0.85	4488	2860	20	2840	2910	12	2898	58	1.379	957	2.13	4.02	140	0.0053	23.8	15	2.4	99.1	ok
PS3																						
11.734	0.98	0.751	0.95	5016	2890	12	2878	2910	10	2900	22	2.214	1,537	3.43	4.56	140	0.0055	27.4	15	2.7	67.2	ok
Waimea Town (Alternative 3A, 3B)																						
PS																						
6.134	0.51	0.205	0.70	3696	2640	20	2620	2670	10	2660	40	0.25	170	0.38	1.85	140	0.0022	8.1	15	0.8	63.9	ok
Kawaihae North																						
PS1																						
6.134	0.51	0.205	0.50	2640	70	20	50	110	10	100	50	0.17	118	0.26	1.28	140	0.0011	2.9	15	0.3	68.2	ok
PS2																						
6.134	0.51	0.205	0.74	3907	10	10	0	60	10	50	50	0.40	278	0.62	3.02	140	0.0054	21.2	15	2.1	88.3	ok
PS3																						
6.134	0.51	0.205	0.18	950	60	10	50	115	10	105	55	0.40	27									

Alternative 3 with Waimea Town 3A and 3B

11.734	0.98	0.751	3.00	15840	44	10	34	75	10	65	31	1.56	1,083	2.41	3.21	140	0.0029	45.3	15	4.5	95.8	ok
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Note:

Cells in gray are based on user-input values for population, pipe diameter, pipe slope, or FlowMaster (for velocity and depth at design flow).

Pipe Friction Loss Hazen-Williams =>	$h_L = L(\text{ft}) * ((2.314 Q(\text{ft}^3/\text{s})) / (C^* D(\text{ft})^{2.63}))^{1.852}$ (ft)
Pipe & Valve Minor Loss Equation =>	$h_M = K^* V^2 / 2g$ (ft)

Mile to ft 5280

Assumption:

1. pipe length and surface elevation were based on Google Earth profile
2. C value of 140 for PVC pipe
3. station loss of 15 ft at this planning level
4. 10% of FM friction loss to account for minor loss along FM route at this planning level
5. Pipe inside diameter, C900 DR18 (235 psi)

Quick notes to check FM calculation:

1. maintain FM velocity between 3-5 ft to minimize friction loss
2. TDH should be less than 100 ft per CCH Design Standard at this planning level.

DR18 PVC inside diameter		
4"	4.266	in
6"	6.134	in
8"	8.044	in
10"	9.866	in
12"	11.734	in
14"	13.6	in
16"	15.466	in
18"	17.334	in
20"	19.2	in
24"	22.934	in

C900/RJ Certa-Lok® PVC Pressure Pipe | Restrained Joint

Nominal Diameter (Inch) Size	C900/RJ CERTA-LOK PIPE & COUPLING DIMENSIONS						Sleeving				
	Outside Diameter (Inch) OD	Wall Thickness (Inch) TI	Internal Diameter (Inch) ID	S	W	R	Weight (lb/ft) W	OD L	Weight (lb/ft) W		
4"	4.000	0.207	4.206	3.000	6.375	0.125	0.002	2.1	5.964	9.059	4.6
	14	0.340	4.114								
6"	6.000	0.303	6.134	3.000	9.500	0.125	0.002	5.1	8.386	8.258	7.1
	14	0.400	5.914								
8"	9.000	0.303	8.044	3.183	10.000	0.145	0.004	8.7	10.947	10.399	10.5
	14	0.466	7.756								
10"	11.100	0.317	9.998	3.625	10.750	0.215	0.004	13.2	13.361	11.125	23.9
	14	0.700	9.514								
12"	13.300	0.320	11.754	3.625	10.750	0.215	0.004	18.8	15.026	12.000	36.1
	14	0.940	11.214								
14"	15.300	0.612	14.076								
	21	0.729	13.842	3.810	10.750	0.215	0.004	21.7	16.400	12.000	36.9
16"	18	0.850	13.800								
	25	0.986	16.000	3.810	10.750	0.215	0.004	37.7	18.075	12.000	36.8
18"	17.400	0.829	15.742	3.810	10.750	0.215	0.004	38.0	21.100	12.000	36.8
	18	0.967	15.406								
20"	14	1.240	14.914	3.823	10.875	0.265	0.004	48.9			
	25	0.780	17.940								
25"	21	0.929	17.642	4.035	11.000	0.300	0.750	35.1	20.070	15.000	47.0
	18	1.001	17.254								
28"	21.600	0.956	18.972								
	21	1.029	18.542	4.035	11.000	0.300	0.750	43.1	23.100	15.000	55.7
34"	25.800	1.032	23.736								
	21	1.234	23.342	4.035	11.000	0.300	0.750	51.5	27.620	15.000	81.3
	18	1.402	22.958								

Pipe D (in)	Pipe D (ft)	Pipe A (ft ²)	Pipe L (mi)	Pipe L (ft)	PS Surface Ele. (ft)	Incoming Sewer Depth (ft)	Wet Well Ele. (ft)	Discharge Surface Ele. (ft)	Minimum Cover (ft)	Discharge Ele. (ft)	Static H (ft)	Qpeak (mgd)	Q (gpm)	Q (ft ³ /s)	V (ft/s)	C	Friction Slope (ft/ft)	Friction H _L (ft)	Station H _L (ft)	Minor H _L (ft)	TDH (ft)	check
East Waimea																						
PS1																						
8.044	0.67	0.353	0.55	2904	2830	20	2810	2860	10	2850	40	0.72	497	1.11	3.14	140	0.0043	12.3	15	1.2	68.6	ok
PS2																						
9.866	0.82	0.531	0.85	4488	2860	20	2840	2910	12	2898	58	1.379	957	2.13	4.02	140	0.0053	23.8	15	2.4	99.1	ok
PS3																						
11.734	0.98	0.751	0.95	5016	2890	10	2880	2910	10	2900	20	2.214	1,537	3.43	4.56	140	0.0055	27.4	15	2.7	65.2	ok
Waimea Town (Alternative 3C)																						
PS																						
6.134	0.51	0.205	0.25	1320	2455	20	2435	2495	10	2485	50	0.66	457	1.02	4.96	140	0.0136	18.0	15	1.8	84.8	ok
Kawaihae North																						
PS1																						
6.134	0.51	0.205	0.50	2640	70	20	50	110	10	100	50	0.17	118	0.26	1.28	140	0.0011	2.9	15	0.3	68.2	ok
PS2																						
6.134	0.51	0.205	0.74	3907	10	10	0	60	10	50	50	0.40	278	0.62	3.02	140	0.0054	21.2	15	2.1	88.3	ok
PS3																						
6.134	0.51	0.205																				

Alternative 3 with Waimea Town 3C

11.734	0.98	0.751	3.00	15840	44	10	34	75	10	65	31	1.56	1,083	2.41	3.21	140	0.0029	45.3	15	4.5	95.8	ok
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Note:

Cells in gray are based on user-input values for population, pipe diameter, pipe slope, or FlowMaster (for velocity and depth at design flow).

Pipe Friction Loss Hazen-Williams =>	$h_f = L(ft) * ((2.314 Q(ft^3/s)) / (C^D(ft)^{2.63}))^{1.852} (ft)$
Pipe & Valve Minor Loss Equation =>	$h_M = K * V^2 / 2g (ft)$

Mile to ft 5280

- 1. pipe length and surface elevation were based on Google Earth profile
 - 2. C value of 140 for PVC pipe
 - 3. station loss of 15 ft at this planning level
 - 4. 10% of FM friction loss to account for minor loss along FM route at this planning level
 - 5. Pipe inside diameter, C900 DR18 (235 psi)

Quick notes to check FM calculation:

1. maintain FM velocity between 3-5 ft to minimize friction loss
 2. TDH should be less than 100 ft per CCH Design Standard at this planning level.

DR18 PVC inside diameter

4"	4.266	in
6"	6.134	in
8"	8.044	in
10"	9.866	in
12"	11.734	in
14"	13.6	in
16"	15.466	in
18"	17.334	in
20"	19.2	in
24"	22.934	in

C900/RJ Certa-Lok® PVC Pressure Pipe | Restrained Joint

COKO/UJ CERTA-LOK PIPE & COUPLING DIMENSIONS											
Nom. Size	Outside Diameter (OD) in	Weld Thickness (T) in	Internal Radius (R) in	Pipe				Coupling			
				S	W	E	F	Weight (lb/in)	SUS	L	Weight (lb/in)
4"	4.900	18	0.267	4.206	3.880	0.375	0.125	2.0	5.964	8.259	4.0
		14	0.343	4.116				3.1			
6"	6.900	18	0.363	6.134	5.880	0.500	0.125	5.1	8.366	12.250	7.1
		14	0.400	5.914				0.4			
8"	9.950	18	0.503	8.044				8.7			
		14	0.646	7.750	3.183	0.500	0.145	11.0	10.947	10.389	15.5
10"	11.100	18	0.617	9.096				13.2			
		14	0.730	9.514	3.825	0.750	0.215	16.6	13.361	11.125	23.9
12"	13.300	18	0.730	11.756				18.6			
		14	0.946	11.314	3.625	0.750	0.215	23.5	15.036	12.000	36.1
14"	15.300	21	0.729	13.842	3.810	0.750	0.215	21.7			
		18	0.830	13.600				25.0			
16"	17.400	21	0.896	16.000				33.7			
		18	0.929	15.742	3.610	0.750	0.215	38.0			
18"	19.500	21	0.967	15.466				32.4			
		14	1.245	14.914	3.873	0.875	0.285	41.9			
20"	21.600	21	0.780	17.940				29.8			
		18	1.029	17.642	4.035	1.100	0.300	35.1			
22"	23.700	21	0.966	18.072				43.1			
		18	1.200	18.200				48.8			
24"	25.800	21	1.224	23.342	4.035	1.100	0.300	51.5			
		18	1.422	22.358				57.1			

Pipe D (in)	Pipe D (ft)	Pipe A (ft2)	Pipe L (mi)	Pipe L (ft)	PS Surface Ele. (ft)	Incoming Sewer Depth (ft)	Wet Well Ele. (ft)	Discharge Surface Ele. (ft)	Minimum Cover (ft)	Discharge Ele. (ft)	Static H (ft)	Qpeak (mgd)	Q (gpm)	Q (ft³/s)	V (ft/s)	C	Friction Slope (ft/ft)	Friction H _L (ft)	Station H _L (ft)	Minor H _L (ft)	TDH (ft)	check
East Waimea																						
PS1																						
6.134	0.51	0.205	0.55	2904	2830	20	2810	2860	10	2850	40	0.61	424	0.94	4.60	140	0.0118	34.4	15	3.4	92.8	ok
PS2																						
9.866	0.82	0.531	0.85	4488	2860	20	2840	2910	10	2900	60	0.95	660	1.47	2.77	140	0.0027	11.9	15	1.2	88.1	ok
PS3																						
9.866	0.82	0.531	0.95	5016	2890	20	2870	2910	10	2900	30	1.51	1,049	2.34	4.40	140	0.0063	31.4	15	3.1	79.6	ok
Waimea Town (Alternative 4A, 4B)																						
PS																						
6.134	0.51	0.205	0.70	3696	2640	20	2620	2670	10	2660	40	0.21	146	0.32	1.58	140	0.0016	6.1	15	0.6	61.7	ok
Kawaihae North																						
PS1																						
6.134	0.51	0.205	0.50	2640	70	20	50	110	10	100	50	0.18	125	0.28	1.36	140	0.0012	3.3	15	0.3	68.6	ok
PS2																						
6.134	0.51	0.205	0.74	3907	10	10	0	60	10	50	50	0.36	250	0.56	2.71	140	0.0045	17.4	15	1.7	84.2	ok
PS3																						
6.134	0.51	0.205	0.18	950	60	10	50	115	10	105	55	0.36	250	0.56	2.71	140	0.0045	4.2	15	0.4	74.7	ok
PS4																						
6.134	0.51	0.205	0.20	1056	115	10	105	170	10	160	55	0.36	250	0.56	2.71	140	0.0045	4.7	15	0.5	75.2	ok
PS5																						
6.134	0.51	0.205	0.23	1214	170	10	160	220	10	210	50	0.36	250	0.56	2.71	140	0.0045	5.4	15	0.5	71.0	ok
Kawaihae South																						
PS6																						
6.134	0.51	0.205	0.75	3960	220	10	210	260	10	250	40	0.37	257	0.57	2.79	140	0.0047	18.6	15	1.9	75.4	ok
PS7																						
6.134	0.51	0.205	0.95	5016	260	10	250	280	10	270	20	0.37	257	0.57	2.79	140	0.0047	23.5	15	2.4	60.9	ok
PS8																						
6.134	0.51	0.205	0.80	4224	170	10	160	160	10	150	-10	0.37	257	0.57	2.79	140	0.0047	19.8	15	2.0	26.8	ok
Puako																						
PS9																						
6.134	0.51	0.205	0.30	1584	80	10	70	150	10	140	70	0.32	222	0.50	2.41	140	0.0036	5.7	15	0.6	91.2	ok
PS10																						
6.134	0.51	0.205	0.97	5122	150	10	140	160	10	150	10	0.32	222	0.50	2.41	140	0.0036	18.4	15	1.8	45.2	ok

Note:

Cells in gray are based on user-input values for population, pipe diameter, pipe slope, or FlowMaster (for velocity and depth at design flow).

$$\text{Pipe Friction Loss Hazen-Williams} \Rightarrow h_L = L(\text{ft}) * ((2.314 Q(\text{ft}^3/\text{s})) / (C^* D(\text{ft})^{2.63}))^{1.852} (\text{ft})$$

$$\text{Pipe & Valve Minor Loss Equation} \Rightarrow h_M = K^* V^2 / 2g (\text{ft})$$

Mile to ft 5280

- 1. pipe length and surface elevation were based on Google Earth profile
 - 2. C value of 140 for PVC pipe
 - 3. station loss of 15 ft at this planning level
 - 4. 10% of FM friction loss to account for minor loss along FM routeat this planing level
 - 5. Pipe inside diameter, C900 DR18 (235 psi)

Quick notes to check FM calculation:

1. maintain FM velocity between 3-5 ft to minimize friction loss
 2. TDH should be less than 100 ft per CCH Design Standard at this planning level.

DR18 PVC inside diameter

4"	4.266	in
6"	6.134	in
8"	8.044	in
10"	9.866	in
12"	11.734	in
14"	13.6	in
16"	15.466	in
18"	17.334	in
20"	19.2	in
24"	22.934	in

C900/RJ Certa-Lok® PVC Pressure Pipe | Restrained Joint

COKO/UL CERTA-LOK PIPE & COUPLING DIMENSIONS												
Nom. Size	Outside Diameter (OD) in.	Pipe					Coupling					
		Weld Thickness (T)	Internal Radius (R)	S	W	E	F	Weight (lb/ft)	H	L	Weight (lb/ft)	
4"	4.000	18	0.367	4.206	3.880	6.375	6.125	0.862	2.5	5.964	8.259	4.0
		14	0.343	4.114	3.880				3.1			
6"	6.000	18	0.365	6.124	3.880	8.500	8.125	2.000	5.1	8.386	8.291	7.1
		14	0.400	5.914					8.4			
8"	8.000	18	0.363	8.044	3.880	10.500	9.125	2.654	6.7	10.947	10.599	10.5
		14	0.460	7.756					11.0			
10"	11.100	18	0.617	9.986	3.825	12.750	10.215	3.634	13.2			
		14	0.793	9.514					16.6	13.361	11.123	23.9
12"	13.300	18	0.733	11.756	3.825	15.750	12.215	3.634	18.6			
		14	0.945	11.314					23.5	15.036	12.091	36.1
14"	15.300	21	0.612	14.076	3.810	18.750	14.215	3.634	18.2			
		18	0.630	13.842					25.0			
16"	17.400	21	0.696	16.000					33.7			
		21	0.829	15.742	3.810	19.750	16.215	3.634	28.0			
18"	19.500	18	0.367	15.406					32.4	18.075	12.000	38.6
		14	1.240	14.914	3.823	18.875	18.215	3.634	48.9			
20"	21.600	25	0.780	17.940					29.8			
		21	0.929	17.642	4.035	1.100	0.300	0.750	35.1	20.870	15.000	47.0
22"	23.700	18	1.033	17.338					40.6			
		25	0.956	18.072					36.9			
24"	25.800	21	1.029	18.542	4.035	1.100	0.300	0.750	43.1	23.120	15.000	55.7
		18	1.200	18.200					49.8			
26"	27.900	25	1.187	19.736					52.1			
		21	1.224	23.345	4.035	1.100	0.300	0.750	41.5	27.620	15.000	61.3
28"	29.900	18	1.422	22.356					71.1			

Pipe D (in)	Pipe D (ft)	Pipe A (ft2)	Pipe L (mi)	Pipe L (ft)	PS Surface Ele. (ft)	Incoming Sewer Depth (ft)	Wet Well Ele. (ft)	Discharge Surface Ele. (ft)	Minimum Cover (ft)	Discharge Ele. (ft)	Static H (ft)	Qpeak (mgd)	Q (gpm)	Q (ft³/s)	V (ft/s)	C	Friction Slope (ft/ft)	Friction H _L (ft)	Station H _L (ft)	Minor H _L (ft)	TDH (ft)	check
East Waimea																						
PS1																						
6.134	0.51	0.205	0.55	2904	2830	20	2810	2860	10	2850	40	0.61	424	0.94	4.60	140	0.0118	34.4	15	3.4	92.8	ok
PS2																						
9.866	0.82	0.531	0.85	4488	2860	20	2840	2910	10	2900	60	0.95	660	1.47	2.77	140	0.0027	11.9	15	1.2	88.1	ok
PS3																						
9.866	0.82	0.531	0.95	5016	2890	20	2870	2910	10	2900	30	1.51	1,049	2.34	4.40	140	0.0063	31.4	15	3.1	79.6	ok
Waimea Town (Alternative 4C)																						
PS																						
6.134	0.51	0.205	0.25	1320	2455	20	2435	2495	10	2485	50	0.55	382	0.85	4.15	140	0.0098	12.9	15	1.3	79.2	ok
Kawaihae North																						
PS1																						
6.134	0.51	0.205	0.50	2640	70	20	50	110	10	100	50	0.18	125	0.28	1.36	140	0.0012	3.3	15	0.3	68.6	ok
PS2																						
6.134	0.51	0.205	0.74	3907	10	10	0	60	10	50	50	0.36	250	0.56	2.71	140	0.0045	17.4	15	1.7	84.2	ok
PS3																						
6.134	0.51	0.205	0.18	950	60	10	50	115	10	105	55	0.36	250	0.56	2.71	140	0.0045	4.2	15	0.4	74.7	ok
PS4																						
6.134	0.51	0.205	0.20	1056	115	10	105	170	10	160	55	0.36	250	0.56	2.71	140	0.0045	4.7	15	0.5	75.2	ok
PS5																						
6.134	0.51	0.205	0.23	1214	170	10	160	220	10	210	50	0.36	250	0.56	2.71	140	0.0045	5.4	15	0.5	71.0	ok
Kawaihae South																						
PS6																						
6.134	0.51	0.205	0.75	3960	220	10	210	260	10	250	40	0.37	257	0.57	2.79	140	0.0047	18.6	15	1.9	75.4	ok
PS7																						
6.134	0.51	0.205	0.95	5016	260	10	250	280	10	270	20	0.37	257	0.57	2.79	140	0.0047	23.5	15	2.4	60.9	ok
PS8																						
6.134	0.51	0.205	0.80	4224	170	10	160	160	10	150	-10	0.37	257	0.57	2.79	140	0.0047	19.8	15	2.0	26.8	ok
Puako																						
PS9																						
6.134	0.51	0.205	0.30	1584	80	10	70	150	10	140	70	0.32	222	0.50	2.41	140	0.0036	5.7	15	0.6	91.2	ok
PS10																						
6.134	0.51	0.205	0.97	5122	150	10	140	160	10	150	10	0.32	222	0.50	2.41	140	0.0036	18.4	15	1.8	45.2	ok

Note:

Cells in gray are based on user-input values for population, pipe diameter, pipe slope, or FlowMaster (for velocity and depth at design flow).

Pipe Friction Loss Hazen-Williams =>	$h_L = L(\text{ft}) * ((2.314 Q(\text{ft}^3/\text{s})) / (C^* D(\text{ft})^{2.63}))^{1.852}$ (ft)
Pipe & Valve Minor Loss Equation =>	$h_M = K^* V^2 / 2g$ (ft)

Mile to ft 5280

Assumption:

1. pipe length and surface elevation were based on Google Earth profile
2. C value of 140 for PVC pipe
3. station loss of 15 ft at this planning level
4. 10% of FM friction loss to account for minor loss along FM route at this planning level
5. Pipe inside diameter, C900 DR18 (235 psi)

Quick notes to check FM calculation:

1. maintain FM velocity between 3-5 ft to minimize friction loss
2. TDH should be less than 100 ft per CCH Design Standard at this planning level.

DR18 PVC inside diameter		
4"	4.266	in
6"	6.134	in
8"	8.044	in
10"	9.866	in
12"	11.734	in
14"	13.6	in
16"	15.466	in
18"	17.334	in
20"	19.2	in
24"	22.934	in

C900/RJ Certa-Lok® PVC Pressure Pipe | Restrained Joint

Nominal Size Inches (mm)	C900/RJ CERTA-LOK PIPE & COUPLING DIMENSIONS						Weight lb/ft (kg/m)	Weight lb/ft (kg/m)
	Wall Thickness (T) in (mm)	Internal Diameter (D) in (mm)	S	W	R	F		
4"	4.800	4.266	3.880	6.375	0.125	0.302	2.9	5.964
	14	4.340	4.114				3.1	6.059
6"	6.900	6.134	3.880	8.500	0.125	0.302	5.1	8.298
	14	5.400	5.914				5.4	8.386
8"	9.000	8.044	3.163	9.300	0.145	0.604	8.7	10.947
	14	6.646	7.756				11.0	10.399
10"	11.100	9.866	3.625	7.750	0.215	0.604	13.2	13.361
	14	7.793	9.514				16.8	11.123
12"	13.200	11.734	3.625	7.750	0.215	0.604	18.8	15.026
	14	9.649	11.214				24.5	12.099
14"	15.300	13.6	14.076				18.3	
	21	0.729	13.842	3.810	0.750	0.215	0.604	21.7
16"	17.400	15.466	16.000				25.0	
	21	0.850	15.742	3.810	0.750	0.215	0.604	28.0
18"	19.500	17.334	16.000				32.4	
	21	0.929	17.642	4.035	1.100	0.300	0.750	35.1
20"	21.600	19.2	17.234				38.9	
	21	1.031	19.914	3.823	0.875	0.285	0.604	40.9
22"	23.700	21.934	19.914				44.9	
	21	1.132	22.736	3.823	0.875	0.285	0.604	48.9
24"	25.800	23.342	19.914				52.7	
	21	1.234	23.342	4.035	1.100	0.300	0.750	51.5
	18	1.422	22.056				71.1	27.620
								15.000
								81.3

Pipe D (in)	Pipe D (ft)	Pipe A (ft ²)	Pipe L (mi)	Pipe L (ft)	PS Surface Ele. (ft)	Incoming Sewer Depth (ft)	Wet Well Ele. (ft)	Discharge Surface Ele. (ft)	Minimum Cover (ft)	Discharge Ele. (ft)	Static H (ft)	Qpeak (mgd)	Q (gpm)	Q (ft ³ /s)	V (ft/s)	C	Friction Slope (ft/ft)	Friction H _L (ft)	Station H _L (ft)	Minor H _L (ft)	TDH (ft)	check	
East Waimea																							
PS1																							
8.044	0.67	0.353	0.55	2904	2830	20	2810	2860	10	2850	40	0.72	497	1.11	3.14	140	0.0043	12.3	15	1.2	68.6	ok	
PS2																							
9.866	0.82	0.531	0.85	4488	2860	20	2840	2910	12	2898	58	1.379	957	2.13	4.02	140	0.0053	23.8	15	2.4	99.1	ok	
PS3																							
11.734	0.98	0.751	0.95	5016	2890	20	2870	2910	10	2900	30	2.214	1,537	3.43	4.56	140	0.0055	27.4	15	2.7	75.2	ok	
Waimea Town (Alternatives 5A and 5B)																							
PS																							
6.134	0.51	0.205	0.70	3696	2640	20	2620	2670	10	2660	40	0.25	170	0.38	1.85	140	0.0022	8.1	15	0.8	63.9	ok	
Kawaihae North																							
PS1																							
6.134	0.51	0.205	0.50	2640	70	20	50	110	10	100	50	0.17	118	0.26	1.28	140	0.0011	2.9	15	0.3	68.2	ok	
PS2																							
6.134	0.51	0.205	0.74	3907	10	10	0	60	10	50	50	0.40	278	0.62	3.02	140	0.0054	21.2	15				

Note:

Cells in gray are based on user-input values for population, pipe diameter, pipe slope, or FlowMaster (for velocity and depth at design flow).

Pipe Friction Loss Hazen-Williams =>	$h_L = L(\text{ft}) * ((2.314 Q(\text{ft}^3/\text{s})) / (C^* D(\text{ft})^{2.63}))^{1.852}$ (ft)
Pipe & Valve Minor Loss Equation =>	$h_M = K^* V^2 / 2g$ (ft)

Mile to ft 5280

Assumption:

1. pipe length and surface elevation were based on Google Earth profile
2. C value of 140 for PVC pipe
3. station loss of 15 ft at this planning level
4. 10% of FM friction loss to account for minor loss along FM route at this planning level
5. Pipe inside diameter, C900 DR18 (235 psi)

Quick notes to check FM calculation:

1. maintain FM velocity between 3-5 ft to minimize friction loss
2. TDH should be less than 100 ft per CCH Design Standard at this planning level.

DR18 PVC inside diameter		
4"	4.266	in
6"	6.134	in
8"	8.044	in
10"	9.866	in
12"	11.734	in
14"	13.6	in
16"	15.466	in
18"	17.334	in
20"	19.2	in
24"	22.934	in

C900/RJ Certa-Lok® PVC Pressure Pipe | Restrained Joint

Nominal Size (Inches) (mm)	Type						Sleeving					
	Wall Thickness (In.) (mm)	Wet Wall Thickness (In.) (mm)	Internal Diameter (In.) (mm)	S	W	R	F	Weight (lb/ft) (kg/m)	Weight (lb) (kg)			
4"	4.800	18	0.207	4.266	3.893	6.375	0.125	0.302	2.9	1.964	9.359	4.6
	14	0.340	4.114						3.1			
6"	6.900	18	0.303	6.134	3.893	8.500	0.125	0.302	5.1	0.386	8.258	7.1
	14	0.400	5.914						5.4			
8"	9.900	18	0.503	8.044	3.183	10.000	0.145	0.604	8.7	10.947	10.399	10.5
	14	0.646	7.756						11.0			
10"	11.100	18	0.617	9.866	3.625	12.750	0.215	0.604	13.2	13.361	11.123	23.9
	14	0.793	9.514						16.8			
12"	13.300	18	0.720	11.734	3.625	15.750	0.215	0.604	18.8	15.026	12.009	36.1
	14	0.945	11.214						24.5			
14"	15.300	20	0.612	14.076					18.3			
	21	0.729	13.842	3.810	0.750	0.215	0.604	21.7	16.400	12.000	36.9	
	18	0.850	13.300					25.0				
	25	0.986	16.000					37.7				
	21	0.829	15.742	3.810	0.750	0.215	0.604	38.0				
	18	0.967	15.406					32.4				
	14	1.243	14.914	3.823	0.875	0.265	0.634	40.9				
	25	0.780	17.940					29.8				
	21	0.929	17.642	4.035	1.100	0.300	0.750	35.1	20.670	13.000	47.0	
	18	1.081	17.254					40.6				
	25	0.954	19.972					36.9				
	21	1.029	19.542	4.035	1.100	0.300	0.750	43.1	23.100	13.000	55.7	
	18	1.200	19.200					49.8				
	25	1.052	23.736					52.7				
	21	1.234	23.342	4.035	1.100	0.300	0.750	51.5	27.620	13.000	81.3	
	18	1.402	22.958					71.1				

Pipe D (in)	Pipe D (ft)	Pipe A (ft ²)	Pipe L (mi)	Pipe L (ft)	PS Surface Ele. (ft)	Incoming Sewer Depth (ft)	Wet Well Ele. (ft)	Discharge Surface Ele. (ft)	Minimum Cover (ft)	Discharge Ele. (ft)	Static H (ft)	Qpeak (mgd)	Q (gpm)	Q (ft ³ /s)	V (ft/s)	C	Friction Slope (ft/ft)	Friction H _L (ft)	Station H _L (ft)	Minor H _L (ft)	TDH (ft)	check	
East Waimea																							
PS1																							
8.044	0.67	0.353	0.55	2904	2830	20	2810	2860	10	2850	40	0.72	497	1.11	3.14	140	0.0043	12.3	15	1.2	68.6	ok	
PS2																							
9.866	0.82	0.531	0.85	4488	2860	20	2840	2910	12	2898	58	1.379	957	2.13	4.02	140	0.0053	23.8	15	2.4	99.1	ok	
PS3																							
11.734	0.98	0.751	0.95	5016	2890	20	2870	2910	10	2900	30	2.214	1,537	3.43	4.56	140	0.0055	27.4	15	2.7	75.2	ok	
Waimea Town (Alternative 5C)																							
PS																							
6.134	0.51	0.205	0.25	1320	2455	20	2435	2495	10	2485	50	0.66	457	1.02	4.96	140	0.0136	18.0	15	1.8	84.8	ok	
Kawaihae North																							
PS1																							
6.134	0.51	0.205	0.50	2640	70	20	50	110	10	100	50	0.17	118	0.26	1.28	140	0.0011	2.9	15	0.3	68.2	ok	
PS2																							
6.134	0.51	0.205	0.74	3907	10	10	0	60	10	50	50	0.40	278	0.62	3.02	140	0.0054	21.2	15	2.1	88.3	ok	
PS3																							
6.134	0.51	0.205	0.18	950	60	10	50																

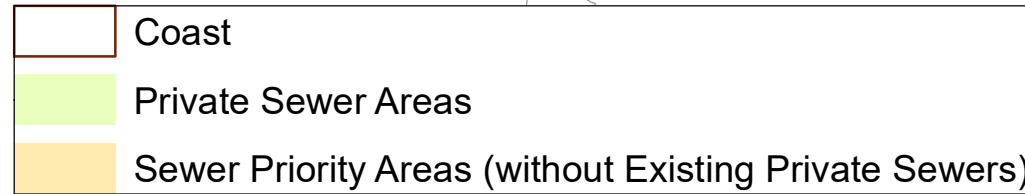
Note:

Cells in gray are based on user-input values for population, pipe diameter, pipe slope, or FlowMaster (for velocity and depth at design flow).

A-4: Contour Maps (Basis for Collection System Layout and calculation)

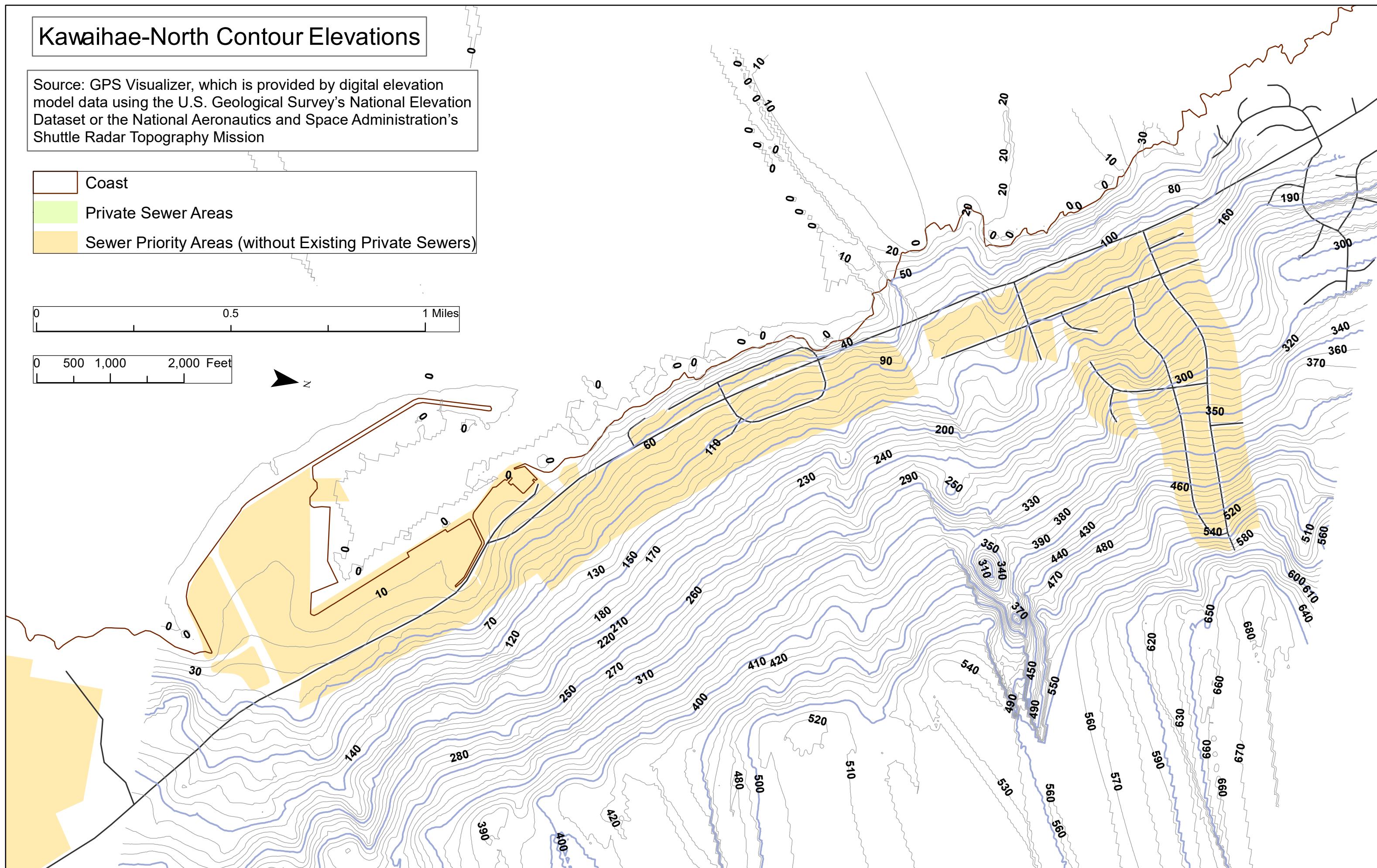
Kawaihae-North Contour Elevations

Source: GPS Visualizer, which is provided by digital elevation model data using the U.S. Geological Survey's National Elevation Dataset or the National Aeronautics and Space Administration's Shuttle Radar Topography Mission



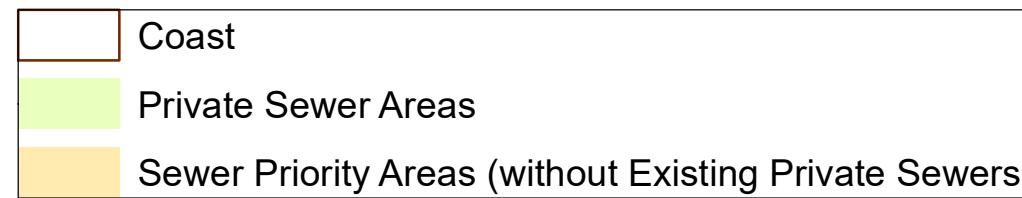
0 0.5 1 Miles

0 500 1,000 2,000 Feet



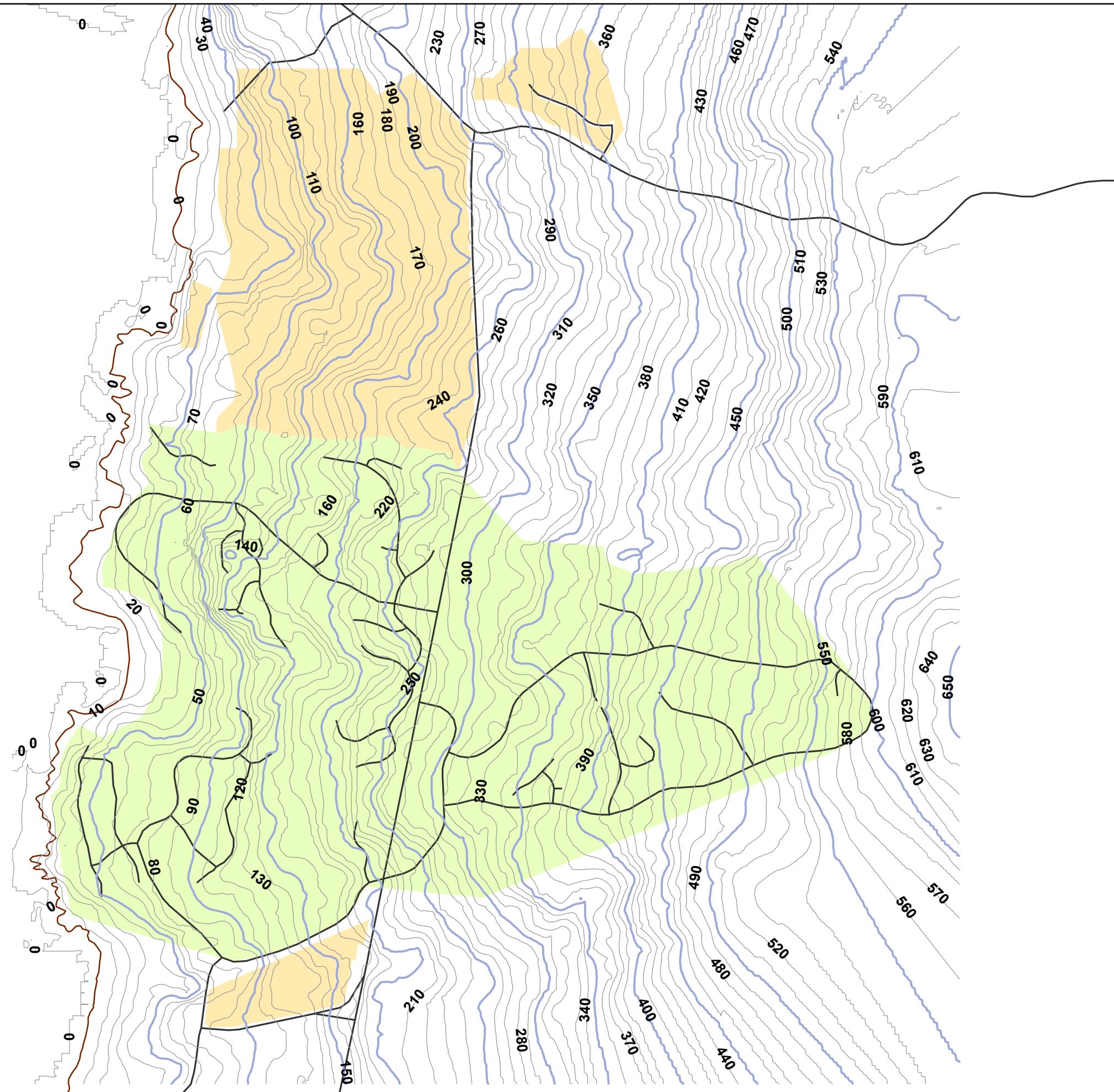
Kawaihae-South Contour Elevations

Source: GPS Visualizer, which is provided by digital elevation model data using the U.S. Geological Survey's National Elevation Dataset or the National Aeronautics and Space Administration's Shuttle Radar Topography Mission



0 0.5 1 Miles

0 500 1,000 2,000 Feet



Appendix B:

Collection System Layout Maps and

Hydraulic Calculations – Puakō

Subregion

Appendix B Collection System Layout Maps and Hydraulic Calculations

Puako

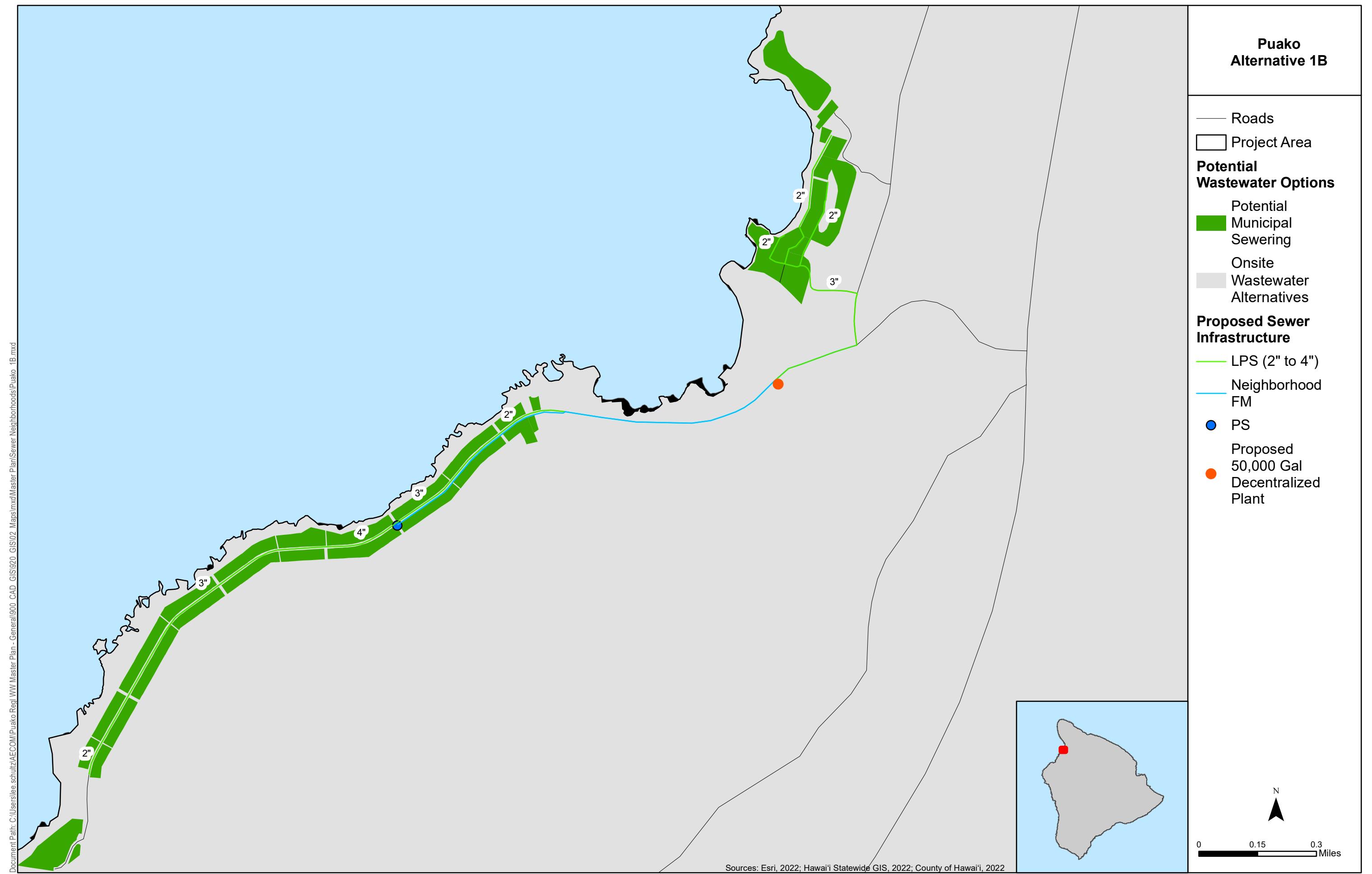
B-1: Community Collection System Layout Maps

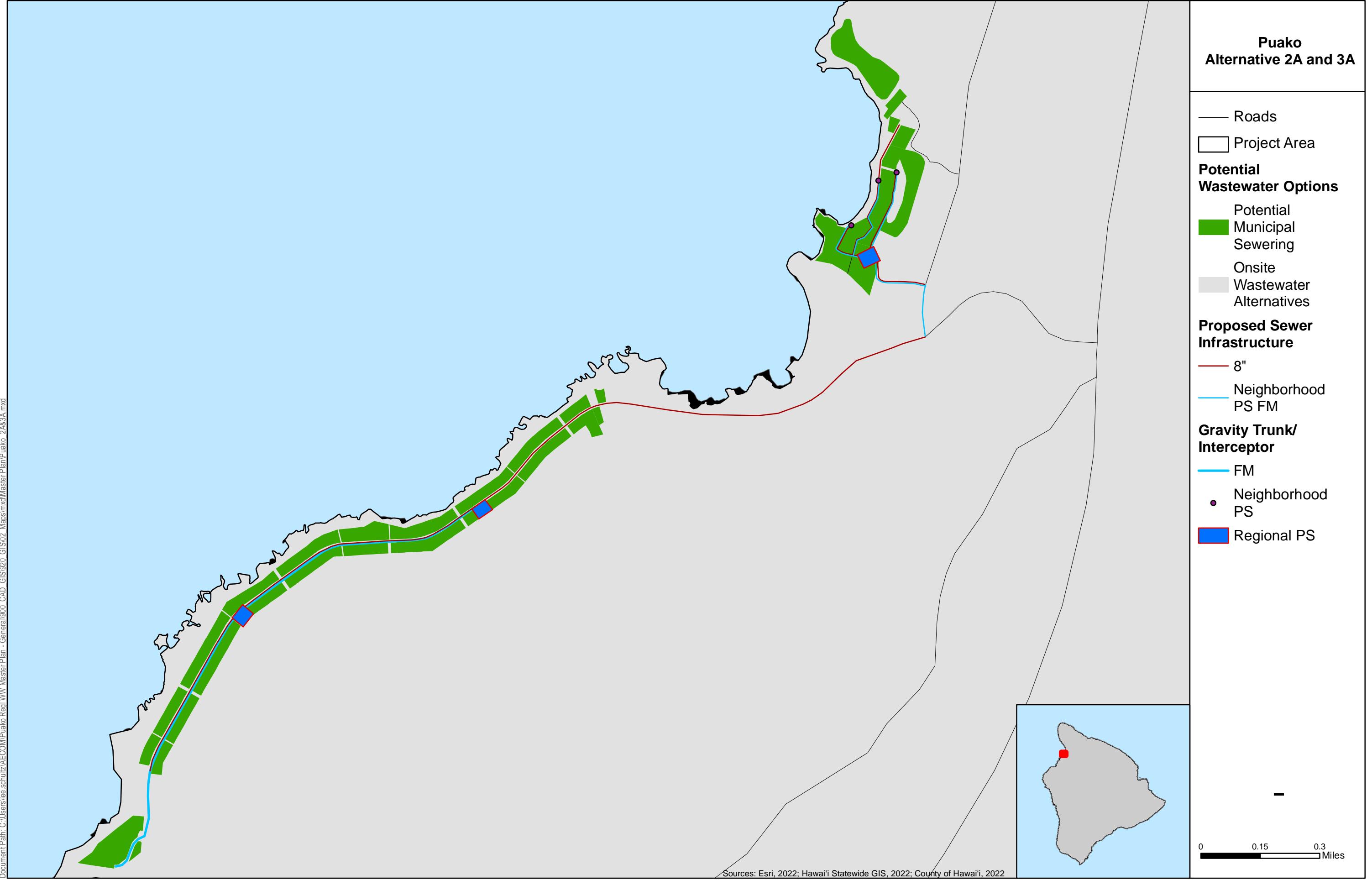
B-2: Sewer Hydraulic Calculations

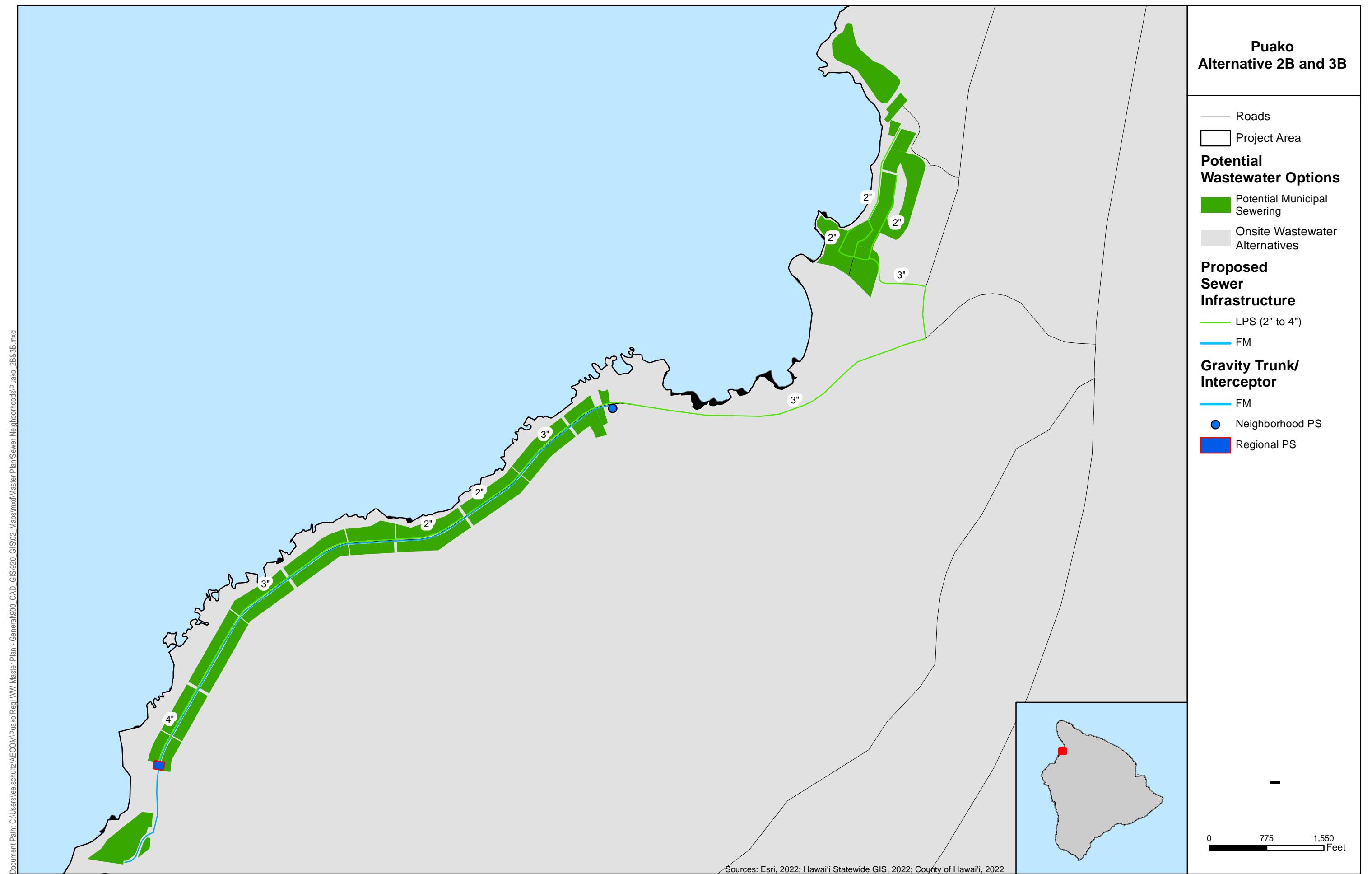
B-3: Pump Station and Force Main Hydraulic Calculations (see Appendix A-3)

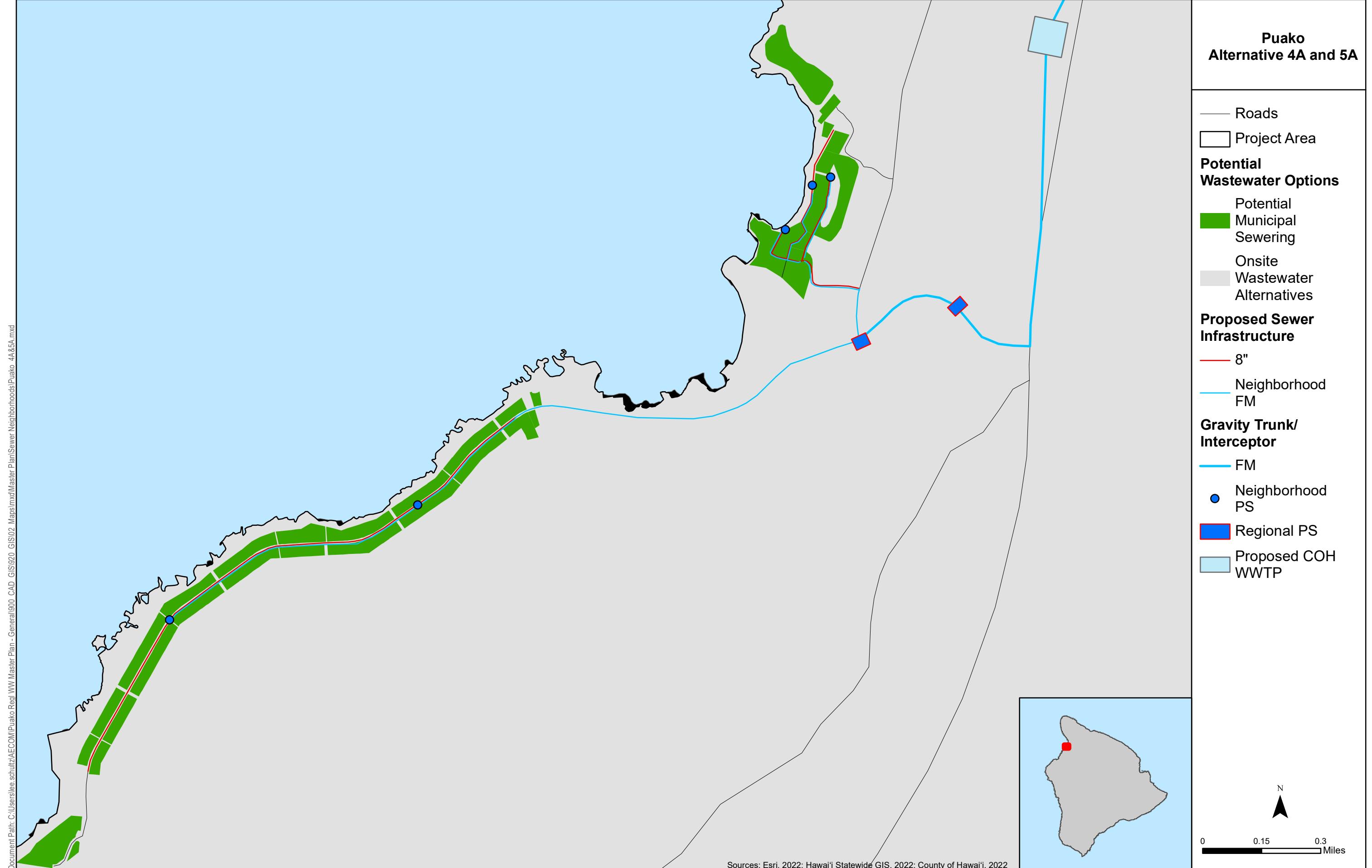
B-4: Contour Maps (Basis for Collection System Layout and calculation)

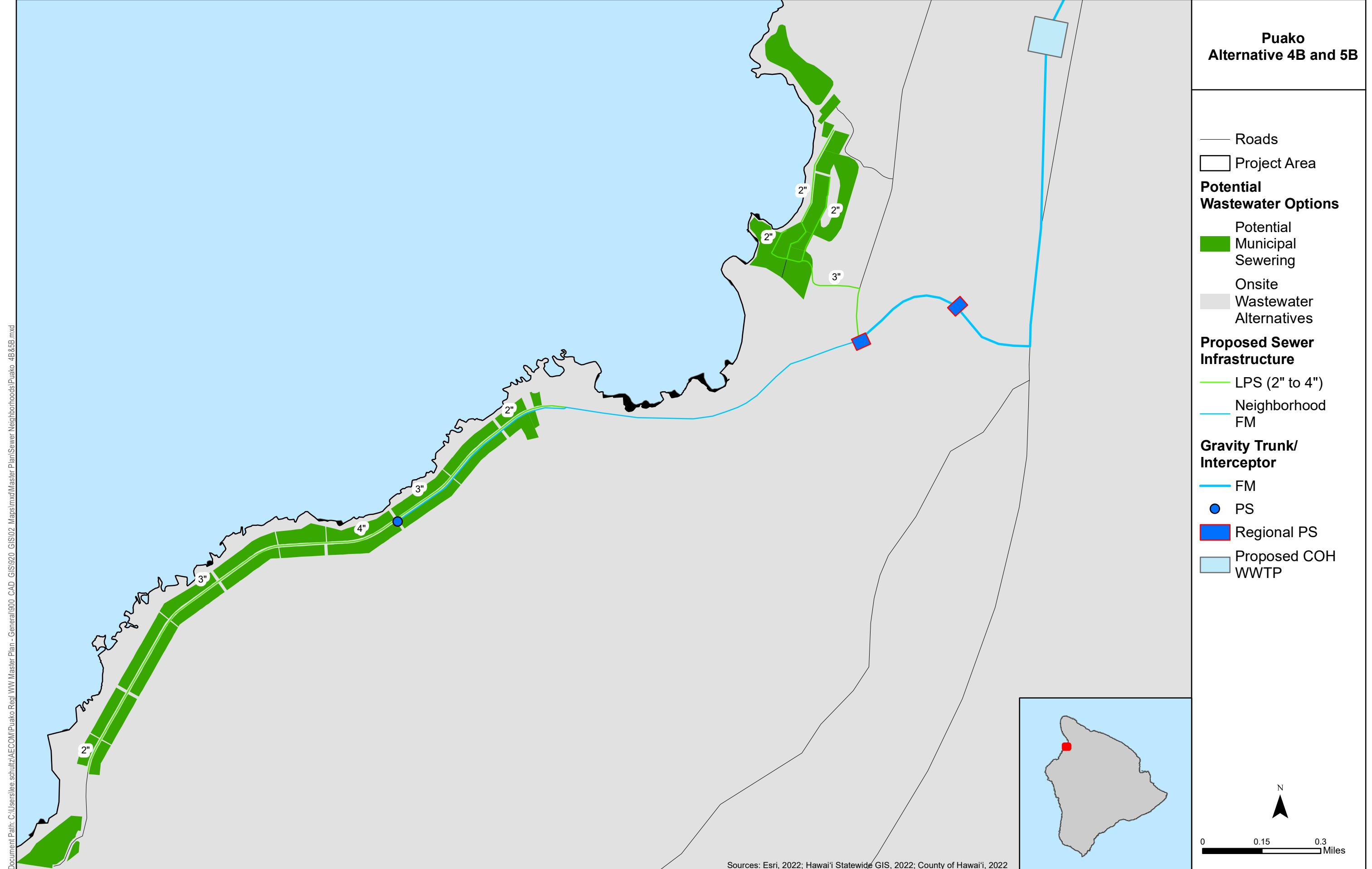
B-1: Community Collection System Layout Map











B-2: Sewer Hydraulic Calculations

Computation of Wastewater Flow for Puako

Sewer: Puako districts

District: Puako

Reference Maps: Hawaii Statewide GIS Program

Page: 1 of 1

Computed by: Adrienne Fung, Tieshi Huang, Lee Schultz
Date: September 14, 2023

Sewer Location	Tributary Area (Acres)	Tributary Equivalent Population										Wastewater Flow Computation	() Existing Sewer Study (X) Ultimate Sewer Study															
		Residential					Other	Total	Increment					Increment														
		Homes	Apartment	Total	Increment	Total			Increment	Total	Increment	Total	Increment	Total	Increment	Total	Slope (%)											
District Zone or Street		Lots	Increment	Total	Lots	Increment	Total	Total	Increment	Total	Increment	Total	Base Sanitary Flow - $BSF @ 70 \text{ gpcd}$ (MGD)	Flow Factor	Peak Base Sanitary Flow - PBSF (MGD)	Ground Water Infiltration - GW @ 35 gpcd (MGD)	Average Dry Weather Flow - ADWF (MGD)	Peak Dry Weather Flow - PDWF (MGD)	Area Used for Wet Weather VI Calculation factors)	Wet Weather LI @ 3000 gpcd (MGD)	Design Peak Flow - Q_{des} (MGD)	Pipe Diameter (in)	Velocity at Full Pipe - V_{full} (fps)	Full Pipe Flow - Q_{full} (MGD)	Design Flow - Q_{des} (MGD)	Flow - Q_{full} (MGD)	Velocity at Design Flow - V_{des} (fps)	Depth at Design Flow - D_{des} (ft)
Peuko	Peuko Alt 2 and Alt 4	26	26	65	188	188	0	0	0	0	188	188	0.013	2.5	0.03	0.007	0.020	0.04	26	0.078	0.12	8	0.52	2.50	0.56	0.21	1.98	2.5

Note:

NOTE:

1. Minimum slope is

Cells in gray are based on user-input values for population, pipe diameter, pipe slope, or FlowMaster (for velocity and depth at design flow)

Cells in gray are based on user-input values for population.

1. Minimum slope is used for undulating roadway segments in which sewers are planned to minimize sewer depth.

Computation of Wastewater Flow for Puako

Sewer: Puako districts

District: Puako

Reference Maps: Hawaii Statewide GIS Program

Page: 1 of 1

Computed by: Adrienne Fung, Tieshi Huang, Lee Schultz
Date: September 14, 2023

Sewer Location	Tributary Area (Acres)	Tributary Equivalent Population										Wastewater Flow Computation										() Existing Sewer Study (X) Ultimate Sewer Study														
		Residential					Other																													
		Homes	Apartment	Total	Increment	Total	Increment	Total	Increment	Total	Increment	Total	Increment	Total	Increment	Total	Increment	Total	Increment	Total	Base Sanitary Flow - BSF @ 70 gpcd (MGD)															
District Zone or Street		Lot	Lot	Total	Lot	Total	Lot	Total	Lot	Total	Lot	Total	Flow Factor	Peak Base Sanitary Flow - PBSF (MGD)	Ground Water Infiltration - GW @ 35 gpcd (MGD)	Average Dry Weather Flow - ADWF (MGD)	Peak Dry Weather Flow - PDWF (MGD)	Area Used for Wet Weather VI Calculation (acres)	Wet Weather LI @ 3000 gpd (MGD)	Design Peak Flow - Q _{DES} (MGD)	Pipe Diameter (in)	Slope (%)	Velocity at Full Pipe - V _{FULL} (fps)	Full Pipe Flow - Q _{FULL} (MGD)	Design Flow - Q _{DES} (MGD)	Flow - Q _{FULL} (MGD)	Velocity at Design Flow - V _{DES} (fps)	Depth at Design Flow - D _{DES} (ft)								
Peako	Peako Alt 3 and 5	51	51	127	371	371	0	0	0	0	371	371	0.026	2.5	0.06	0.013	0.039	0.08	51	0.153	0.23	8	0.52	2.50	0.56	0.41	2.37	3.6								

Note:

Cells in gray are based on user-input values for population, pipe diameter, pipe slope, or FlowMaster (for velocity and depth at design flow)

1. Minimum slope is used for undulating roadway segments in which sewers are planned to minimize sewer depth.

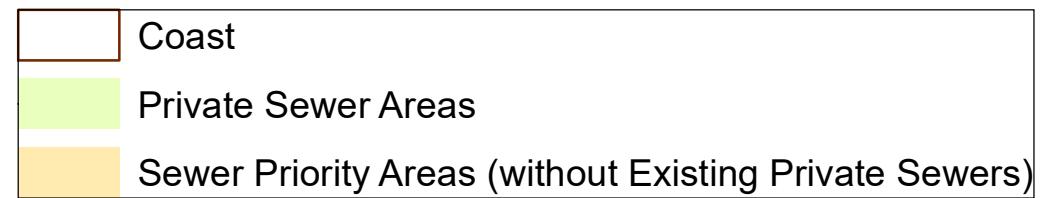
Note

B-3: Pump Station and Force Main Hydraulic Calculations (see Appendix A-3)

B-4: Contour Maps (Basis for Collection System Layout and calculation)

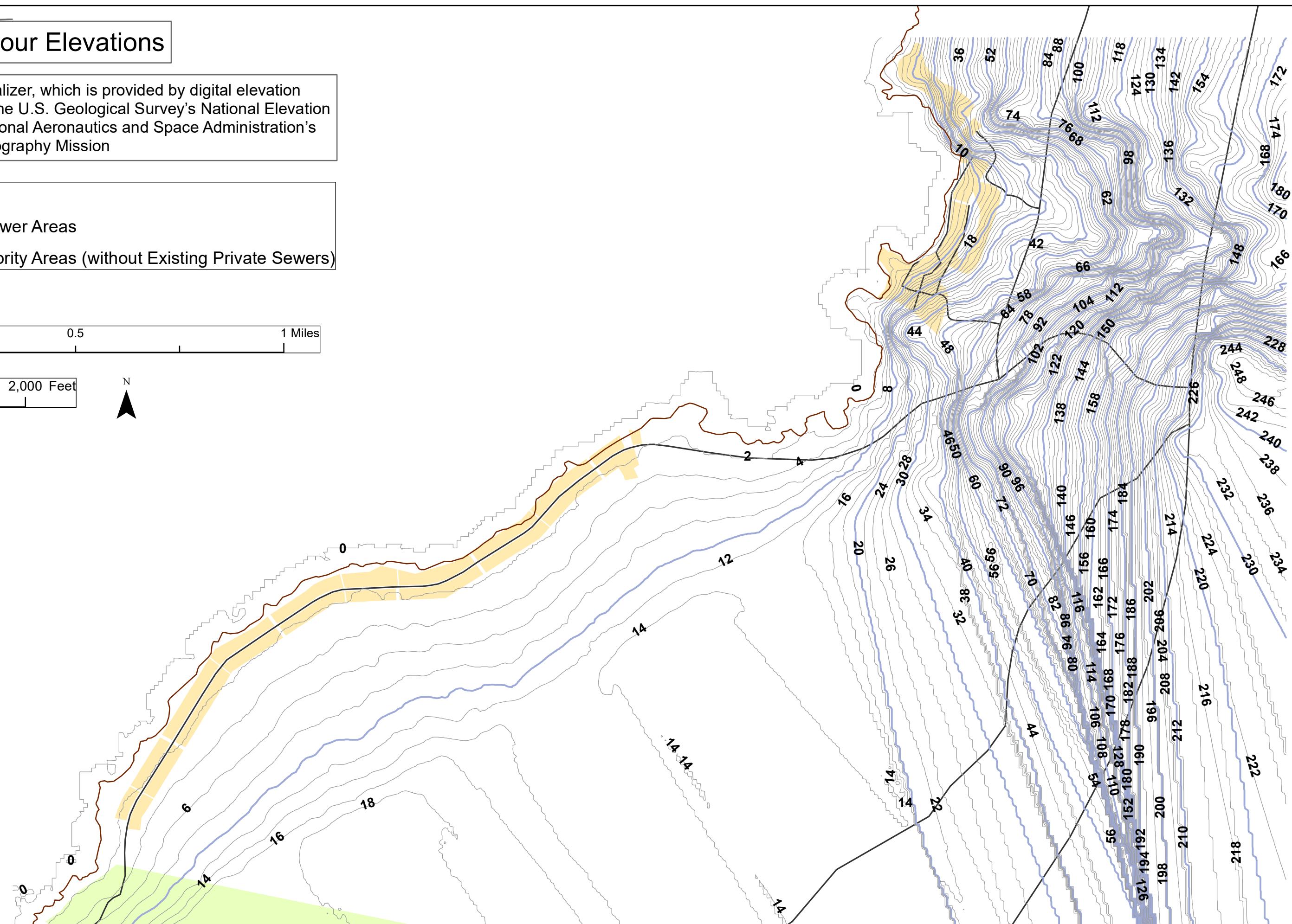
Puako Contour Elevations

Source: GPS Visualizer, which is provided by digital elevation model data using the U.S. Geological Survey's National Elevation Dataset or the National Aeronautics and Space Administration's Shuttle Radar Topography Mission



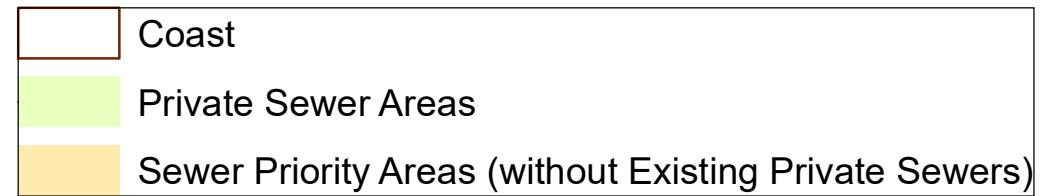
0 0.5 1 Miles

0 500 1,000 2,000 Feet



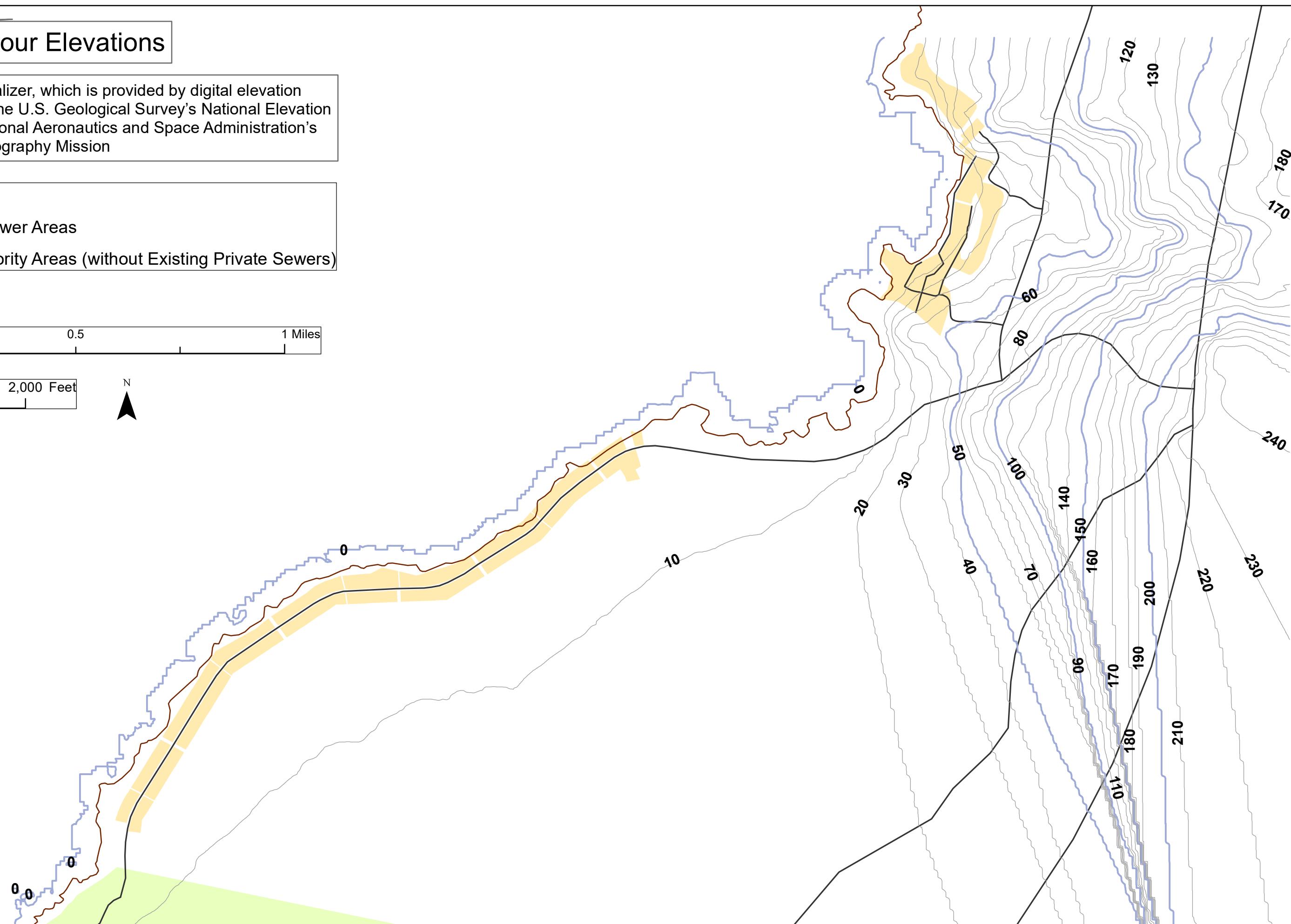
Puako Contour Elevations

Source: GPS Visualizer, which is provided by digital elevation model data using the U.S. Geological Survey's National Elevation Dataset or the National Aeronautics and Space Administration's Shuttle Radar Topography Mission



0 0.5 1 Miles

0 500 1,000 2,000 Feet



Appendix C:

Collection System Layout Maps and

Hydraulic Calculations – Waikoloa

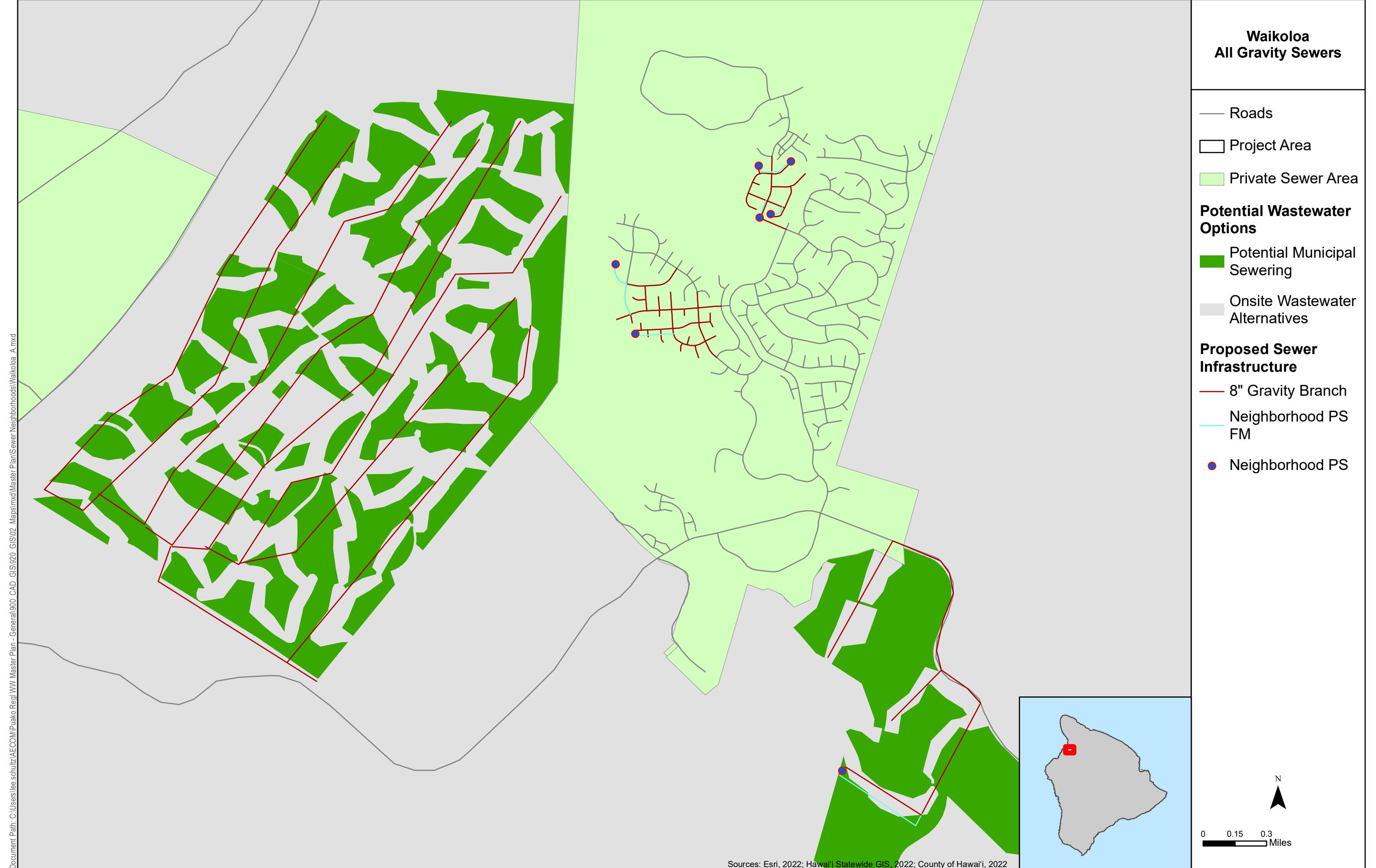
Subregion

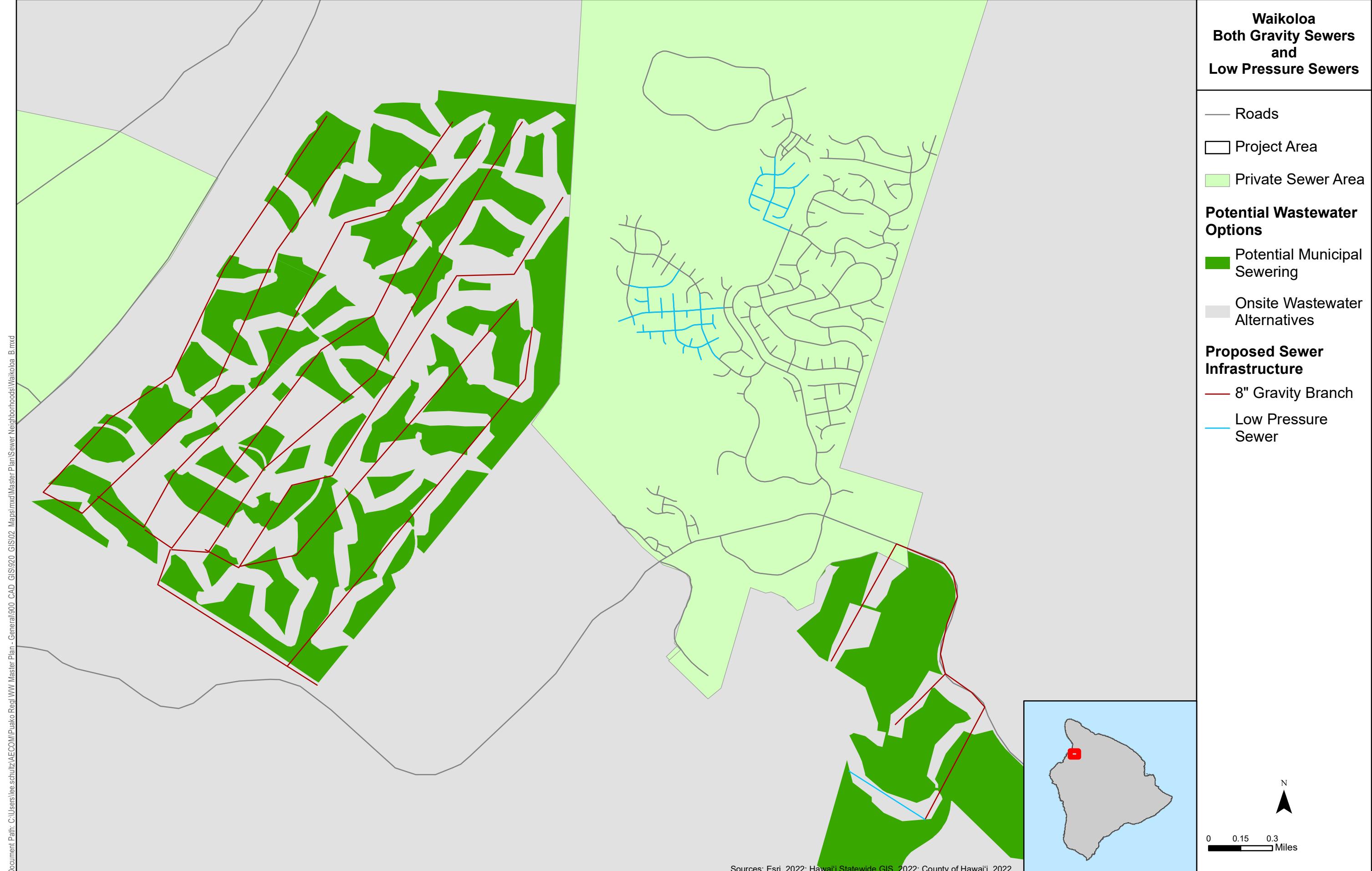
Appendix C Collection System Layout Maps and Hydraulic Calculations

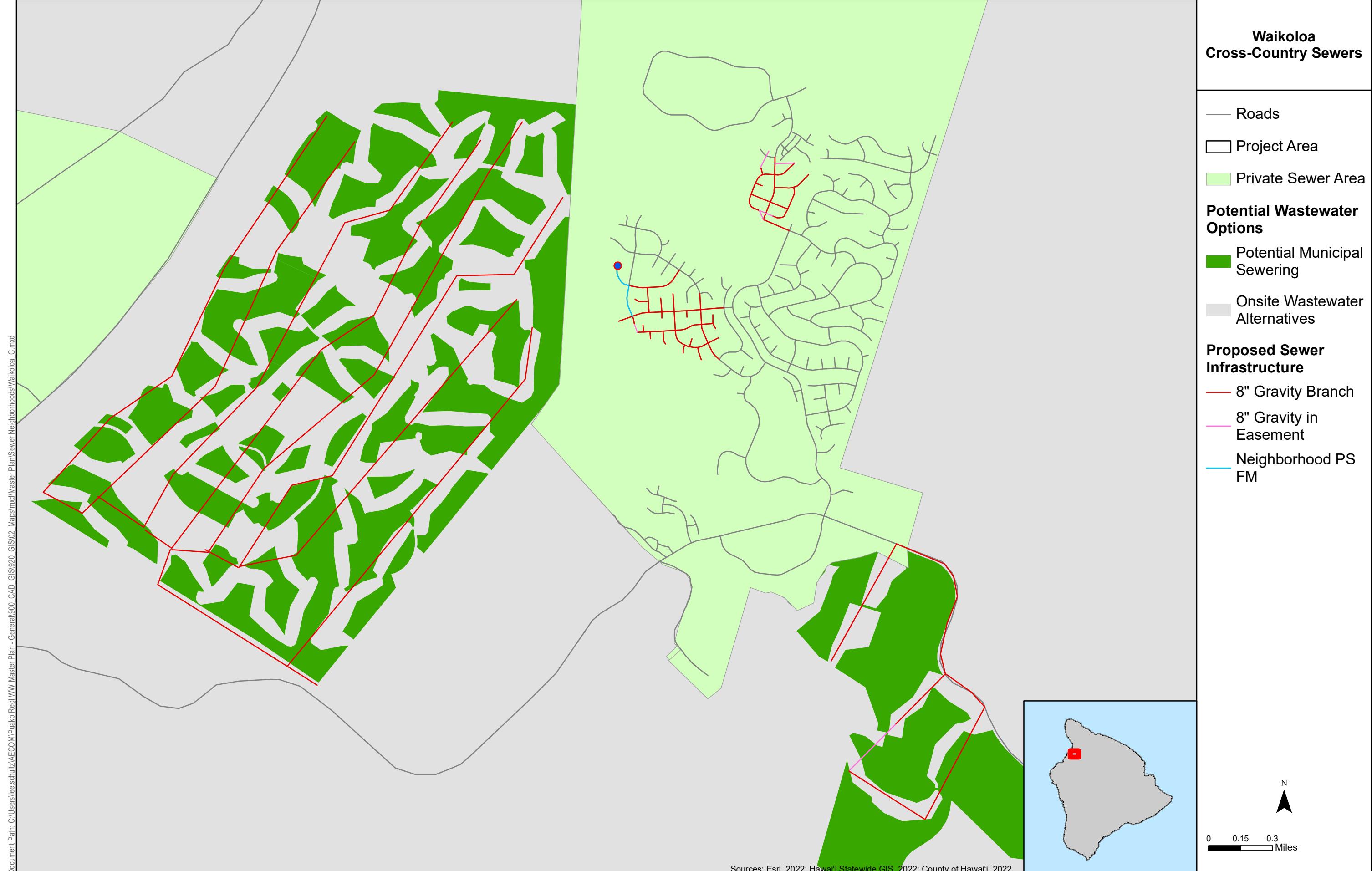
Waikoloa

- C-1: Community Collection System Layout Maps
- C-2: Sewer Hydraulic Calculations (N/A)
- C-3: Pump Station and Force Main Hydraulic Calculations (see Appendix A-3)
- C-4: Contour Maps (Basis for Collection System Layout and calculation)

C-1: Community Collection System Layout Map





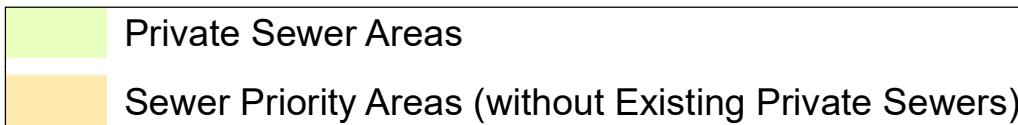


C-2: Sewer Hydraulic Calculations (N/A)

C-3: Pump Station and Force Main Hydraulic Calculations (see Appendix A-3)

C-4: Contour Maps (Basis for Collection System Layout and calculation)

Waikoloa Contour Elevations

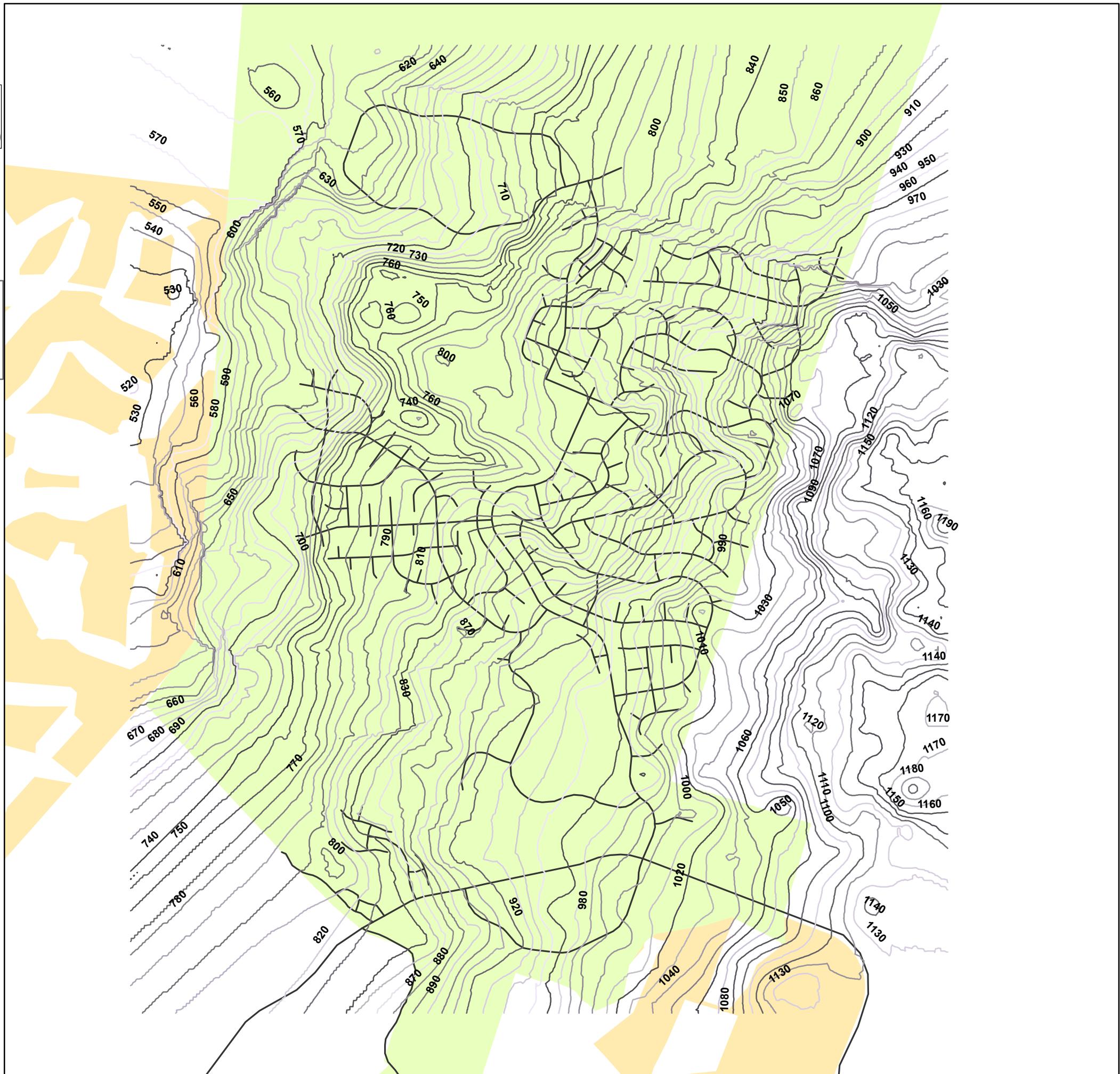


0 500 1,000 2,000 3,000 Feet

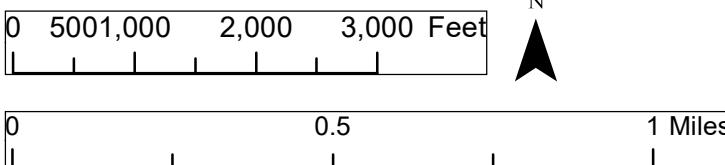
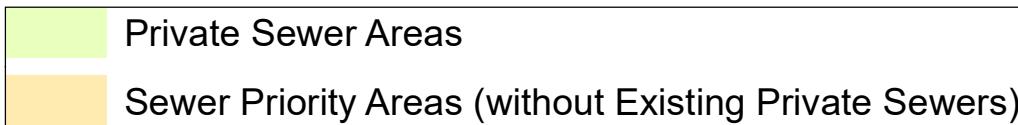


0 0.5 1 Miles

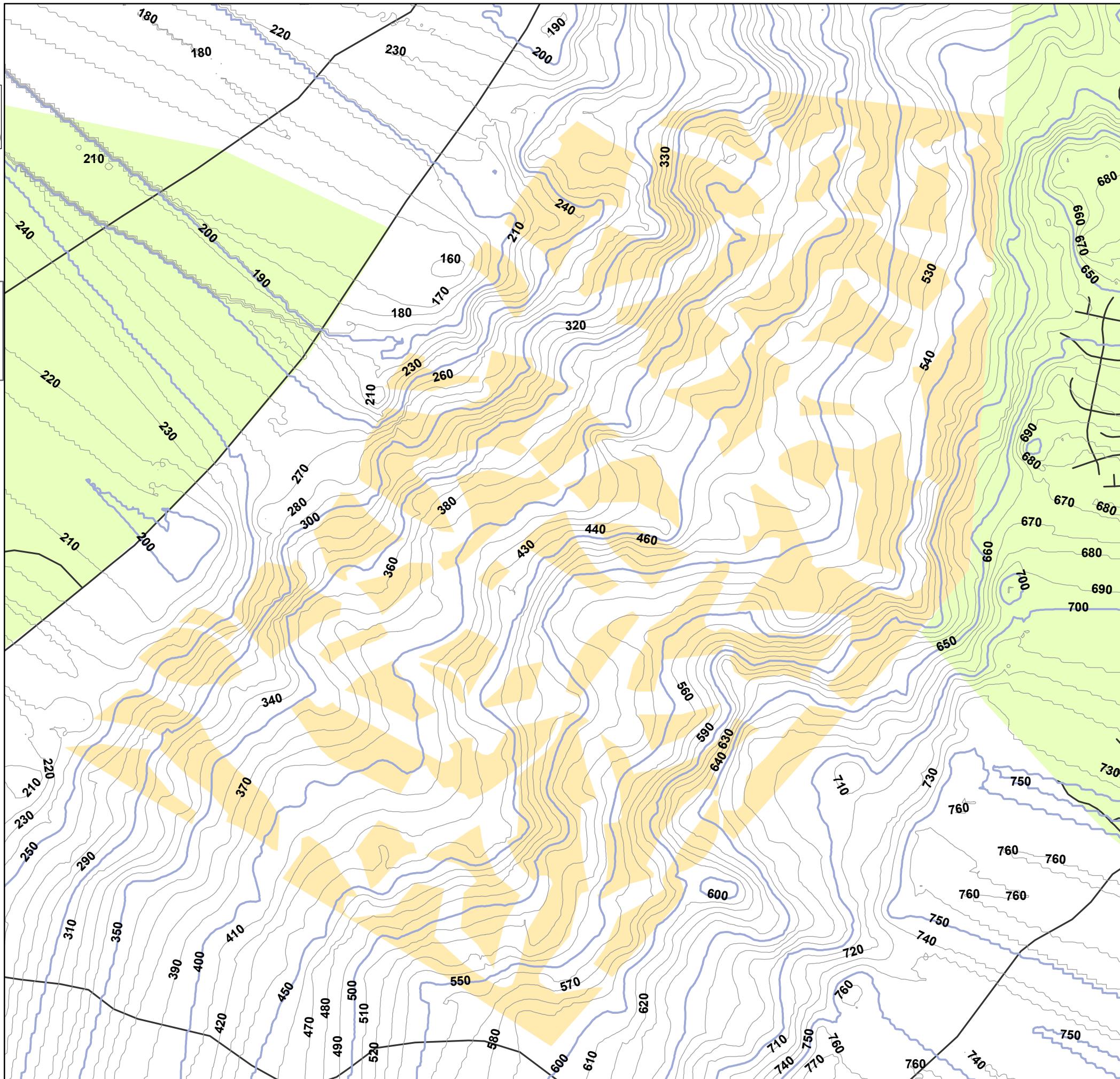
Source: GPS Visualizer, which is provided by digital elevation model data using the U.S. Geological Survey's National Elevation Dataset or the National Aeronautics and Space Administration's Shuttle Radar Topography Mission



Waikoloa Expansion Contour Elevations



Source: GPS Visualizer, which is provided by digital elevation model data using the U.S. Geological Survey's National Elevation Dataset or the National Aeronautics and Space Administration's Shuttle Radar Topography Mission



Appendix D:

Collection System Layout Maps and

Hydraulic Calculations – Waimea

Subregion

Appendix D Collection System Layout Maps and Hydraulic Calculations

Kawaihae (East Waimea, Waimea town, Kawaihae Road)

D-1: Community Collection System Layout Maps

D-2: Sewer Hydraulic Calculations

D-3: Pump Station and Force Main Hydraulic Calculations (see Appendix A-3)

D-4: Contour Maps (Basis for Collection System Layout and calculation)

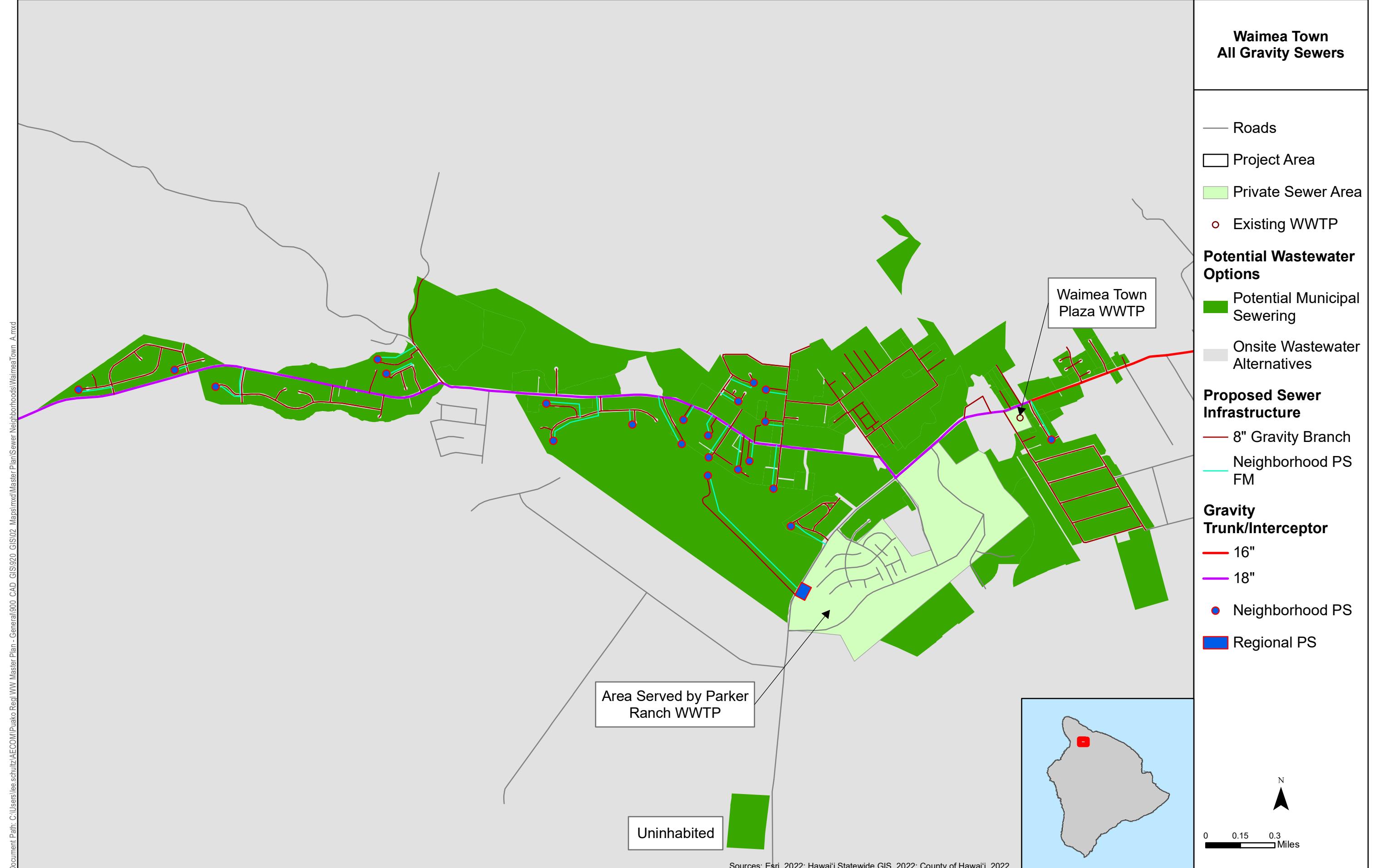
D-1: Community Collection System Layout Map

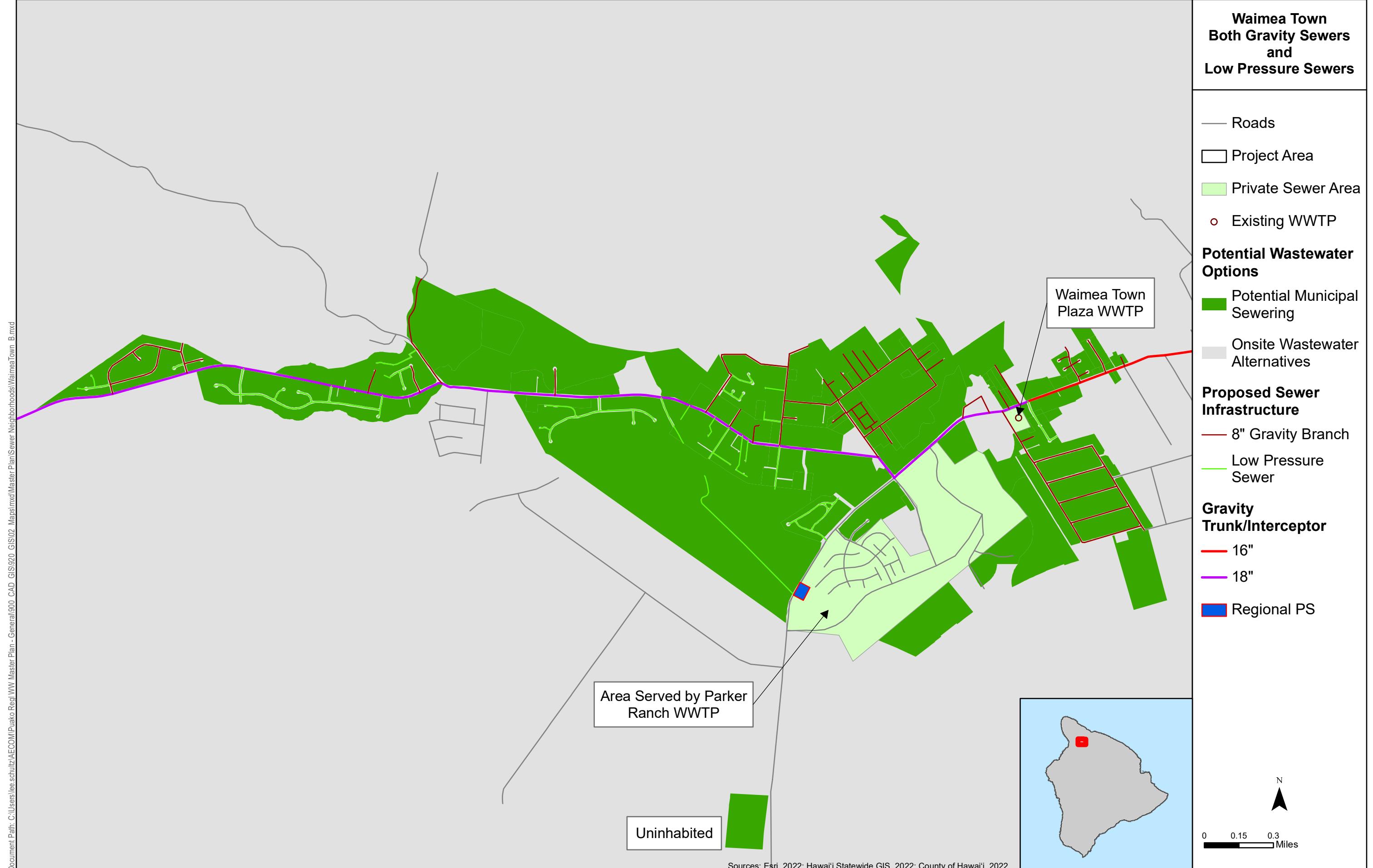


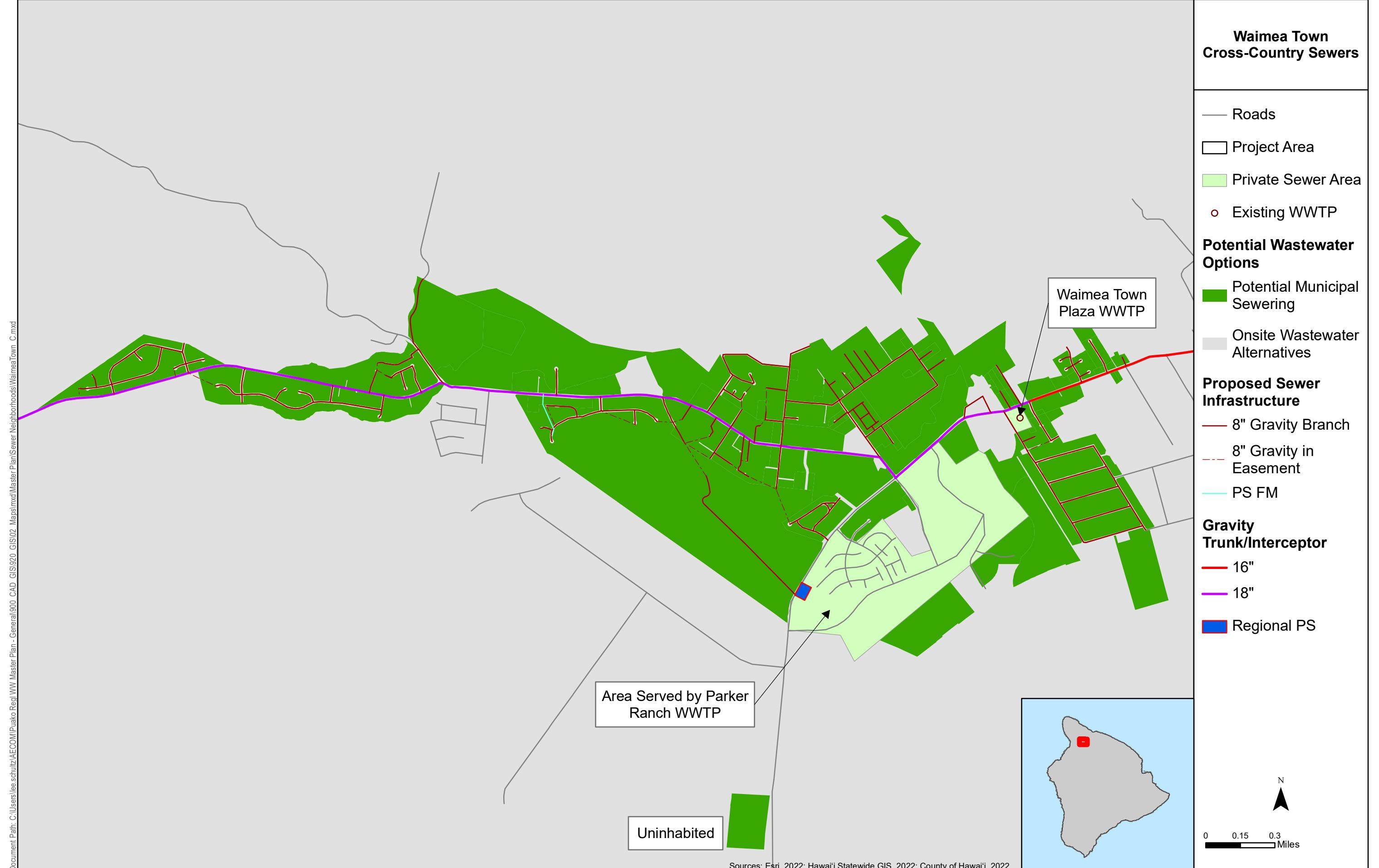












D-2: Sewer Hydraulic Calculations

Computation of Wastewater Flow for East Waimea Sewering

Sewer: East Waimea districts

District: East Waimea

Reference Maps: Hawaii Statewide GIS Program

Page: 1 of 1

Computed by: Adrienne Fung, Tieshi Huang, Lee Schultz

Date: September 1, 2023

Sewer Location	Tributary Area (Acres)		Tributary Equivalent Population						Wastewater Flow Computation												Existing Sewer Study () Existing Sewer Study (X) Ultimate Sewer Study							
			Residential			Other		Total																				
			Homes	Apartment	Increment			Increment	Total																			
District Zone or Street	Increment	Total	Lots	Increment	Total	Increment	Total	Increment	Total	Base Sanitary Flow - BSF @ 70 gpcd (MGD)	Flow Factor	Peak Base Sanitary Flow - PBSF (MGD)	Ground Water Infiltration - GWI @ 35 gpcd (MGD)	Average Dry Weather Flow - ADWF (MGD)	Peak Dry Weather Flow - PDWF (MGD)	Area Used for Wet Weather I/I Calculation (acres)	Wet Weather I/I @ 3000 gpad (MGD)	Design Peak Flow - Q _{DPS} (MGD)	Pipe Diameter (in)	Slope (%)	Velocity at Full Pipe - V _{FULL} (fps)	Full Pipe Flow - Q _{FULL} (MGD)	Design Flow - Q _{DPS} (MGD) / Full Pipe Flow - Q _{FULL} (MGD)	Velocity at Design Flow - V _{DPS} (fps)	Depth at Design Flow - D _{DPS} (in)			
East Waimea																												
East Waimea 1	36	36	120	432	432	0	0	0	0	432	432	0.030	2.5	0.08	0.015	0.045	0.09	36	0.108	0.20	8	0.52	2.50	0.56	0.35	2.29	3.3	
East Waimea 2	53	53	178	640	640	0	0	0	0	640	640	0.045	2.5	0.11	0.022	0.067	0.13	53	0.160	0.29	8	0.52	2.50	0.56	0.52	2.52	4.1	
East Waimea 1+2	89	89	298	1072	1072	0	0	0	0	1072	1072	0.075	2.5	0.19	0.038	0.113	0.23	89	0.268	0.49	12	0.31	2.53	1.28	0.38	2.36	5.1	
East Waimea 3	21	21	70	251	251	0	0	0	0	251	251	0.018	2.5	0.04	0.009	0.026	0.05	21	0.063	0.12	8	0.52	2.50	0.56	0.20	1.98	2.5	
East Waimea 4	61	61	204	732	732	0	0	0	0	732	732	0.051	2.5	0.13	0.026	0.077	0.15	61	0.183	0.34	8	0.52	2.50	0.56	0.60	2.61	4.5	
East Waimea 5	19	19	62	223	223	0	0	0	0	223	223	0.016	2.5	0.04	0.008	0.023	0.05	19	0.056	0.10	8	0.52	2.50	0.56	0.18	1.89	2.3	
East Waimea 1 to 5	190	190	633	2278	2278	0	0	0	0	2278	2278	0.159	2.5	0.40	0.080	0.239	0.48	190	0.570	1.05	12	0.40	2.87	1.46	0.72	3.12	7.6	
East Waimea 6	8	8	26	93	93	0	0	0	0	93	93	0.006	2.5	0.02	0.003	0.010	0.02	8	0.023	0.04	8	0.52	2.50	0.56	0.08	1.44	1.4	
East Waimea 7	16	16	53	190	190	0	0	0	0	190	190	0.013	2.5	0.03	0.007	0.020	0.04	16	0.047	0.09	8	0.52	2.50	0.56	0.15	1.83	2.2	
East Waimea 8	45	45	150	539	539	0	0	0	0	539	539	0.038	2.5	0.09	0.019	0.057	0.11	45	0.135	0.25	8	0.52	2.50	0.56	0.44	2.42	3.7	
East Waimea 6+7+8	68	68	228	821	821	0	0	0	0	821	821	0.057	2.5	0.14	0.029	0.086	0.17	68	0.205	0.38	8	0.52	2.50	0.56	0.67	2.68	4.8	
East Waimea 9	15	15	51	184	184	0	0	0	0	184	184	0.013	2.5	0.03	0.006	0.019	0.04	15	0.046	0.08	8	0.52	2.50	0.56	0.15	1.77	2.0	
East Waimea 10	6	6	21	74	74	0	0	0	0	74	74	0.005	2.5	0.01	0.003	0.008	0.02	6	0.018	0.03	8	0.52	2.50	0.56	0.06	1.33	1.3	
East Waimea 11	77	77	256	921	921	0	0	0	0	921	921	0.064	2.5	0.16	0.032	0.097	0.19	77	0.230	0.42	8	0.52	2.50	0.56	0.75	2.74	5.2	
East Waimea 12	14	14	46	166	166	0	0	0	0	166	166	0.012	2.5	0.03	0.006	0.017	0.03	14	0.041	0.08	8	0.52	2.50	0.56	0.14	1.77	2.0	
East Waimea 13	42	42	141	506	506	0	0	0	0	506	506	0.035	2.5	0.09	0.018	0.053	0.11	42	0.127	0.23	8	0.52	2.50	0.56	0.41	2.37	3.6	
East Waimea 1 to 13	413	413	1376	4950	4950	0	0	0	0	4950	4950	0.347	2.5	0.87	0.173	0.520	1.04	413	1.238	2.28	16	0.50	3.89	3.51	0.65	4.14	9.4	

Note:

Cells in gray are based on user-input values for population, pipe diameter, pipe slope, or FlowMaster (for velocity and depth at design flow).

1. Minimum slope is used for undulating roadway segments in which sewers are planned to minimize sewer depth.

Computation of Wastewater Flow for Kawaihae Road Sewering

Sewer: Kawaihae Road districts

District: Kawaihae Road

Reference Maps: Hawaii Statewide GIS Program

Page: 1 of 1

Computed by: Adrienne Fung, Tieshi Huang, Lee Schultz

Date: September 8, 2023

Sewer Location	Tributary Area (Acres)		Tributary Equivalent Population						Wastewater Flow Computation										Existing Sewer Study (X) Ultimate Sewer Study								
			Residential			Other																					
	Homes	Apartment	Total	Increment	Total	Increment	Total	Increment	Total	Flow Factor	Peak Base Sanitary Flow - PBSF (MGD)	Ground Water Infiltration - GWI @ 35 gpcd (MGD)	Average Dry Weather Flow - ADWF (MGD)	Peak Dry Weather Flow - PDWF (MGD)	Area Used for Wet Weather I/I Calculation (acres)	Wet Weather I/I @ 3000 gpad (MGD)	Design Peak Flow - Q _{DES} (MGD)	Pipe Diameter (in)	Slope (%)	Velocity at Full Pipe - V _{FULL} (fps)	Full Pipe Flow - Q _{FULL} (MGD)	Design Flow - Q _{DES} (MGD) / Full Pipe Flow - Q _{FULL} (MGD)	Velocity at Design Flow - V _{DES} (fps)	Depth at Design Flow - D _{DES} (in)			
Kawaihae Road	District Zone or Street	Increment	Total	Lots	Increment	Total	Increment	Total	Increment	Total	Base Sanitary Flow - BSF @ 70 gpcd (MGD)	Ground Water Infiltration - GWI @ 35 gpcd (MGD)	Average Dry Weather Flow - ADWF (MGD)	Peak Dry Weather Flow - PDWF (MGD)	Area Used for Wet Weather I/I Calculation (acres)	Wet Weather I/I @ 3000 gpad (MGD)	Design Peak Flow - Q _{DES} (MGD)	Pipe Diameter (in)	Slope (%)	Velocity at Full Pipe - V _{FULL} (fps)	Full Pipe Flow - Q _{FULL} (MGD)	Design Flow - Q _{DES} (MGD) / Full Pipe Flow - Q _{FULL} (MGD)	Velocity at Design Flow - V _{DES} (fps)	Depth at Design Flow - D _{DES} (in)			
From Waimea Town	900	900	2594	9733	9733	0	0	0	0	9733	9733	0.681	2.5	1.70	0.341	1.022	2.04	900	2.700	4.74	18	0.75	5.15	5.88	0.81	12.25	5.7
Kawaihae Road 1	19	19	46	153	153	0	0	0	0	153	153	0.011	2.5	0.03	0.005	0.016	0.03	19	0.056	0.09	8	0.52	2.50	0.56	0.16	1.83	2.2
Kawaihae Road 1 + Waimea Town	918	918	2640	9886	9886	0	0	0	0	9886	9886	0.692	2.5	1.73	0.346	1.038	2.08	918	2.755	4.83	18	0.75	5.15	5.88	0.82	5.75	12.4

Note:

Cells in gray are based on user-input values for population, pipe diameter, pipe slope, or FlowMaster (for velocity and depth at design flow).

1. Minimum slope is used for undulating roadway segments in which sewers are planned to minimize sewer depth.

Computation of Wastewater Flow for Waimea Town Sewering

Sewer: Waimea Town districts

District: Waimea Town

Reference Maps: Hawaii Statewide GIS Program

Page: 1 of 1

Computed by: Adrienne Fung, Tieshi Huang, Lee Schultz

Date: September 7, 2023

Sewer Location	Tributary Area (Acres)		Tributary Equivalent Population						Wastewater Flow Computation										Existing Sewer Study () Existing Sewer Study (X) Ultimate Sewer Study																											
			Residential			Other		Total																																						
	Homes		Apartment			Increment		Total		Increment		Total		Increment		Total		Flow Factor		Peak Base Sanitary Flow - PBSF (MGD)		Ground Water Infiltration - GWI @ 35 gpcd (MGD)		Average Dry Weather Flow - ADWF (MGD)		Peak Dry Weather Flow - PDWF (MGD)		Area Used for Wet Weather I/I Calculation (acres)		Wet Weather I/I @ 3000 gpad (MGD)		Design Peak Flow - Q _{DES} (MGD)		Pipe Diameter (in)		Slope (%)		Velocity at Full Pipe - V _{FULL} (fps)		Full Pipe Flow - Q _{FULL} (MGD)		Design Flow - Q _{DES} (MGD) / Full Pipe Flow - Q _{FULL} (MGD)		Velocity at Design Flow - V _{DES} (fps)		Depth at Design Flow - D _{DES} (in)
District Zone or Street	Increment	Total	Lots	Increment	Total	Increment	Total	Increment	Total	Increment	Total	Increment	Total	Increment	Total	Base Sanitary Flow - BSF @ 70 gpcd (MGD)	Flow Factor	Peak Base Sanitary Flow - PBSF (MGD)	Ground Water Infiltration - GWI @ 35 gpcd (MGD)	Average Dry Weather Flow - ADWF (MGD)	Peak Dry Weather Flow - PDWF (MGD)	Area Used for Wet Weather I/I Calculation (acres)	Wet Weather I/I @ 3000 gpad (MGD)	Design Peak Flow - Q _{DES} (MGD)	Pipe Diameter (in)	Slope (%)	Velocity at Full Pipe - V _{FULL} (fps)	Full Pipe Flow - Q _{FULL} (MGD)	Design Flow - Q _{DES} (MGD) / Full Pipe Flow - Q _{FULL} (MGD)	Velocity at Design Flow - V _{DES} (fps)	Depth at Design Flow - D _{DES} (in)															
Waimea Town																																														
From East Waimea	413	413	1376	4950	4950	0	0	0	0	4950	4950	0.347	2.5	0.87	0.173	0.520	1.04	413	1.238	2.28	16	0.50	3.89	3.51	0.65	4.14	9.4																			
Waimea Town 1	17	17	43	170	170	0	0	0	0	170	170	0.012	2.5	0.03	0.006	0.018	0.04	17	0.052	0.09	8	0.52	2.50	0.56	0.16	1.83	2.2																			
East Waimea + Waimea Town 1	430	430	1419	5120	5120	0	0	0	0	5120	5120	0.358	2.5	0.90	0.179	0.538	1.08	430	1.290	2.37	16	0.50	3.89	3.51	0.67	4.17	9.6																			
Waimea Town 2	85	85	211	830	830	0	0	0	0	830	830	0.058	2.5	0.15	0.029	0.087	0.17	85	0.254	0.43	8	0.52	2.50	0.56	0.76	2.75	5.2																			
Waimea Town 3	16	16	40	156	156	0	0	0	0	156	156	0.011	2.5	0.03	0.005	0.016	0.03	16	0.048	0.08	8	0.52	2.50	0.56	0.14	1.77	2.0																			
East Waimea + Waimea Town 1 to 3	530	530	1670	6106	6106	0	0	0	0	6106	6106	0.427	2.5	1.07	0.214	0.641	1.28	530	1.591	2.87	18	0.50	4.20	4.80	0.60	4.39	10.0																			
Waimea Town 7	19	19	48	189	189	0	0	0	0	189	189	0.013	2.5	0.03	0.007	0.020	0.04	19	0.058	0.10	8	0.52	2.50	0.56	0.17	1.89	2.3																			
Waimea Town 8	22	22	55	214	214	0	0	0	0	214	214	0.015	2.5	0.04	0.007	0.022	0.04	22	0.065	0.11	8	0.52	2.50	0.56	0.20	1.94	2.4																			
East Waimea + Waimea Town 1,2,3,7,8	572	572	1773	6510	6510	0	0	0	0	6510	6510	0.456	2.5	1.14	0.228	0.684	1.37	572	1.715	3.08	18	0.50	4.20	4.80	0.64	4.46	10.5																			
Waimea Town 4	90	90	225	883	883	0	0	0	0	883	883	0.062	2.5	0.15	0.031	0.093	0.19	90	0.270	0.46	8	0.52	2.50	0.56	0.81	2.78	5.5																			
East Waimea + Waimea Town 1,2,3,7,8,4	662	662	1998	7393	7393	0	0	0	0	7393	7393	0.518	2.5	1.29	0.259	0.776	1.55	662	1.985	3.54	18	0.50	4.20	4.80	0.74	4.60	11.5																			
Waimea Town 5	57	57	142	557	557	0	0	0	0	557	557	0.039	2.5	0.10	0.019	0.058	0.12	57	0.170	0.29	8	0.52	2.50	0.56	0.51	2.52	4.1																			
Waimea Town 6	35	35	88	347	347	0	0	0	0	347	347	0.024	2.5	0.06	0.012	0.036	0.07	35	0.106	0.18	8	0.52	2.50	0.56	0.32	2.22	3.1																			
East Waimea + Waimea Town 1,2,3,7,8,4,5,6	754	754	2228	8297	8297	0	0	0	0	8297	8297	0.581	2.5	1.45	0.290	0.871	1.74	754	2.261	4.00	18	0.60	4.60	5.26	0.76	5.07	11.8																			
Waimea Town 9	31	31	78	306	306	0	0	0	0	306	306	0.021	2.5	0.05	0.011	0.032	0.06	31	0.094	0.16	8	0.52	2.50	0.56	0.28	2.15	2.9																			
East Waimea + Waimea Town 1,2,3,7,8,4,5,6,9	785	785	2306	8603	8603	0	0	0	0	8603	8603	0.602	2.5	1.51	0.301	0.903	1.81	785	2.354	4.16	18	0.60	4.60	5.26	0.79	5.11	12.1																			
Waimea Town 10	36	36	91	357	357	0	0	0	0	357	357	0.025	2.5	0.06	0.012	0.037	0.07	36	0.109	0.18	8	0.52	2.50	0.56	0.33	2.22	3.1																			
East Waimea + Waimea Town 1,2,3,7,8,4,5,6,9,10,10	821	821	2397	8960	8960	0	0	0	0	8960	8960	0.627	2.5	1.57	0.314	0.941	1.88	821	2.463	4.34	18	0.65	4.79	5.47	0.79	5.32	12.1																			
Waimea Town 11	39	39	97	380	380	0	0	0	0	380	380	0.027	2.5	0.07	0.013	0.04																														

D-3: Pump Station and Force Main Hydraulic Calculations (see Appendix A-3)

D-4: Contour Maps (Basis for Collection System Layout and calculation)

East Waimea Contour Elevations

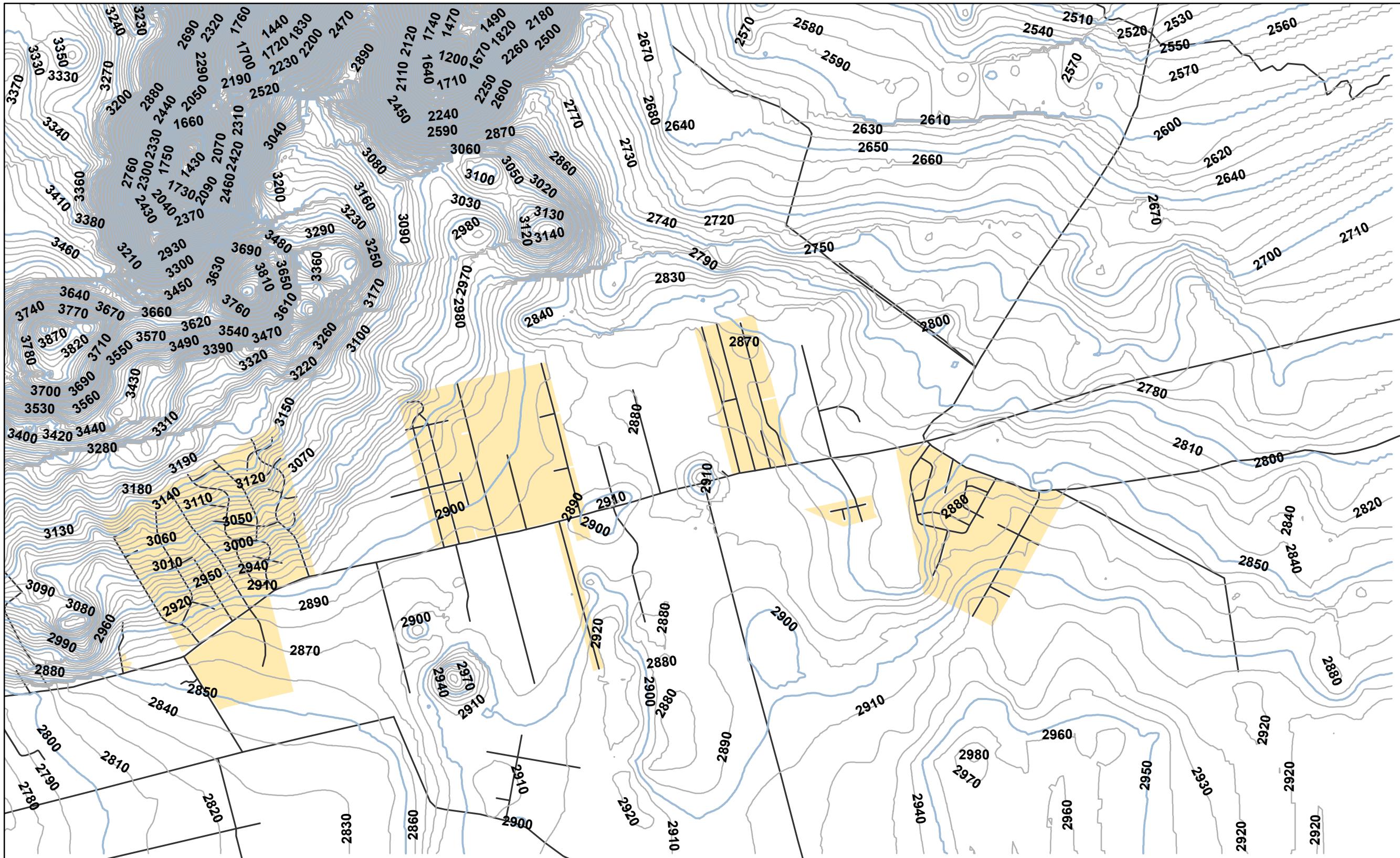
Source: GPS Visualizer, which is provided by digital elevation model data using the U.S. Geological Survey's National Elevation Dataset or the National Aeronautics and Space Administration's Shuttle Radar Topography Mission

0 0.5 1 Miles

0 1,000 2,000 3,000 Feet N

Private Sewer Areas

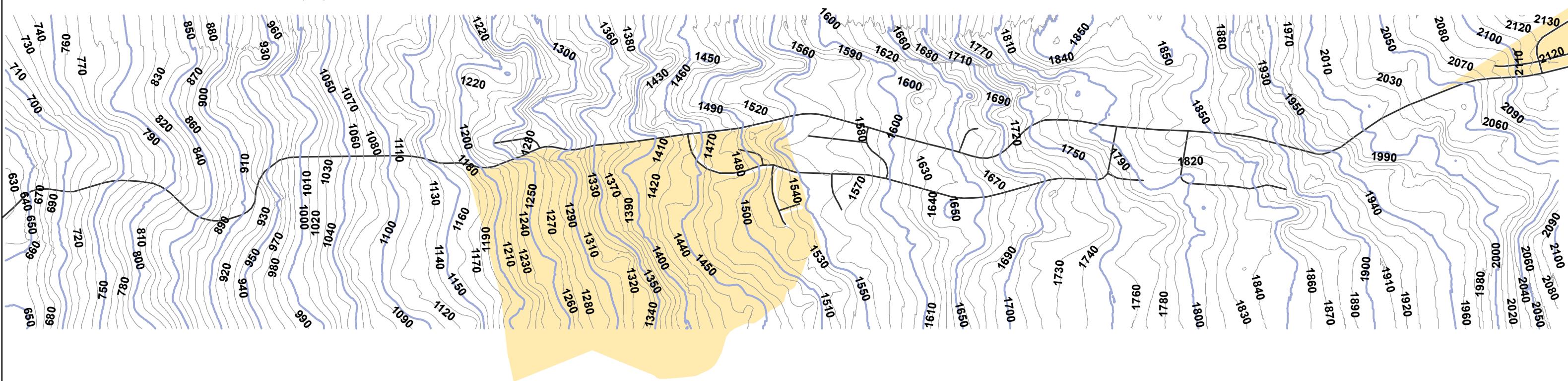
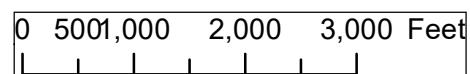
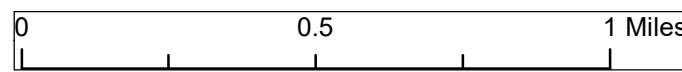
Sewer Priority Areas (without Existing Private Sewers)



Kawaihae Road Contour Elevations

Source: GPS Visualizer, which is provided by digital elevation model data using the U.S. Geological Survey's National Elevation Dataset or the National Aeronautics and Space Administration's Shuttle Radar Topography Mission

- Private Sewer Areas
- Sewer Priority Areas (without Existing Private Sewers)



Waimea Town Contour Elevations

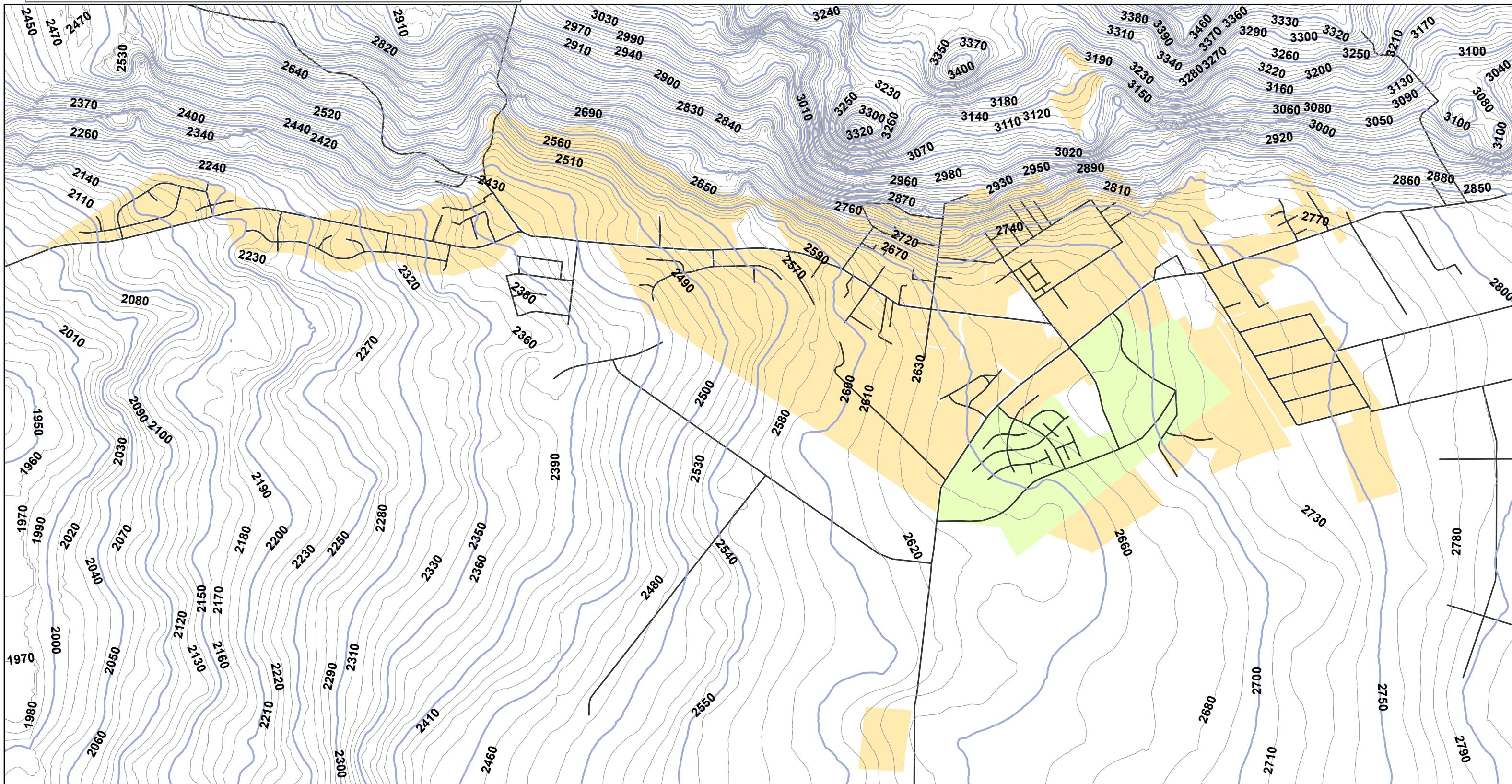
Source: GPS Visualizer, which is provided by digital elevation model data using the U.S. Geological Survey's National Elevation Dataset or the National Aeronautics and Space Administration's Shuttle Radar Topography Mission

0 0.5 1 Miles

0 1,000 2,000 3,000 Feet
N

Private Sewer Areas

Sewer Priority Areas (without Existing Private Sewers)



Appendix E:

Collection System Layout Maps and

Hydraulic Calculations – Waiki‘i

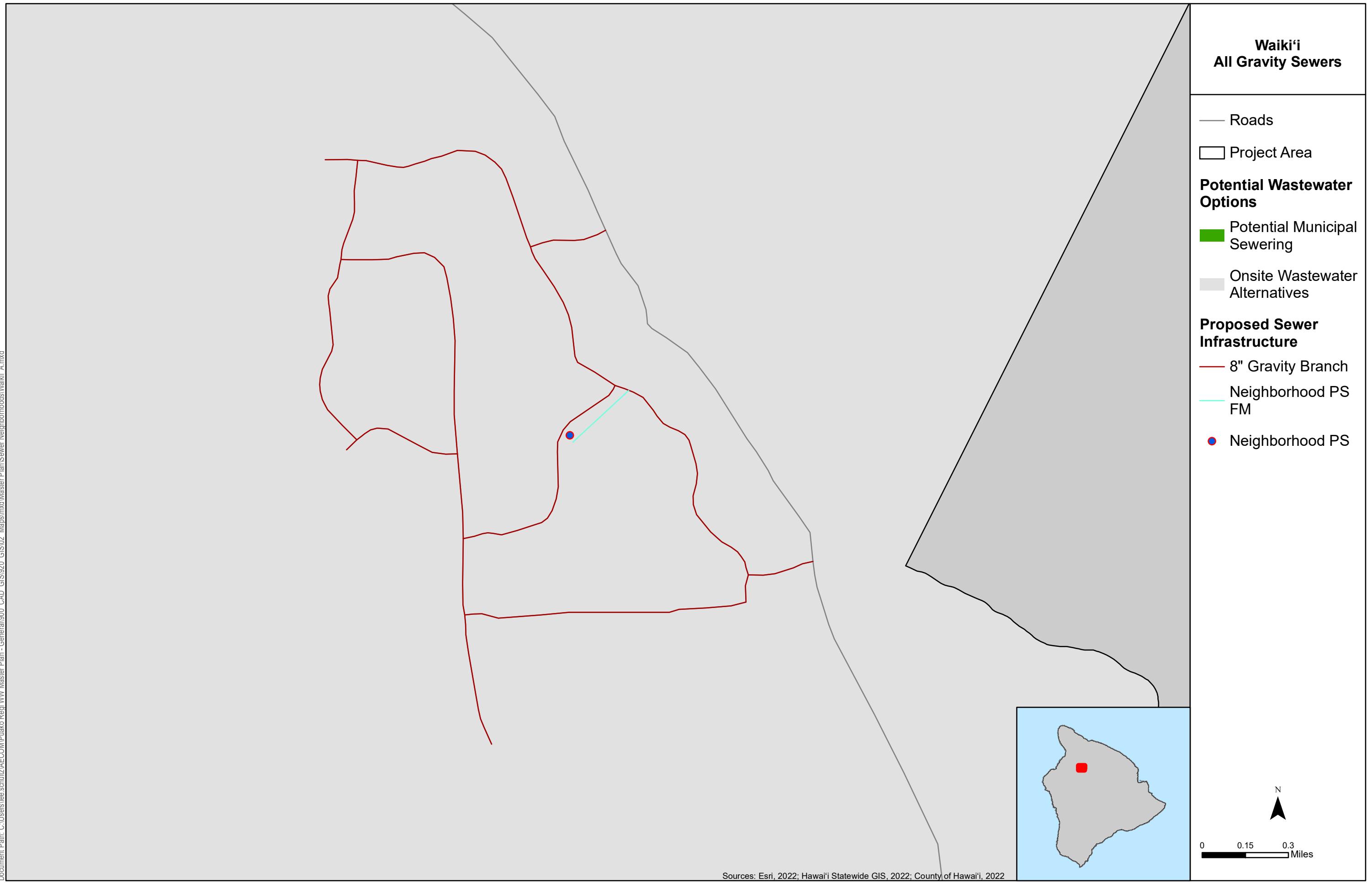
Subregion

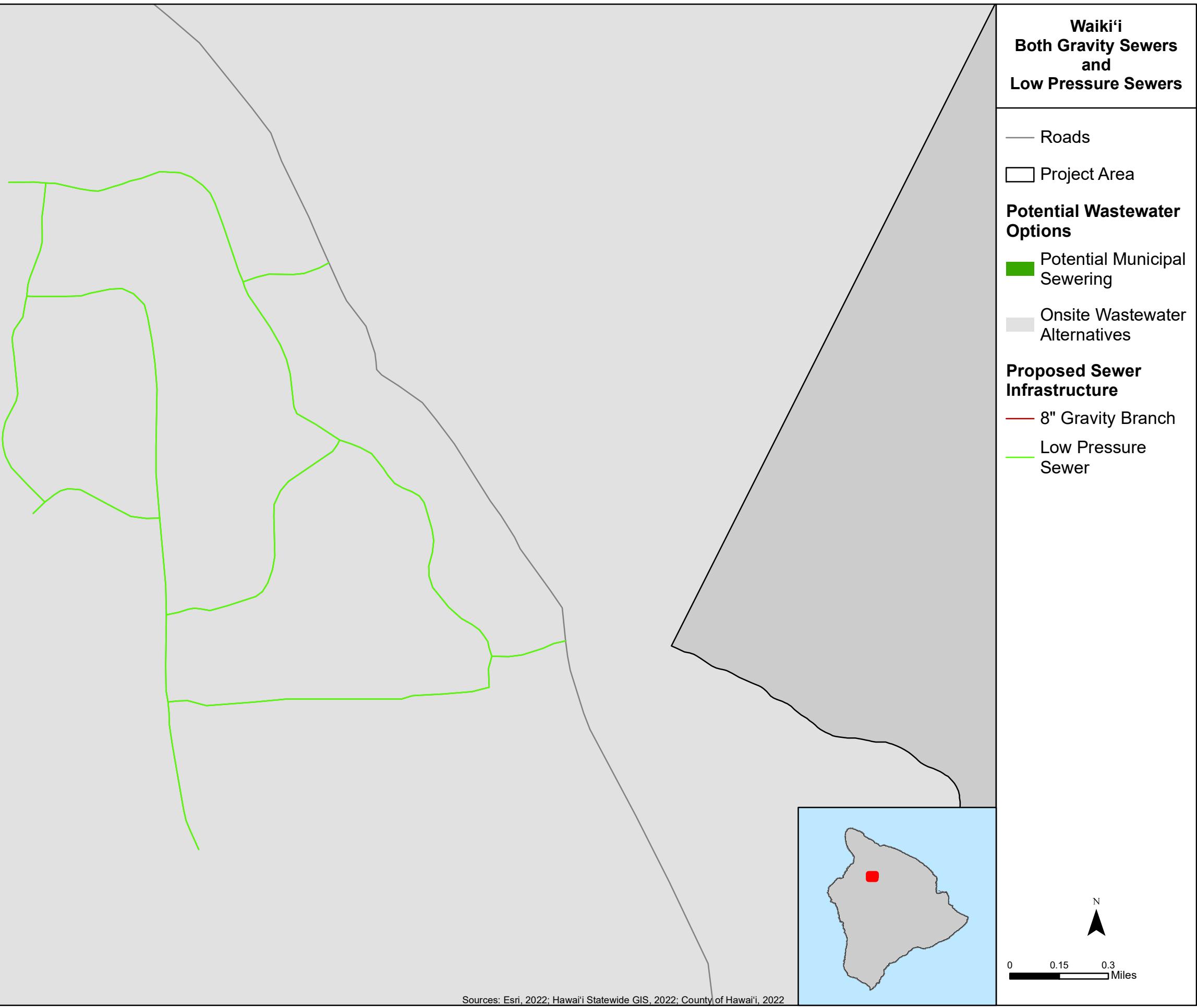
Appendix E Collection System Layout Maps and Hydraulic Calculations

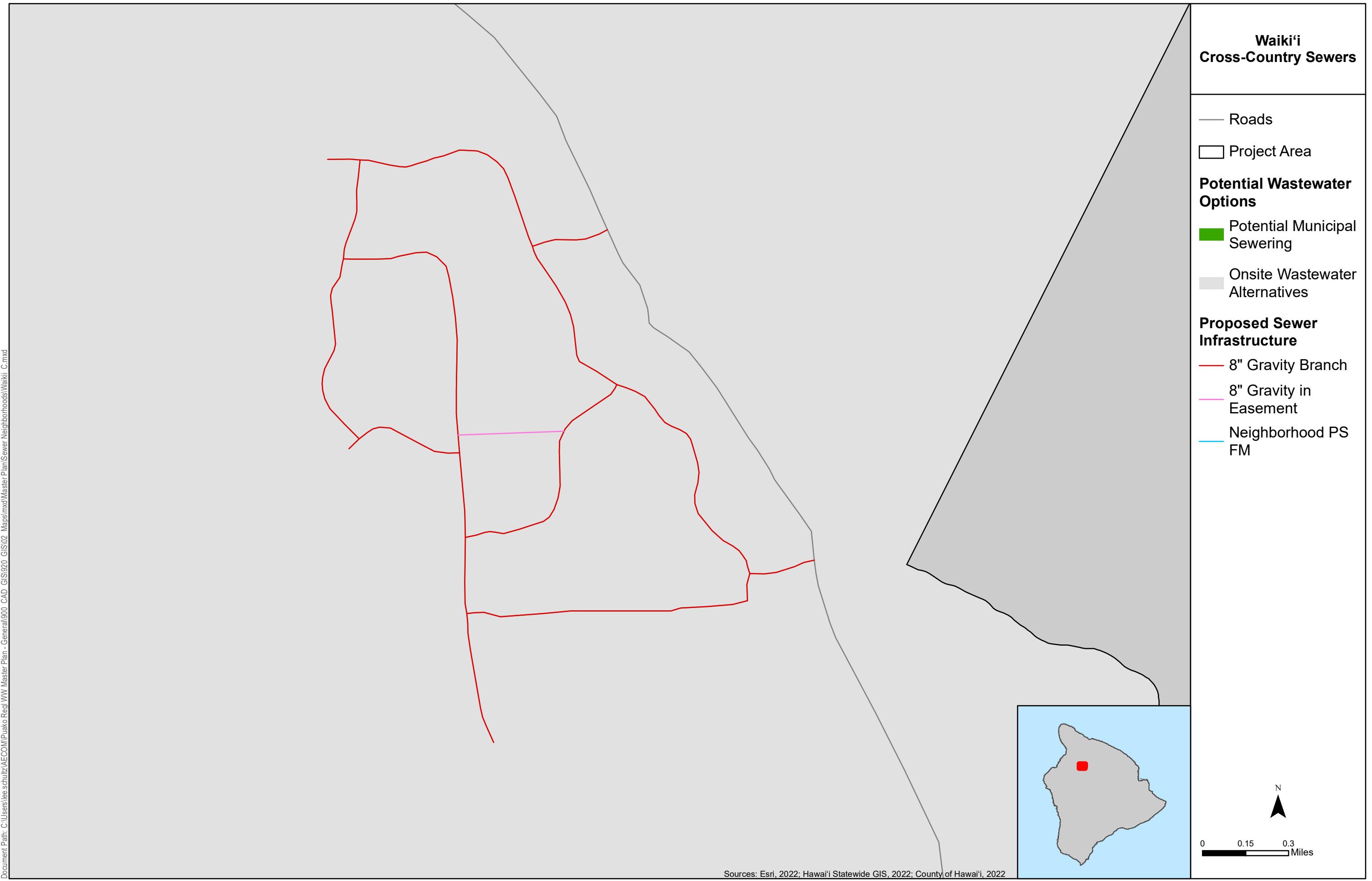
Waiki

- E-1: Community Collection System Layout Maps
- E-2: Sewer Hydraulic Calculations (N/A)
- E-3: Pump Station and Force Main Hydraulic Calculations (N/A)
- E-4: Contour Maps (Basis for Collection System Layout and calculation)

E-1: Community Collection System Layout Map





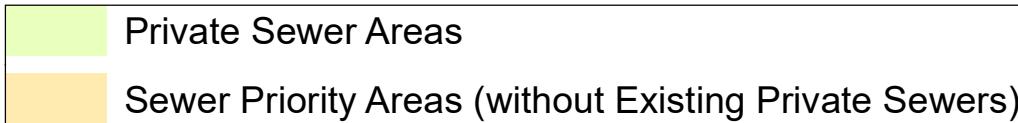


E-2: Sewer Hydraulic Calculations (N/A)

E-3: Pump Station and Force Main Hydraulic Calculations (N/A)

E-4: Contour Maps (Basis for Collection System Layout and calculation)

Waikii Contour Elevations



0 500 1,000 2,000 3,000 Feet



0 0.5 1 Miles

Source: GPS Visualizer, which is provided by digital elevation model data using the U.S. Geological Survey's National Elevation Dataset or the National Aeronautics and Space Administration's Shuttle Radar Topography Mission



Appendix F:

Interceptor Sewer System Hydraulic

Calculations – Alternatives 3 and 5

Appendix F Interceptor Sewer System Hydraulic Calculations_Alternatives 3 and 5

Computation of Wastewater Flow for South Kohala Alternative 3 Sewering

Sewer: South Kohala

District: South Kohala

Reference Maps: Hawaii Statewide GIS Program

Page: 1 of 1

Computed by: Adrienne Fung, Tieshi Huang, Lee Schultz

Date: September 19, 2023

District Zone or Street	Segment Name	Increment	Total	Tributary Area (Acres)				Tributary Equivalent Population						Wastewater Flow Computation												() Existing Sewer Study (X) Ultimate Sewer Study						
								Residential			Other			Total																		
				Homes		Apartment																										
				Lots	Increment	Total	Increment	Total	Increment	Total	Increment	Total	Increment	Total	Increment	Total	Base Sanitary Flow - BSF @ 70 gpcd (MGD)	Flow Factor	Peak Base Sanitary Flow - PBSF (MGD)	Ground Water Infiltration - GWI @ 35 gpcd (MGD)	Average Dry Weather Flow - ADWF (MGD)	Peak Dry Weather Flow - PDWF (MGD)	Area Used for Wet Weather I/I Calculation (acres)	Wet Weather I/I @ 3000 gpad (MGD)	Design Peak Flow - Q _{DES} (MGD)	Pipe Diameter (in)	Slope (%)	Velocity at Full Pipe - V _{FULL} (fps)	Full Pipe Flow - Q _{FULL} (MGD)	Design Flow - Q _{DES} (MGD) / Full Pipe Flow - Q _{FULL} (MGD)	Velocity at Design Flow - V _{DES} (fps)	Depth at Design Flow - D _{DES} (in)
South Kohala Alternative 3																																
East Waimea	COH West Waimea WWTP	413	413	1532	5778	5778	0	0	0	0	5778	5778	0.404	2.5	1.01	0.202	0.607	1.21	413	1.238	2.45	16	0.46	3.73	3.36	0.73	4.07	10.1				
Waimea Town	COH West Waimea WWTP	487	900	1431	5398	11176	0	0	0	0	5398	11176	0.782	2.5	1.96	0.391	1.174	2.35	900	2.700	5.05	18	0.88	5.58	6.37	0.79	6.19	12.1				
Kawaihae Road	COH West Waimea WWTP	52	952	131	1623	12799	0	0	0	0	1623	12799	0.896	2.5	2.24	0.448	1.344	2.69	952	2.857	5.54	24	0.23	3.45	7.01	0.79	3.83	16.1				
Waiki'i	COH Waiki'i WWTP	26	26	65	355	355	0	0	0	0	355	355	0.025	2.5	0.06	0.012	0.037	0.07	26	0.078	0.15	8	0.52	2.50	0.56	0.27	2.11	2.8				
Aina Lea	Existing Waikoloa Resort WRF	108	108	1932	2496	2496	0	0	0	0	2496	2496	0.175	2.5	0.44	0.087	0.262	0.52	108	0.325	0.85	12	0.31	2.53	1.28	0.66	2.70	7.1				
Ouli Farms	COH West Waimea WWTP	13	13	210	345	345	0	0	0	0	345	345	0.024	2.5	0.06	0.012	0.036	0.07	13	0.039	0.11	8	0.52	2.50	0.56	0.20	1.94	2.4				
Southeast Waikoloa	Waikoloa Village WWTP	Assume 8". No info on proposed development here.																														
Kawaihae North	Existing South Kohala WWRF	83	83	208	708	708	0	0	0	0	708	708	0.050	2.5	0.12	0.025	0.074	0.15	83	0.249	0.40	8	0.52	2.50	0.56	0.71	2.71	5.0				
Kawaihae South	Existing South Kohala WWRF	Flow by force main to WWTP																														
Puako	Existing Mauna Lani WWTP	Flow by force main to WWTP																														

Note:

Cells in gray are based on user-input values for population, pipe diameter, pipe slope, or FlowMaster (for velocity and depth at design flow).

1. Minimum slope is used for undulating roadway segments in which sewers are planned to minimize sewer depth.

Computation of Wastewater Flow for South Kohala Alternative 5 Sewering

Sewer: South Kohala

District: South Kohala

Reference Maps: Hawaii Statewide GIS Program

Page: 1 of 1

Computed by: Adrienne Fung, Tieshi Huang, Lee Schultz

Date: September 19, 2023

District Zone or Street	Segment Name	Tributary Area (Acres)		Tributary Equivalent Population						Wastewater Flow Computation												() Existing Sewer Study (X) Ultimate Sewer Study							
				Residential			Other	Total																					
		Increment	Total	Lots	Increment	Total	Increment	Total	Increment	Total	Increment	Total	Increment	Total	Increment	Total	Base Sanitary Flow - BSF @ 70 gpcd (MGD)	Ground Water Infiltration - GWI @ 35 gpcd (MGD)	Average Dry Weather Flow - ADWF (MGD)	Peak Dry Weather Flow - PDWF (MGD)	Area Used for Wet Weather I/I Calculation (acres)	Wet Weather I/I @ 3000 gpad (MGD)	Design Peak Flow - Q _{DES} (MGD)	Pipe Diameter (in)	Slope (%)	Velocity at Full Pipe - V _{FULL} (fps)	Full Pipe Flow - Q _{FULL} (MGD)	Design Flow - Q _{DES} (MGD) / Full Pipe Flow - Q _{FULL} (MGD)	Velocity at Design Flow - V _{DES} (fps)
South Kohala Alternative 5																													
East Waimea	COH West Waimea WWTP	413	413	1532	5778	5778	0	0	0	0	5778	5778	0.404	2.5	1.01	0.202	0.607	1.21	413	1.238	2.45	16	0.46	3.73	3.36	0.73	4.07	10.1	
Waimea Town	COH West Waimea WWTP	487	900	1431	5398	11176	0	0	0	0	5398	11176	0.782	2.5	1.96	0.391	1.174	2.35	900	2.700	5.05	18	0.88	5.58	6.37	0.79	6.19	12.1	
Kawaihae Road	COH West Waimea WWTP	52	952	131	1623	12799	0	0	0	0	1623	12799	0.896	2.5	2.24	0.448	1.344	2.69	952	2.857	5.54	24	0.23	3.45	7.01	0.79	3.83	16.1	
Kawaihae North	COH Makai WWTP	83	83	208	708	708	0	0	0	0	708	708	0.050	2.5	0.12	0.025	0.074	0.15	83	0.249	0.40	8	0.52	2.50	0.56	0.71	2.71	5.0	
Kawaihae South	COH Makai WWTP	1	84	3	33	741	0	0	0	0	33	741	0.052	2.5	0.13	0.026	0.078	0.16	84	0.253	0.41	8	0.52	2.50	0.56	0.73	2.72	5.1	
Puako	COH Makai WWTP	Flow by force main to WWTP																											
Aina Lea	COH West Waikoloa WWTP	108	108	1932	2496	2496	0	0	0	0	2496	2496	0.175	2.5	0.44	0.087	0.262	0.52	108	0.325	0.85	12	0.31	2.53	1.28	0.66	2.70	7.1	
Waiki'i	COH Waiki'i WWTP	26	26	65	355	355	0	0	0	0	355	355	0.025	2.5	0.06	0.012	0.037	0.07	26	0.078	0.15	12	0.31	2.53	1.28	0.12	1.69	2.8	
Southeast Waikoloa	COH West Waikoloa WWTP	Assume 8". No info on proposed development here.																											
Waikoloa	COH Waikoloa WWTP	107	107	462	3261	3261	0	0	0	0	3261	3261	0.228	2.5	0.57	0.114	0.342	0.68	107	0.320	1.00	12	0.31	2.53	1.28	0.78	2.79	8.0	

Note:

Cells in gray are based on user-input values for population, pipe diameter, pipe slope, or FlowMaster (for velocity and depth at design flow).

1. Minimum slope is used for undulating roadway segments in which sewers are planned to minimize sewer depth.

Appendix G:

**Construction Cost Estimation and Life
Cycle Cost (LCC) Analysis**

Appendix G Construction Cost Estimation and Life Cycle Cost (LCC) Analysis

G-1: LCC Analysis Summary and Assumptions

G-2: Pipe, IWS, and WWTP Unit Costs

G-3: Alternative 1A Construction Cost and LCC Analysis

G-4: Alternative 1B Construction Cost and LCC Analysis

G-5: Alternative 2A Construction Cost and LCC Analysis

G-6: Alternative 2B Construction Cost and LCC Analysis

G-7: Alternative 2C Construction Cost and LCC Analysis

G-8: Alternative 3A Construction Cost and LCC Analysis

G-9: Alternative 3B Construction Cost and LCC Analysis

G-10: Alternative 3C Construction Cost and LCC Analysis

G-11: Alternative 4A Construction Cost and LCC Analysis

G-12: Alternative 4B Construction Cost and LCC Analysis

G-13: Alternative 4C Construction Cost and LCC Analysis

G-14: Alternative 5A Construction Cost and LCC Analysis

G-15: Alternative 5B Construction Cost and LCC Analysis

G-16: Alternative 5C Construction Cost and LCC Analysis

G-1: LCC Analysis Summary and Assumptions

JOB #:	South Kohala Wastewater Master Plan	AECOM			
DATE:	June 5, 2024	Construction Cost Estimate			
LOCATION:	South Kohala, County of Hawaii	Conceptual Level			
PREPARED BY:	J. Fahmie/T. Huang/A. Fung	Wastewater Master Plan Estimates			
REVIEWED BY:	B. Stallings/A. Symonds	*****			
G R A N D S U M M A R Y					
Alternative No.	DESCRIPTION Level of Treatment - R3	Capital Cost	NPV of O&M Cost	Residual Value	Total LCC
1A	IWS for All Residential + Decentralized Treatment for Commercial/Institutions	\$590,457,600	\$179,294,000	\$179,013,000	\$590,738,600
1B	Both Decentralized On-Site Treatment and LPS				
	Waimea Area	\$340,179,000	\$91,577,000	\$124,095,000	\$307,661,000
	Kawaihae Area	\$55,524,000	\$12,467,000	\$19,954,000	\$48,037,000
	Puako Area	\$39,764,000	\$9,186,000	\$15,045,000	\$33,905,000
	Waikoloa Area	\$22,408,000	\$3,440,000	\$8,705,000	\$17,143,000
	Waikii	\$40,597,000	\$4,962,000	\$16,221,000	\$29,338,000
	Other non-urban area and private sewer areas	\$102,211,000	\$63,704,000	\$32,958,000	\$132,957,000
	1B Total	\$600,683,000	\$185,336,000	\$216,978,000	\$569,041,000
2A	3 COH Plants Urban Sewering w/ Private and County Plants_All Gravity Sewers				
	Waimea Area	\$952,002,000	\$37,803,000	\$407,283,000	\$582,522,000
	Kawaihae Area	\$224,453,000	\$19,503,000	\$89,479,000	\$154,477,000
	Puako Area	\$93,195,000	\$8,102,000	\$37,018,000	\$64,279,000
	Waikoloa Area	\$54,269,000	\$551,000	\$23,910,000	\$30,910,000
	Waikii Area	\$0	\$0	\$0	\$0
	2A Total	\$1,323,919,000	\$65,959,000	\$557,690,000	\$832,188,000
2B	3 COH Plants Urban Sewering w/ Private and County plants_Both Gravity Sewer and LPS				
	Waimea Area	\$824,319,000	\$56,359,000	\$351,325,000	\$529,353,000
	Kawaihae Area	\$200,848,000	\$21,319,000	\$79,709,000	\$142,458,000
	Puako Area	\$46,147,000	\$9,407,000	\$17,639,000	\$37,915,000
	Waikoloa Area	\$48,222,000	\$1,653,000	\$21,142,000	\$28,733,000
	Waikii Area	\$0	\$0	\$0	\$0
	2B Total	\$1,119,536,000	\$88,738,000	\$469,815,000	\$738,459,000
2C	3 COH Plants Urban Sewering w/ Private and County Plants_Cross Country Sewer				
	Waimea Area	\$888,722,000	\$25,227,000	\$386,043,000	\$527,906,000
	Kawaihae Area	\$209,101,000	\$17,459,000	\$83,763,000	\$142,797,000
	Puako Area	\$93,195,000	\$8,102,000	\$37,018,000	\$64,279,000
	Waikoloa Area	\$53,308,000	\$154,000	\$23,713,000	\$29,749,000
	Waikii Area	\$0	\$0	\$0	\$0
	2C Total	\$1,244,326,000	\$50,942,000	\$530,537,000	\$764,731,000
3A	2 COH Plants Full Flow Sewering w/ Private and County Plants_All Gravity Sewers				
	Waimea Area	\$1,158,164,000	\$37,633,000	\$501,047,000	\$694,750,000
	Kawaihae Area	\$230,951,000	\$19,690,000	\$92,344,000	\$158,297,000
	Puako Area	\$93,195,000	\$8,120,000	\$37,018,000	\$64,297,000
	Waikoloa Area	\$465,370,000	\$6,801,000	\$204,386,000	\$267,785,000
	Waikii Area	\$115,698,000	\$2,659,000	\$50,149,000	\$68,208,000
	3A Total	\$2,063,378,000	\$74,903,000	\$884,944,000	\$1,253,337,000
3B	2 COH Plants Full Flow Sewering w/ Private and County Plants_Both Gravity Sewer and LPS				
	Waimea Area	\$1,030,575,000	\$56,189,000	\$445,131,000	\$641,633,000
	Kawaihae Area	\$209,259,000	\$24,824,000	\$82,780,000	\$151,303,000
	Puako Area	\$77,598,000	\$13,893,000	\$29,105,000	\$62,386,000
	Waikoloa Area	\$429,975,000	\$19,958,000	\$186,944,000	\$262,989,000
	Waikii Area	\$41,557,000	\$4,922,000	\$16,653,000	\$29,826,000
	3B Total	\$1,788,964,000	\$119,786,000	\$760,613,000	\$1,148,137,000
3C	2 COH Plants Full Flow Sewering w/ Private and County Plants_Cross Country Sewer				
	Waimea Area	\$1,094,978,000	\$25,246,000	\$479,848,000	\$640,376,000
	Kawaihae Area	\$209,101,000	\$17,647,000	\$83,763,000	\$142,985,000
	Puako Area	\$93,195,000	\$8,120,000	\$37,018,000	\$64,297,000
	Waikoloa Area	\$455,581,000	\$4,373,000	\$201,368,000	\$258,586,000
	Waikii Area	\$116,654,000	\$2,264,000	\$50,800,000	\$68,118,000
	3C Total	\$1,969,509,000	\$57,650,000	\$852,797,000	\$1,174,362,000

	5 COH Plants Urban Sewering _All Gravity Sewers				
4A	Waimea Area	\$814,091,000	\$37,778,000	\$345,233,000	\$506,636,000
	Kawaihae Area	\$269,944,000	\$22,448,000	\$108,322,000	\$184,070,000
	Puako Area	\$80,380,000	\$6,718,000	\$32,100,000	\$54,998,000
	Waikoloa Area	\$48,075,000	\$1,912,000	\$20,365,000	\$29,622,000
	Waikii Area	\$0	\$0	\$0	\$0
	4A Total	\$1,212,490,000	\$68,856,000	\$506,020,000	\$775,326,000
	5 COH Plants Urban Sewering _Both Gravity Sewer and LPS				
4B	Waimea Area	\$686,408,000	\$56,334,000	\$289,275,000	\$453,467,000
	Kawaihae Area	\$245,157,000	\$24,312,000	\$98,020,000	\$171,449,000
	Puako Area	\$59,736,000	\$11,606,000	\$22,455,000	\$48,887,000
	Waikoloa Area	\$42,028,000	\$3,014,000	\$17,596,000	\$27,446,000
	Waikii Area	\$0	\$0	\$0	\$0
	4B Total	\$1,033,329,000	\$95,266,000	\$427,346,000	\$701,249,000
	5 COH Plants Urban Sewering _Cross Country Sewer				
4C	Waimea Area	\$750,811,000	\$25,364,000	\$323,993,000	\$452,182,000
	Kawaihae Area	\$252,108,000	\$20,404,000	\$101,512,000	\$171,000,000
	Puako Area	\$80,380,000	\$6,718,000	\$32,100,000	\$54,998,000
	Waikoloa Area	\$47,115,000	\$1,514,000	\$20,166,000	\$28,463,000
	Waikii Area	\$0	\$0	\$0	\$0
	4C Total	\$1,130,414,000	\$54,000,000	\$477,771,000	\$706,643,000
	4 COH Plants Full Flow Sewering _All Gravity Sewers				
5A	Waimea Area	\$1,158,164,000	\$37,633,000	\$501,047,000	\$694,750,000
	Kawaihae Area	\$248,200,000	\$22,813,000	\$98,506,000	\$172,507,000
	Puako Area	\$80,380,000	\$6,758,000	\$32,100,000	\$55,038,000
	Waikoloa Area	\$486,320,000	\$10,184,000	\$212,661,000	\$283,843,000
	Waikii Area	\$115,698,000	\$2,659,000	\$50,149,000	\$68,208,000
	5A Total	\$2,088,762,000	\$80,047,000	\$894,463,000	\$1,274,346,000
	4 COH Plants Full Flow Sewering _Both Gravity Sewer and LPS				
5B	Waimea Area	\$1,030,481,000	\$56,189,000	\$445,088,000	\$641,582,000
	Kawaihae Area	\$229,794,000	\$27,826,000	\$90,421,000	\$167,199,000
	Puako Area	\$59,736,000	\$11,498,000	\$22,455,000	\$48,779,000
	Waikoloa Area	\$450,925,000	\$23,342,000	\$195,217,000	\$279,050,000
	Waikii Area	\$41,557,000	\$4,922,000	\$16,653,000	\$29,826,000
	5B Total	\$1,812,493,000	\$123,777,000	\$769,834,000	\$1,166,436,000
	4 COH Plants Full Flow Sewering Plants_Cross Country Sewer				
5C	Waimea Area	\$1,094,884,000	\$25,246,000	\$479,805,000	\$640,325,000
	Kawaihae Area	\$232,918,000	\$20,770,000	\$92,822,000	\$160,866,000
	Puako Area	\$80,380,000	\$6,758,000	\$32,100,000	\$55,038,000
	Waikoloa Area	\$476,532,000	\$7,757,000	\$209,643,000	\$274,646,000
	Waikii Area	\$116,654,000	\$2,264,000	\$50,800,000	\$68,118,000
	5C Total	\$2,001,368,000	\$62,795,000	\$865,170,000	\$1,198,993,000

Capital Cost Percentage for Different Type of WW Infrastructures					
Alternative No.	DESCRIPTION Level of Treatment - R3	Capital Cost	Capital Cost %		
			Piping	PS	WWTP
1A	All IWS or Decentralized Systems	\$590,457,600	0%	0%	100%
1B	Both Decentralized On-Site Treatment and LPS	\$600,683,000	72.7%	0.0%	27.3%
2A	3 COH Plants Urban Sewering w/ Private and County Plants_All Gravity Sewers	\$1,323,919,000	80.2%	16.7%	3.1%
2B	3 COH Plants Urban Sewering w/ Private and County plants_Both Gravity Sewer and LPS	\$1,119,536,000	85.3%	11.0%	3.7%
2C	3 COH Plants Urban Sewering w/ Private and County Plants_Cross Country Sewer	\$1,244,326,000	84.2%	12.6%	3.3%
3A	2 COH Plants Full Flow Sewering w/ Private and County Plants_All Gravity Sewers	\$2,063,378,000	86.3%	11.8%	2.0%
3B	2 COH Plants Full Flow Sewering w/ Private and County Plants_Both Gravity Sewer and LPS	\$1,788,964,000	89.1%	8.6%	2.3%
3C	2 COH Plants Full Flow Sewering w/ Private and County Plants_Cross Country Sewer	\$1,969,509,000	89.4%	8.5%	2.1%
4A	4 COH Plants Urban Sewering _All Gravity Sewers	\$1,212,490,000	77.5%	17.7%	4.8%
4B	4 COH Plants Urban Sewering _Both Gravity Sewer and LPS	\$1,033,329,000	81.4%	13.0%	5.7%
4C	4 COH Plants Urban Sewering _Cross Country Sewer	\$1,130,414,000	81.6%	13.2%	5.2%
5A	4 COH Plants Full Flow Sewering _All Gravity Sewers	\$2,088,762,000	85.8%	10.8%	3.4%
5B	4 COH Plants Full Flow Sewering _Both Gravity Sewer and LPS	\$1,812,493,000	88.7%	7.4%	3.9%
5C	4 COH Plants Full Flow Sewering Plants_Cross Country Sewer	\$2,001,368,000	88.9%	7.6%	3.5%

Life-Cycle Cost Assumptions

Item	Criteria	Notes
Cash Flow Assumptions		
Economic Base Year	2022	
Analysis Period	30	years
Discount Interest Rate (Nominal)	3.11%	10 year average of Nominal Treasury Interest Rates for Different Maturities (30 years)
Escalation rate (Nominal)	3.37%	10 year average of ENR construction cost index
Effective Interest Rate (Real)	-0.26%	Calculated from discount interest rate (nominal) and escalation rate (nominal)
Planning cycle	30	years
Residual Value		
Residual Value at End of Design Life	0	
Percentage of Capital Cost		
Piping, Valves, etc	20%	Percentage of capital cost
Electrical and Motorized Equipment	30%	Percentage of capital cost
Hydraulic Structures and Buildings	50%	Percentage of capital cost
Design Life		
Gravity Sewers/New Force Mains	75	years
Electrical and Motorized Equipment	20	years
Hydraulic Structures and Buildings & Piping valves	50	years
Septic Tank/Leach Field	50	years

O&M Cost Assumptions

Item	Unit Cost	Unit	Notes
Sewer Inspection - CCTV	\$ 14.00	per FT	every 10 years
Sewer Cleaning	\$ 7.00	per FT	every 20 years
Force Main Assessment	\$ 70.00	per LF	every 20 years
Linear asset labor	\$ 0.70	Hr/ Day	
Average Electrical rate	\$ 0.44	per kWh	
GST inspection	\$ 70.00	per LF	2 years after construction and every 10 years thereafter
GST cleaning	\$ 70.00	per LF	every 20 years

JOB #:	South Kohala Wastewater Master Plan	AECOM			
DATE:	June 5, 2024	Construction Cost Estimate			
LOCATION:	South Kohala, County of Hawaii	Conceptual Level			
PREPARED BY:	J. Fahmie/T. Huang/A. Fung	Wastewater Master Plan Estimates			
REVIEWED BY:	B. Stallings/A. Symonds	*****			
GRAND SUMMARY					
Alternative No.	DESCRIPTION Level of Treatment - R2	Capital Cost	NPV of O&M Cost	Residual Value	Total LCC
1A	IWS for All Residential + Decentralized Treatment for Commercial/Institutions				
1B	Both Decentralized On-Site Treatment and LPS				
	Waimea Area	\$344,211,000	\$96,207,000	\$125,395,000	\$315,023,000
	Kawaihae Area	\$57,252,000	\$13,264,000	\$20,511,000	\$50,005,000
	Puako Area	\$40,211,000	\$9,457,000	\$15,184,000	\$34,484,000
	Waikoloa Area	\$22,840,000	\$3,621,000	\$8,844,000	\$17,617,000
	Waikiki	\$41,030,000	\$5,172,000	\$16,360,000	\$29,842,000
	Other non-urban area and private seweraging areas	\$102,211,000	\$63,704,000	\$32,958,000	\$132,957,000
	1B Total	\$607,755,000	\$191,425,000	\$219,252,000	\$579,928,000
2A	3 COH Plants Urban Sewering w/ Private and County Plants_All Gravity Sewers				
	Waimea Area	\$954,804,000	\$41,724,000	\$408,187,000	\$588,341,000
	Kawaihae Area	\$224,453,000	\$19,503,000	\$89,479,000	\$154,477,000
	Puako Area	\$93,195,000	\$8,102,000	\$37,018,000	\$64,279,000
	Waikoloa Area	\$54,269,000	\$551,000	\$23,910,000	\$30,910,000
	Waikiki Area	\$0	\$0	\$0	\$0
	2A Total	\$1,326,721,000	\$69,880,000	\$558,594,000	\$838,007,000
2B	3 COH Plants Urban Sewering w/ Private and County plants_Both Gravity Sewer and LPS				
	Waimea Area	\$827,121,000	\$60,280,000	\$352,228,000	\$535,173,000
	Kawaihae Area	\$200,848,000	\$21,319,000	\$79,709,000	\$142,458,000
	Puako Area	\$46,147,000	\$9,407,000	\$17,639,000	\$37,915,000
	Waikoloa Area	\$48,222,000	\$1,653,000	\$21,142,000	\$28,733,000
	Waikiki Area	\$0	\$0	\$0	\$0
	2B Total	\$1,122,338,000	\$92,659,000	\$470,718,000	\$744,279,000
2C	3 COH Plants Urban Sewering w/ Private and County Plants_Cross Country Sewer				
	Waimea Area	\$891,524,000	\$29,147,000	\$386,946,000	\$533,725,000
	Kawaihae Area	\$209,101,000	\$17,459,000	\$83,763,000	\$142,797,000
	Puako Area	\$93,195,000	\$8,102,000	\$37,018,000	\$64,279,000
	Waikoloa Area	\$53,308,000	\$154,000	\$23,713,000	\$29,749,000
	Waikiki Area	\$0	\$0	\$0	\$0
	2C Total	\$1,247,128,000	\$54,862,000	\$531,440,000	\$770,550,000
3A	2 COH Plants Full Flow Sewering w/ Private and County Plants_All Gravity Sewers				
	Waimea Area	\$1,160,414,000	\$42,436,000	\$501,772,000	\$701,078,000
	Kawaihae Area	\$230,951,000	\$19,690,000	\$92,344,000	\$158,297,000
	Puako Area	\$93,195,000	\$8,120,000	\$37,018,000	\$64,297,000
	Waikoloa Area	\$465,370,000	\$6,801,000	\$204,386,000	\$267,785,000
	Waikiki Area	\$116,292,000	\$2,904,000	\$50,341,000	\$68,855,000
	3A Total	\$2,066,222,000	\$79,951,000	\$885,861,000	\$1,260,312,000
3B	2 COH Plants Full Flow Sewering w/ Private and County Plants_Both Gravity Sewer and LPS				
	Waimea Area	\$1,032,824,000	\$60,992,000	\$445,856,000	\$647,960,000
	Kawaihae Area	\$209,259,000	\$24,824,000	\$82,780,000	\$151,303,000
	Puako Area	\$77,598,000	\$13,893,000	\$29,105,000	\$62,386,000
	Waikoloa Area	\$429,975,000	\$19,958,000	\$186,944,000	\$262,989,000
	Waikiki Area	\$42,151,000	\$5,167,000	\$16,844,000	\$30,474,000
	3B Total	\$1,791,807,000	\$124,834,000	\$761,529,000	\$1,155,112,000
3C	2 COH Plants Full Flow Sewering w/ Private and County Plants_Cross Country Sewer				
	Waimea Area	\$1,097,227,000	\$30,049,000	\$480,573,000	\$646,703,000
	Kawaihae Area	\$209,101,000	\$17,647,000	\$83,763,000	\$142,985,000
	Puako Area	\$93,195,000	\$8,120,000	\$37,018,000	\$64,297,000
	Waikoloa Area	\$455,581,000	\$4,373,000	\$201,368,000	\$258,586,000
	Waikiki Area	\$117,249,000	\$2,508,000	\$50,992,000	\$68,765,000
	3C Total	\$1,972,353,000	\$62,697,000	\$853,714,000	\$1,181,336,000

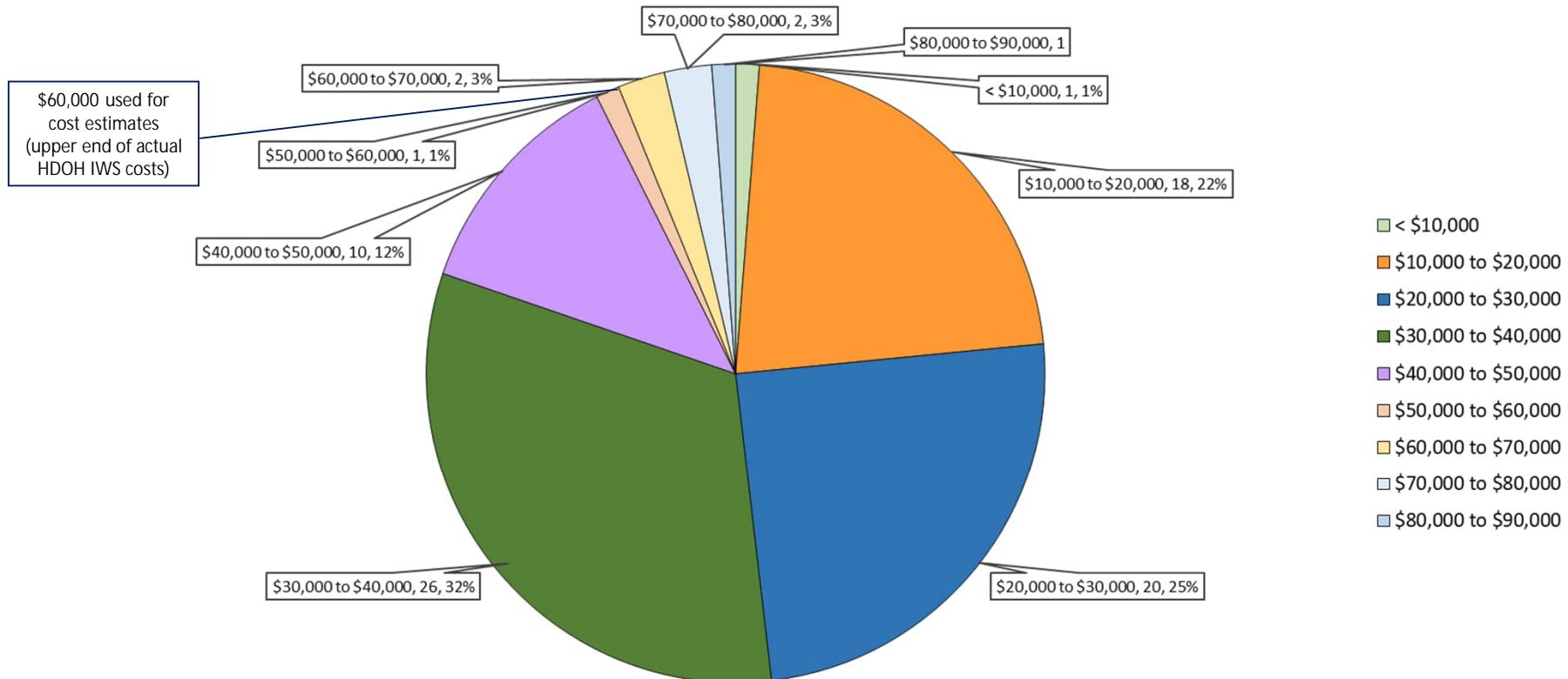
4A	5 COH Plants Urban Sewering _All Gravity Sewers				
	Waimea Area	\$816,853,000	\$41,668,000	\$346,124,000	\$512,397,000
	Kawaihae Area	\$270,727,000	\$23,008,000	\$108,575,000	\$185,160,000
	Puako Area	\$80,380,000	\$6,718,000	\$32,100,000	\$54,998,000
	Waikoloa Area	\$48,486,000	\$2,089,000	\$20,497,000	\$30,078,000
	Waikii Area	\$0	\$0	\$0	\$0
	4A Total	\$1,216,446,000	\$73,483,000	\$507,296,000	\$782,633,000
4B	5 COH Plants Urban Sewering _Both Gravity Sewer and LPS				
	Waimea Area	\$689,169,000	\$60,224,000	\$290,165,000	\$459,228,000
	Kawaihae Area	\$245,940,000	\$24,872,000	\$98,272,000	\$172,540,000
	Puako Area	\$59,736,000	\$11,606,000	\$22,455,000	\$48,887,000
	Waikoloa Area	\$42,439,000	\$3,191,000	\$17,728,000	\$27,902,000
	Waikii Area	\$0	\$0	\$0	\$0
	4B Total	\$1,037,284,000	\$99,893,000	\$428,620,000	\$708,557,000
4C	5 COH Plants Urban Sewering _Cross Country Sewer				
	Waimea Area	\$753,572,000	\$29,254,000	\$324,883,000	\$457,943,000
	Kawaihae Area	\$252,891,000	\$20,964,000	\$101,764,000	\$172,091,000
	Puako Area	\$80,380,000	\$6,718,000	\$32,100,000	\$54,998,000
	Waikoloa Area	\$47,526,000	\$1,691,000	\$20,299,000	\$28,918,000
	Waikii Area	\$0	\$0	\$0	\$0
	4C Total	\$1,134,369,000	\$58,627,000	\$479,046,000	\$713,950,000
5A	4 COH Plants Full Flow Sewering _All Gravity Sewers				
	Waimea Area	\$1,160,318,000	\$42,416,000	\$501,741,000	\$700,993,000
	Kawaihae Area	\$249,012,000	\$23,451,000	\$98,768,000	\$173,695,000
	Puako Area	\$80,380,000	\$6,758,000	\$32,100,000	\$55,038,000
	Waikoloa Area	\$487,495,000	\$12,436,000	\$213,040,000	\$286,891,000
	Waikii Area	\$116,275,000	\$2,900,000	\$50,335,000	\$68,840,000
	5A Total	\$2,093,480,000	\$87,961,000	\$895,984,000	\$1,285,457,000
5B	4 COH Plants Full Flow Sewering _Both Gravity Sewer and LPS				
	Waimea Area	\$1,032,635,000	\$60,972,000	\$445,782,000	\$647,825,000
	Kawaihae Area	\$230,607,000	\$28,464,000	\$90,683,000	\$168,388,000
	Puako Area	\$59,736,000	\$11,498,000	\$22,455,000	\$48,779,000
	Waikoloa Area	\$452,100,000	\$25,593,000	\$195,596,000	\$282,097,000
	Waikii Area	\$42,134,000	\$5,163,000	\$16,839,000	\$30,458,000
	5B Total	\$1,817,212,000	\$131,690,000	\$771,355,000	\$1,177,547,000
5C	4 COH Plants Full Flow Sewering Plants_Cross Country Sewer				
	Waimea Area	\$1,097,038,000	\$30,028,000	\$480,501,000	\$646,565,000
	Kawaihae Area	\$233,730,000	\$21,407,000	\$93,085,000	\$162,052,000
	Puako Area	\$80,380,000	\$6,758,000	\$32,100,000	\$55,038,000
	Waikoloa Area	\$477,707,000	\$10,008,000	\$210,022,000	\$277,693,000
	Waikii Area	\$117,232,000	\$2,505,000	\$50,986,000	\$68,751,000
	5C Total	\$2,006,087,000	\$70,706,000	\$866,694,000	\$1,210,099,000

JOB #:	South Kohala Wastewater Master Plan	AECOM			
DATE:	June 5, 2024	Construction Cost Estimate			
LOCATION:	South Kohala, County of Hawaii	Conceptual Level			
PREPARED BY:	J. Fahmie/T. Huang/A. Fung	Wastewater Master Plan Estimates			
REVIEWED BY:	B. Stallings/A. Symonds	*****			
G R A N D S U M M A R Y					
Alternative No.	DESCRIPTION Level of Treatment - R1	Capital Cost	NPV of O&M Cost	Residual Value	Total LCC
1A	IWS for All Residential + Decentralized Treatment for Commercial/Institutions				
1B	Both Decentralized On-Site Treatment and LPS				
	Waimea Area	\$361,203,000	\$100,437,000	\$130,875,000	\$330,765,000
	Kawaihae Area	\$64,884,000	\$14,960,000	\$22,972,000	\$56,872,000
	Puako Area	\$42,515,000	\$9,977,000	\$15,927,000	\$36,565,000
	Waikoloa Area	\$24,712,000	\$4,035,000	\$9,448,000	\$19,299,000
	Waikii	\$43,334,000	\$5,682,000	\$17,103,000	\$31,913,000
	Other non-urban area and private sewer areas	\$102,211,000	\$63,704,000	\$32,958,000	\$132,957,000
	1B Total	\$638,859,000	\$198,795,000	\$229,283,000	\$608,371,000
2A	3 COH Plants Urban Sewering w/ Private and County Plants_All Gravity Sewers				
	Waimea Area	\$967,827,000	\$45,035,000	\$412,386,000	\$600,476,000
	Kawaihae Area	\$224,453,000	\$19,503,000	\$89,479,000	\$154,477,000
	Puako Area	\$93,195,000	\$8,102,000	\$37,018,000	\$64,279,000
	Waikoloa Area	\$54,269,000	\$551,000	\$23,910,000	\$30,910,000
	Waikii Area	\$0	\$0	\$0	\$0
	2A Total	\$1,339,744,000	\$73,191,000	\$562,793,000	\$850,142,000
2B	3 COH Plants Urban Sewering w/ Private and County plants_Both Gravity Sewer and LPS				
	Waimea Area	\$840,144,000	\$63,592,000	\$356,427,000	\$547,309,000
	Kawaihae Area	\$209,848,000	\$21,319,000	\$79,709,000	\$142,458,000
	Puako Area	\$46,147,000	\$9,407,000	\$17,639,000	\$37,915,000
	Waikoloa Area	\$48,222,000	\$1,653,000	\$21,142,000	\$28,733,000
	Waikii Area	\$0	\$0	\$0	\$0
	2B Total	\$1,135,361,000	\$95,971,000	\$474,917,000	\$756,415,000
2C	3 COH Plants Urban Sewering w/ Private and County Plants_Cross Country Sewer				
	Waimea Area	\$904,547,000	\$32,459,000	\$391,146,000	\$545,860,000
	Kawaihae Area	\$209,101,000	\$17,459,000	\$83,763,000	\$142,797,000
	Puako Area	\$93,195,000	\$8,102,000	\$37,018,000	\$64,279,000
	Waikoloa Area	\$53,308,000	\$154,000	\$23,713,000	\$29,749,000
	Waikii Area	\$0	\$0	\$0	\$0
	2C Total	\$1,260,151,000	\$58,174,000	\$535,640,000	\$782,685,000
3A	2 COH Plants Full Flow Sewering w/ Private and County Plants_All Gravity Sewers				
	Waimea Area	\$1,170,592,000	\$45,302,000	\$505,054,000	\$710,840,000
	Kawaihae Area	\$230,951,000	\$19,690,000	\$92,344,000	\$158,297,000
	Puako Area	\$93,195,000	\$8,120,000	\$37,018,000	\$64,297,000
	Waikoloa Area	\$465,370,000	\$6,801,000	\$204,386,000	\$267,785,000
	Waikii Area	\$119,020,000	\$3,504,000	\$51,220,000	\$71,304,000
	3A Total	\$2,079,128,000	\$83,417,000	\$890,022,000	\$1,272,523,000
3B	2 COH Plants Full Flow Sewering w/ Private and County Plants_Both Gravity Sewer and LPS				
	Waimea Area	\$1,043,003,000	\$63,858,000	\$449,139,000	\$657,722,000
	Kawaihae Area	\$209,259,000	\$24,824,000	\$82,780,000	\$151,303,000
	Puako Area	\$77,598,000	\$13,893,000	\$29,105,000	\$62,386,000
	Waikoloa Area	\$429,975,000	\$19,958,000	\$186,944,000	\$262,989,000
	Waikii Area	\$44,879,000	\$5,767,000	\$17,723,000	\$32,923,000
	3B Total	\$1,804,714,000	\$128,300,000	\$765,691,000	\$1,167,323,000
3C	2 COH Plants Full Flow Sewering w/ Private and County Plants_Cross Country Sewer				
	Waimea Area	\$1,107,406,000	\$32,915,000	\$483,856,000	\$656,465,000
	Kawaihae Area	\$209,101,000	\$17,647,000	\$83,763,000	\$142,985,000
	Puako Area	\$93,195,000	\$8,120,000	\$37,018,000	\$64,297,000
	Waikoloa Area	\$455,581,000	\$4,373,000	\$201,368,000	\$258,586,000
	Waikii Area	\$119,976,000	\$3,109,000	\$51,870,000	\$71,215,000
	3C Total	\$1,985,259,000	\$66,164,000	\$857,875,000	\$1,193,548,000

	5 COH Plants Urban Sewering _All Gravity Sewers				
4A	Waimea Area	\$829,950,000	\$44,992,000	\$350,347,000	\$524,595,000
	Kawaihae Area	\$274,443,000	\$23,863,000	\$109,773,000	\$188,533,000
	Puako Area	\$80,380,000	\$6,718,000	\$32,100,000	\$54,998,000
	Waikoloa Area	\$50,437,000	\$2,519,000	\$21,126,000	\$31,830,000
	Waikii Area	\$0	\$0	\$0	\$0
	4A Total	\$1,235,210,000	\$78,092,000	\$513,346,000	\$799,956,000
	5 COH Plants Urban Sewering _Both Gravity Sewer and LPS				
4B	Waimea Area	\$702,267,000	\$63,548,000	\$294,388,000	\$471,427,000
	Kawaihae Area	\$249,656,000	\$25,727,000	\$99,470,000	\$175,913,000
	Puako Area	\$59,736,000	\$11,606,000	\$22,455,000	\$48,887,000
	Waikoloa Area	\$44,390,000	\$3,622,000	\$18,357,000	\$29,655,000
	Waikii Area	\$0	\$0	\$0	\$0
	4B Total	\$1,056,049,000	\$104,503,000	\$434,670,000	\$725,882,000
	5 COH Plants Urban Sewering _Cross Country Sewer				
4C	Waimea Area	\$766,670,000	\$32,578,000	\$329,107,000	\$470,141,000
	Kawaihae Area	\$256,606,000	\$21,820,000	\$102,962,000	\$175,464,000
	Puako Area	\$80,380,000	\$6,718,000	\$32,100,000	\$54,998,000
	Waikoloa Area	\$49,476,000	\$2,122,000	\$20,928,000	\$30,670,000
	Waikii Area	\$0	\$0	\$0	\$0
	4C Total	\$1,153,132,000	\$63,238,000	\$485,097,000	\$731,273,000
	4 COH Plants Full Flow Sewering _All Gravity Sewers				
5A	Waimea Area	\$1,170,469,000	\$45,276,000	\$505,014,000	\$710,731,000
	Kawaihae Area	\$252,842,000	\$24,342,000	\$100,003,000	\$177,181,000
	Puako Area	\$80,380,000	\$6,758,000	\$32,100,000	\$55,038,000
	Waikoloa Area	\$493,032,000	\$13,938,000	\$214,825,000	\$292,145,000
	Waikii Area	\$118,997,000	\$3,499,000	\$51,213,000	\$71,283,000
	5A Total	\$2,115,720,000	\$93,813,000	\$903,155,000	\$1,306,378,000
	4 COH Plants Full Flow Sewering _Both Gravity Sewer and LPS				
5B	Waimea Area	\$1,042,785,000	\$63,832,000	\$449,056,000	\$657,561,000
	Kawaihae Area	\$234,436,000	\$29,355,000	\$91,918,000	\$171,873,000
	Puako Area	\$59,736,000	\$11,498,000	\$22,455,000	\$48,779,000
	Waikoloa Area	\$457,637,000	\$27,096,000	\$197,382,000	\$287,351,000
	Waikii Area	\$44,857,000	\$5,762,000	\$17,717,000	\$32,902,000
	5B Total	\$1,839,451,000	\$137,543,000	\$778,528,000	\$1,198,466,000
	4 COH Plants Full Flow Sewering Plants_Cross Country Sewer				
5C	Waimea Area	\$1,107,188,000	\$78,567,000	\$483,773,000	\$701,982,000
	Kawaihae Area	\$237,560,000	\$27,206,000	\$94,319,000	\$170,447,000
	Puako Area	\$80,380,000	\$6,758,000	\$32,100,000	\$55,038,000
	Waikoloa Area	\$483,243,000	\$32,651,000	\$211,807,000	\$304,087,000
	Waikii Area	\$119,954,000	\$4,350,000	\$51,864,000	\$72,440,000
	5C Total	\$2,028,325,000	\$149,532,000	\$873,863,000	\$1,303,994,000

G-2: Pipe, IWS, and WWTP Unit Costs

Actual HDOH IWS Costs Overall Range of Costs (2023 Dollars)



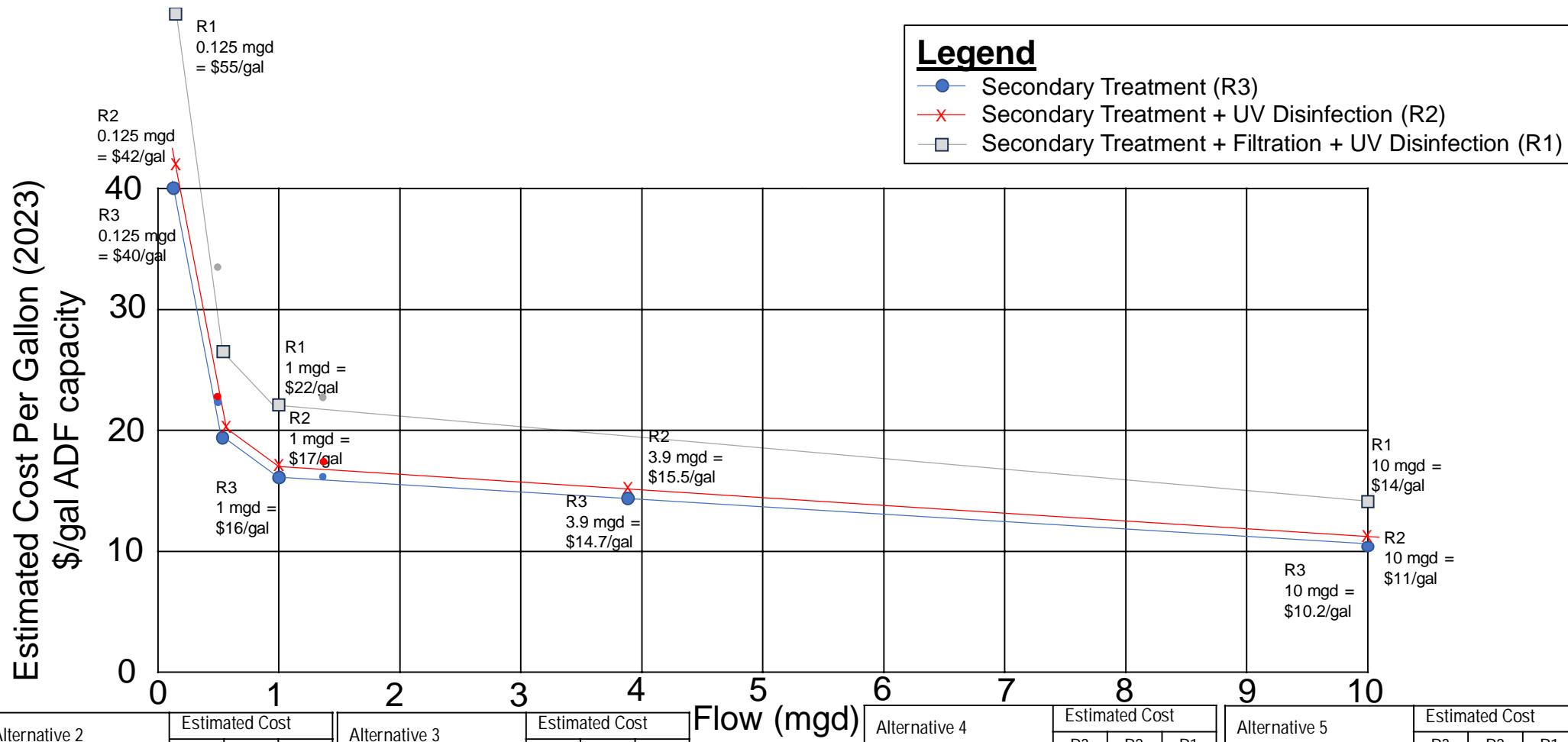
Basis of Pipe Unit Cost

Project	Bid Date	Size, in	Length, ft	Low Bid	High Bid	Average Bid	Cost Per Foot	Ratio of Avg. bid to Low Bid	Escalation Factor	Escalated Cost/ft	Cost/ft used, rounded	Average Size, inch
CCH Aala Drive WWPS Force Main	September 30 2019	8	612	\$2,170,000	\$7,300,000	\$4,500,000	\$7,353	2.07	1.12	\$8,235		
CCH Ahuimanu Pre-Treatment FM	April 6 2017	16 to 24	3657	\$7,700,000	\$9,570,000	\$8,800,000	\$2,406	1.14	1.22	\$2,936		
CCH Dowsett - Nuuanau	February 28 2018	8 to 24	6575	\$21,260,000	\$44,300,000	\$32,600,000	\$4,958	1.53	1.17	\$5,801	\$5,800	16
CCH Dowsett - Pali Hwy	March 2 2018	12 to 18	9763	\$41,560,000	\$52,850,000	\$48,200,000	\$4,937	1.16	1.17	\$5,776		
CCH Kahanahou WWPS FM	April 13 2017	12 to 24	4733	\$14,700,000	\$21,800,000	\$18,400,000	\$3,888	1.25	1.22	\$4,743		
COH DWS Paukaa	January 12 2017	6	680	\$318,350	\$653,500	\$492,390	\$724	1.55	1.25	\$905	\$900	6
COH DWS Paukaa	June 16 2016	6	2956	\$648,555	\$1,168,560	\$926,706	\$314	1.43	1.28	\$401		
COH Lono Kona	January 29 2018	8	6744	\$7,728,427	\$10,726,943	\$9,009,168	\$1,336	1.17	1.21	\$1,617	\$1,600	8
COH Lanihau FM	April 9 2020	8	677	\$990,700	\$2,403,424	\$1,611,473	\$2,380	1.63	1.08	\$2,571		
COH Kaloko Heights	2021	8 to 12	12115	\$8,753,520	Unknown	\$10,204,137	\$842	1.17	1.09	\$918		
COH Lono Kona Rebid	March 29 2018	8	6386	\$8,522,630	Unknown	\$9,934,984	\$1,556	1.17	1.20	\$1,867		

Summary of Estimated Construction Cost Per Foot*

Gravity Sewer		Force Main		LPS	
Size, inch	Unit Cost	Size, inch	Unit Cost	Size, inch	Unit Cost
8	\$1,600	4	\$600	2	\$300
12	\$3,070	6	\$900	3	\$450
16	\$5,800	8	\$1,600	4	\$600
18	\$6,525	10	\$1,700		
24	\$8,700	12	\$3,070		
30	\$10,875	14	\$4,430		
36	\$13,050	16	\$5,800		
42	\$15,200	18	\$6,525		
48	\$17,400	24	\$8,700		
54	\$19,500	30	\$10,875		
		36	\$13,050		
		42	\$15,200		
		48	\$17,400		

* for the project



Alternative 2	Estimated Cost		
	R3	R2	R1
East Waimea WWTP	\$12.0	\$12.8	\$16.7
Waimea Town WWTP	\$12.0	\$12.8	\$16.7
West Waimea WWTP	\$4.2	\$4.5	\$5.8
TOTAL	\$28.2	\$30.1	\$39.2

Alternative 3	Estimated Cost		
	R3	R2	R1
West Waimea WWTP	\$22.0	\$23.6	\$30.6
Waikii WWTP	\$5.9	\$6.3	\$8.2
TOTAL	\$27.9	\$29.9	\$38.8

Alternative 4	Estimated Cost		
	R3	R2	R1
East Waimea WWTP	\$12.0	\$12.8	\$16.7
Waimea Town WWTP	\$12.0	\$12.8	\$16.7
West Waimea WWTP	\$4.2	\$4.5	\$5.8
Makai WWTP	\$8.0	\$8.5	\$11.1
East Waikoloa WWTP	\$4.2	\$4.5	\$5.8
TOTAL	\$40.4	\$43.1	\$56.2

Alternative 5	Estimated Cost		
	R3	R2	R1
West Waimea WWTP	\$22.0	\$23.5	\$30.5
Makai WWTP	\$8.3	\$8.9	\$11.5
West Waikoloa WWTP	\$12.0	\$12.8	\$16.7
Waikii WWTP	\$5.9	\$6.3	\$8.2
TOTAL	\$48.2	\$51.5	\$66.9

R3 Water Construction Cost

5 Alternatives Analysis

5.1 Estimated Capital Cost

A summary of the opinion of probable construction cost (cost estimate) for the Waimea WWTP Upgrade and Expansion is outlined in this report. The cost estimates are based on unit pricing from recent local Hawaii wastewater pumping and treatment projects, and local vendor quotes for major process equipment. The cost estimate is in current September 2016 dollars. (ENR_{20 Cities} Index = 10,132). The following allowances are included in the estimate to cover the contractor's general office expenses:

- Mobilization at 5 percent of the raw construction cost.
- General Contractor's home office overhead and profit at 10 percent of the total estimated construction cost.
- Sales tax at 4.166 percent of the estimated materials cost.
- Vehicle/auto insurance at 0.5 percent of the raw construction cost, builder's risk insurance at 1.0 percent of the raw construction cost and general liability insurance at 1.5 percent of the raw construction cost (3.0 percent total allowance).
- Bond costs for the payment and performance bonds at 2.0 percent of the raw construction cost.
- Miscellaneous home office expenses at approximately 1 percent of the raw construction cost.

The preliminary construction cost estimate for the Waimea WWTP Upgrade and Expansion for the three biological treatment alternatives is shown **Table 5-1**.

Table 5-1: Waimea WWTP Upgrade and Expansion Estimated Construction Cost

Description	Estimated Cost PHASE 1 and 2			Estimated Cost PHASE 3		
	Extended Air AS	SBR	Aerated Lagoon	Extended Air AS	SBR	Aerated Lagoon
Division 0 - General Conditions	1,323,443	1,167,269	1,588,277	602,921	484,354	1,105,507
Division 1 - Contractor Field Office	322,640	322,640	322,640	244,480	244,480	244,480
Division 2 - Sitework	508,350	157,100	1,438,500	384,500	78,000	1,156,300
Division 3 - Concrete	1,505,500	1,670,500	198,000	532,000	603,400	60,000
Division 4 - Masonry	50,400	50,400	50,400	0	0	0
Division 5 - Metals	30,300	75,600	12,000	6,300	28,800	0
Division 6 - Wood and Plastics	64,200	1,200	476,000	157,500	94,500	476,000
Division 7 - Roofing & Insulation	23,100	23,100	23,100	0	0	0
Division 8 - Doors & Windows	7,800	7,800	7,800	0	0	0
Division 9 - Finishes	117,000	126,000	6,000	34,500	81,000	6,000
Division 10 - Specialties	1,200	1,200	300	300	300	300
Division 11 - Equipment	2,033,750	1,627,500	2,090,000	857,500	537,500	1,582,000
Division 12 - Furnishings	1,650	1,650	1,650	0	0	0
Division 13 - Special Construction	0	0	0	0	0	0
Division 14 - Conveying Systems	18,000	27,000	9,000	0	9,000	0
Division 15 - Mechanical	391,000	340,040	571,000	215,000	215,000	371,450
Division 16 - Electrical	510,000	485,000	1,466,000	125,000	120,000	833,630
Division 17 - Instrumentation	175,000	166,000	156,000	90,000	87,000	81,000

Description	Estimated Cost PHASE 1 and 2			Estimated Cost PHASE 3		
	Extended Air AS	SBR	Aerated Lagoon	Extended Air AS	SBR	Aerated Lagoon
Subtotal of Divisions 1 to 17	\$5,759,890	\$5,082,731	\$ 6,828,390	\$2,647,079	\$2,098,980	\$4,811,160
Division 0	\$1,323,443	\$1,167,269	\$1,588,277	\$602,921	\$484,354	\$1,105,507
Subtotal of Divisions 0 to 17	\$7,083,333	\$6,250,000	\$8,416,667	\$3,250,000	\$2,583,334	\$5,916,667
20 percent Contingency	\$1,416,667	\$1,250,000	\$1,683,333	\$650,000	\$516,667	\$1,183,333
Total Estimated Construction Cost	\$8,500,000	\$7,500,000	\$10,100,000	\$3,900,000	\$3,100,000	\$7,100,000

5.2 Estimated O&M Costs

This section reviews projected operation and maintenance costs for various biological treatment and solids handling system improvements. Annual Operation and Maintenance (O&M) Cost Estimates are costs associated with the annual operation and maintenance of the asset and do not include costs associated with replacement of equipment or structures that are at the end of their service life. Annual O&M Cost Estimates are derived from estimated electrical usage, labor, chemical usage, and allowances for miscellaneous utility usage such as water, gas, fuel, and oil. Allowances for the cost of sampling and analysis are also included. The general assumptions used in this report for local Hawaii annual O&M cost estimates include:

- Energy rates of \$0.28/kilowatt-hour using estimated motor horsepower sizes provided by the manufacturer, and the operating times of the “duty” equipment. The “redundant” or standby equipment is not included in the estimated energy costs.
- Labor rates of \$40/hour including fringe benefits using person-hour requirements based on other similar size operating systems (or facilities).
- Concentrated polymer cost of \$7.00 per gallon, and approximately 4 lbs of active polymer per gallon of concentrated polymer solution.
- Combined biosolids processing, transport and tipping fee of \$90 per wet ton.
- An average interest rate of approximately 3 percent over a twenty year period is used to amortize the value of the estimated construction cost of each alternative.
- Residual or salvage value is not included in these comparative cost evaluations since most items have a typical service life of twenty years or more which is the time period used for the life cycle cost comparisons.

The following are the typical service life for each major component of well-maintained wastewater systems:

- Reinforced concrete or masonry structures: 50 or more years.
- Concrete or iron piping: 50 or more years
- Iron valves: 20 or more years
- Mechanical and electrical equipment inside buildings: 20 or more years
- Immersed equipment: 15 or more years
- Exposed plastics (piping, valves, liners etc.): Less than 15 years

The annual O&M cost estimates for each alternative are based on current 2016 dollars using the 1 mgd Phase 3 design flow as the basis of the estimate for the purpose of comparing alternatives. Actual operating costs should be lower during initial operation at lower influent flows and loads.

The preliminary annual cost evaluation for the solids handling improvement alternatives related to the Waimea WWTP Upgrade and Expansion is shown **Table 5-2**.

Table 5-2: Waimea WWTP Upgrade and Expansion Solids Handling Annual Cost Evaluation

Description	Solids Handling Alternative				
	Solar Drying	Screw Press	Rotary Press	Belt Press	Centrifuge
Estimated Construction Cost					
Sitework	\$175,000	\$15,000	\$15,000	\$15,000	\$15,000
Reinforced Concrete	\$725,000	\$30,000	\$30,000	\$60,000	\$30,000
Dewatering System	\$0	\$300,000	\$320,000	\$225,000	\$360,000
Polymer Feed System	\$0	\$22,000	\$22,000	\$22,000	\$22,000
Electrical	\$0	\$36,000	\$38,000	\$27,000	\$43,000
Instrumentation	\$0	\$24,000	\$26,000	\$18,000	\$29,000
Total Estimated Construction Cost	\$900,000	\$427,000	\$451,000	\$367,000	\$499,000
Estimated Annual O&M Cost – Phase 3 Flows					
Labor	\$10,400	\$50,000	\$50,000	\$50,000	\$50,000
Rental Equipment	\$11,600	\$0	\$0	\$0	\$0
Power	\$0	\$500	\$1,400	\$1,300	\$6,500
Chemicals	\$0	\$9,500	\$9,600	\$7,700	\$11,500
Solids Disposal	\$124,000	\$109,000	\$109,000	\$116,000	\$98,000
Total Estimated Annual O&M Cost	\$146,000	\$169,000	\$170,000	\$175,000	\$166,000
Total Annual Cost					
Amortized Construction Cost (3% Interest, 20 years)	\$60,000	\$29,000	\$30,000	\$25,000	\$34,000
Estimated Annual O&M Cost	\$146,000	\$169,000	\$170,000	\$175,000	\$166,000
Total Estimated Annual Cost	\$206,000	\$198,000	\$200,000	\$200,000	\$200,000

Based on the review of solids handling alternatives the screw press dewatering system has the lowest estimated annual cost and would be used as the basis of the capital cost estimates and comparison of biological treatment alternatives.

The preliminary annual cost evaluation for the biological treatment alternatives related to the Waimea WWTP Upgrade and Expansion is shown **Table 5-3**.

Table 5-3: Waimea WWTP Upgrade and Expansion Biological Treatment Annual Cost Evaluation

Description	Biological Treatment Alternative		
	Extended Air AS	SBR	Aerated Lagoon
Estimated Construction Cost			
Estimated Construction Cost Phase 1	\$8,500,000	\$7,500,000	\$10,100,000
Estimated Construction Cost Phase 2	\$3,900,000	\$3,100,000	\$7,100,000
Total Estimated Construction Cost	\$12,400,000	\$10,600,000	\$17,200,000
Estimated Annual O&M Cost – Phase 3 Flows			
Labor	\$208,000	\$208,000	\$166,000
Rental Equipment	\$0	\$0	\$18,000
Power	\$171,000	\$167,000	\$274,000
Chemicals	\$0	\$0	\$0
Replacement Parts	\$23,000	\$18,000	\$29,000
Solids Disposal	\$169,000	\$169,000	\$57,000
Total Estimated Annual O&M Cost	\$571,000	\$562,000	\$544,000
Total Annual Cost			

Amortized Construction Cost (3% Interest, 20 years)	\$834,000	\$713,000	\$1,156,000
Estimated Annual O&M Cost	\$571,000	\$562,000	\$544,000
Total Estimated Annual Cost	\$1,405,000	\$1,275,000	\$1,700,000

Based on the review of biological treatment alternatives the SBR biological treatment system has the lowest estimated annual cost.

5.3 Other Technical Considerations

The following “other technical considerations” were identified. These other technical considerations would be reviewed to compare the various biological treatment alternatives for the Waimea WWTP upgrade and expansion. The comparison helps to differentiate between the three treatment alternatives. The following considerations and technical criteria are considered in the ranking of each biological treatment alternative:

- Site utilization and layout efficiency
- Constructability
- Energy efficiency
- Operability
- Maintainability
- Security
- Biosolids treatment and disposal
- Odor and vector control
- Hawaii HB 2030 adaptability
- Future ability to produce R2 or R1 effluent
- Implementation schedule

A relatively simple multi-criteria rating system has been prepared to evaluate the alternatives and assist with the selection of a preferred treatment alternative. The rating system allows the comparison of each alternative. The following rating scale is used:

- A plus “+” sign means the alternative is better than the others.
- A minus “-“ sign means the Alternative is worse than the others.
- A zero “0” sign means the Alternatives are all equal.

It is possible to add additional numerical ratings to weight the importance of each evaluation criteria. **Table 5-4** shows a summary of the multi-criteria ratings for the three alternatives.

Table 5-4: Evaluation of Biological Treatment Alternatives

Criteria	Treatment Alternative			Discussion
	Extended Aeration AS	SBR	Aerated Lagoon	
Site utilization & layout efficiency	-	+	-	SBR has smallest footprint
Constructability	-	+	-	SBR requires minimal excavation
Energy efficiency	+	+	-	SBR and AS have the lowest equipment horsepower
Operability	-	-	+	Lagoon requires minimal operator intervention
Maintainability	-	+	-	SBR has least amount of equipment
Security	-	+	-	SBR has most compact layout to secure
Biosolids treatment and disposal	-	-	+	Lagoon aerobically digests solids
Odor and vector control	-	+	-	SBR footprint is small and easy to cover
Hawaii HB 2030 adaptability	+	+	-	Waste solids could be used to produce biogas

R2 Water Cost Adder_Construction Cost

ATTACHMENT "A"

BID FORM (R1): Pages B-3(R1) to B-7(R1)

2. "Fraudulent practice" means a misrepresentation of facts made: (a) to influence the bidding or negotiating process to the detriment of Owner; (b) to establish bid prices at artificial non-competitive levels; or (c) to deprive Owner of the benefits of free and open competition.
3. "Collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels.
4. "Coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

ARTICLE 5 – BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s). Unit Bid Prices: The bidder agrees to accept the following Unit Prices for items listed. Sum of items shown is intended to be comprehensive of all work in this contract. Where materials are furnished by the OWNER, the prices provided herein are for installation only. Otherwise the prices include furnishing and installation of materials. Quantities are not guaranteed. Final payment will be made on actual quantities.

BID FORM (R1)

BASE BID				
Item No.	Description	Quantity	Unit	Total Lump Sum Bid
1	Mobilization/ Demobilization	1	LS	19 , 668-
2	Erosion Control Measures	1	LS	9 , 833-
3	Yard Piping	1	LS	35 , 393-
4	Concrete Structures and all other Contract Work not Specifically Listed in Other Bid Items	1	LS	1 , 048 , 353-
5	Transfer of UV Purchase Order	1	LS	284 , 154-
6	Installation of UV Equipment	1	LS	26 , 511-
7	Electrical - excluding new Plant Water	1	LS	345 , 066-
8	Plant Water pumps, piping, and electrical	1	LS	280 , 630-
9	Secondary Clarifier Launder Covers	1	LS	203 , 230-
10	Demolition and disposal of existing structures	1	LS	56 , 294-
Award October 2014 (ENR = 9886) TOTAL BASE BID PRICE				2 , 309 , 172-

BID ALTERNATIVES				
11	<u>Add</u> plant water pump suction connection from existing plant water pumps to new structure. <u>Deduct</u> new PW Pumps and Controls from Line Item 8 above.	1	LS	-192 , 864
12	<u>Deduct</u> new launder covers Secondary Clarifier No. 1	1	LS	
13	<u>Deduct</u> to stockpile surplus soils adjacent to Secondary Clarifier #2, cover/sand bag, and silt	1	LS	-11 , 589

	fence			
14	Deduct – Owner retains Trojan PO/pays for UV equipment. Contractor installs equipment.	1	LS	-240,100
15	Deduct – Delete Control Panel Specified in Section 11301, Article 2.10.G and reuse existing Plant Water Control Panel	1	LS	
16	Add – Remove and Dispose Chlorine Scrubber. Cut off piping, ductwork and electrical conduits flush with existing structure. Seal existing penetrations	1	LS	6,338

Fifty six thousand, two hundred ninety four

Contained in the lump sum base bid is the sum of _____ dollars (\$ 56,294-) associated with cost of demolition of existing facilities and/or removal of existing material and/or equipment as required to complete the Work in accordance with the Contract Documents. This is the net cost to Bidder for such work taking into consideration estimated disposal costs or salvage values accruing to Bidder. This information is necessary for Owner's financial accounting of project costs and will not be used in the selection of the successful Bidder.

- 5.02 Bidder may provide alternative equipment and/or materials (if any) as listed below in lieu of the specified equipment and/or materials.

Owner may select items of any manufacturer or supplier listed in the following tabulation. Bidder will furnish and install such items selected for a Contract Price equal to the lump sum Contract Price, adjusted by the amount of deduction for the substituted item(s).

In the following tabulation, the name of the manufacturer or supplier entered on line (a) is the name of the manufacturer or supplier named in the Specifications for that item and the cost for providing that specified item is included in the lump sum Contract Price. If the name of the manufacturer or supplier is not shown on line (a), it is understood that the lump sum Contract Price includes the cost for providing the item furnished by the manufacturer or supplier first named in that portion of the Specification pertaining to the equipment and/or materials being substituted.

Names of alternative manufacturers and suppliers are shown on lines (b) and (c) with the respective prices to be deducted from the lump sum Contract Price should the Owner elect to accept the alternative item.

ALTERNATIVE EQUIPMENT AND/OR MATERIALS

Spec. Section	Item and Manufacturer or Supplier	Deduct from Base Bid
09980	(a) Sancon 100, Durashield 310	
	(b) Raven 405 - 100% solids epoxy	-\$14,000.00
	(c)	
	(a)	
	(b)	
	(c)	

_____	(a) _____	_____
_____	(b) _____	_____
_____	(c) _____	_____

ARTICLE 6 – TIME OF COMPLETION

- 6.01 Bidder agrees that the Work will be substantially complete within **120 calendar days- UV, and 165 calendar days - Plant Water/Launderers** after the date when the Contract Times commence to run as provided in Paragraph 2.03 of the General Conditions, and will be completed and ready for final payment in accordance with Paragraph 14.07.B of the General Conditions within **150 calendar days - UV and 195 calendar days Plant Water/Launderers** after the date when the Contract Times commence to run.
- 6.01 Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the Contract Times.

ARTICLE 7 – ATTACHMENTS TO THIS BID

- 7.01 The following documents are submitted with and made a condition of this Bid:
- Evidence of authority to do business in the state of the Project, or a written covenant to obtain such license within the time for acceptance of Bids;
 - Contractor's License Number or evidence of Bidder's ability to obtain a State Contractor's License and a covenant by Bidder to obtain said license within the time for acceptance of Bids;
 - Information describing the proposed alternative equipment and/or materials.

ARTICLE 8 – DEFINED TERMS

- 8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 – BID SUBMITTAL

9.01 This Bid is submitted on _____, 20__ by:

If Bidder is:

An Individual

Name (typed or printed): _____

By: _____
(Individual's signature)

Doing business as: _____

Business Address: _____

Phone No.: _____ E-mail: _____

State Contractor License No. (If applicable): _____

A Partnership

Partnership Name: _____

By: _____
(Signature of general partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Business Address: _____

Phone No.: _____ E-mail: _____

State Contractor License No. (If applicable): _____

A Corporation

Corporation Name: _____ (SEAL)

State of Incorporation: _____

Type (General Business, Professional, Service, Limited Liability): _____

By: _____
(Signature -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____
(CORPORATE SEAL)

Attest: _____

Business Address: _____

Phone No.: _____ E-mail: _____

State Contractor License No. (If applicable): _____

Date of Qualification to do business in _____ is ____ / ____ / ____.

[State where Project is located]

A Joint Venture

Name of Joint Venture: _____

First Joint Venturer Name: _____ (SEAL)

By: _____
(Signature of first joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Second Joint Venturer Name: _____ (SEAL)

By: _____
(Signature of second joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Business Address: _____

Phone No.: _____ E-mail: _____

State Contractor License No. (If applicable): _____

(Each joint venturer must sign. The manner of signing for each individual, partnership, and corporation that is a party to the joint venture should be in the manner indicated above.)

R1 Water Cost Adder_Construction Cost

Stallings, Bob

From: Milton Choy <mjchoy@hawaii.rr.com>
Sent: Monday, February 27, 2017 12:48 PM
To: Stallings, Bob
Cc: jarrettchoy11@gmail.com
Subject: Fwd: ATSUGI NAF DWTS JAPAN - 703774 - Preliminary Design
Attachments: 2017-02-27 6-Disk AquaDisk Standard Drawings.pdf; 2017-02-27 147116 AquaDisk Design.pdf

Bob

Please review the attached preliminary design (Design #147116) for the Atsugi NAF project in Japan. Based on the information provided, we recommend two (2) 6-disk package AquaDisk® cloth media filter units, capable of processing an average design flow of 1 MGD and a maximum design flow of 3 MGD. The units are designed to be able to process the Maximum Design Flow with one unit offline.

Preliminary budget price for the equipment in this design is on a CIF basis, including freight and marine insurance to a major seaport in Japan and our standard start-up supervision services, is \$706,790. Inland freight in Japan, as well as any fees, duties, or charges at the port of import are by others.

We expect submittals to be completed and in transit to you within 4-8 weeks after receipt of order with acceptable terms and conditions and guarantee of payment. We expect shipment of equipment (transit time excluded) to be approximately 12-14 weeks from our receipt of approved engineer's submittal data and release for manufacture.

Please let us know if you have any questions or require additional information.

Milton Choy
H2O Process
8083498207

Feb 2017 ENR = 10,559

13,200 / 10,559 = 1.25 x \$706,790 = \$883,488

COH R1 Filter Adder - 1 mgd		
4.35%	Division 1- Field Office Requirements	\$ 235,761
18.88%	Division 2- Sitework	\$ 1,022,393
24.84%	Division 3- Concrete	\$ 1,345,153
0.54%	Division 4- Masonry	\$ 29,237
3.67%	Division 5- Metals	\$ 198,892
0.00%	Division 6- Wood and Plastics	\$ 248
0.41%	Division 7- Thermal & Moisture Protection	\$ 22,419
0.05%	Division 8- Doors, Windows, & Hardware	\$ 2,692
1.98%	Division 9- Finishes	\$ 106,951
0.01%	Division 10- Specialties	\$ 505
18.76%	Division 11- Equipment ^a	\$ 1,016,010
0.01%	Division 12- Furnishings	\$ 324
0.54%	Division 13- Special Construction	\$ 29,499
0.02%	Division 14- Conveying Systems	\$ 983
13.70%	Division 15- Mechanical	\$ 741,601
8.89%	Division 16- Electrical	\$ 481,297
3.34%	Division 17- Instrumentation	\$ 181,034
100.00%		\$ 5,415,000
		Say \$5.4 million

^a. 1.15 x Purchase Price

R2 and R1 Water Cost Adder_O&M Cost

Unless otherwise indicated in this proposal all conduit, conductors, local disconnects and transformers (if required) are the responsibility of the CONTRACTOR and are not included in this Scope of Supply.

ULTRAVIOLET MODULES

Trojan's Responsibility:

Each module supplied shall be completely assembled containing lamps, quartz sleeves and be electrically wired to each electronic ballast. Modules are shipped in a support rack and crated.

Model and Make:	Standard System UV3000Plus™
Quantity:	16 UV modules will be supplied each containing 8-64"lamps Q = 3.9 MGD
Material of Construction:	316 stainless steel frame and 316 stainless steel hydraulic fittings
Approximate Weight:	120 pounds per module

SYSTEM CONTROL CENTER

Trojan's Responsibility:

One (1) System Control Center (SCC) shall be supplied to monitor and control the UV System. Trojan will provide a PLC I/O and soft address map to aid the Contractor with integration of the UV PLC and WWTP SCADA system. The UV SCC shall consist of the following:

Quantity Supplied	One (1) SCC will be supplied
Location:	Wall mounted
Controller Type:	Allen Bradley Compact Logix
Operator Interface:	Allen Bradley Panelview 1000+ with color, touch screen display
Material of Construction:	316 stainless steel
Enclosure Rating:	Type 4X
Approximate Weight:	200 pounds

Installation Contractor's Responsibility:

The Installation Contractor to be responsible for mounting the SCC as indicated on the drawings. The Installation Contractor to be responsible for the supply, installation and connection of the following at the SCC:

1. One (1) 120 Volt, 60 Hz, 1 phase, 2 wire (plus ground), Amps power supply
2. One (1) 4 – 20 mA DC analog signal from plant flow meter
3. One (1) Ground Link, 14 gauge minimum type TWH stranded, daisy chained to the HSC and PDC's.
4. One (1) serial communication link consisting of one (1) shielded twisted pair, 18 gauge maximum from the HSC and other PDC's (daisy chained).
5. One (1) serial communication link consisting of one (1) twisted shielded pair, 18 gauge maximum from the On-Line UVT Monitor (if specified)
6. Discrete signals from Plant SCADA for remote monitoring

POWER DISTRIBUTION CENTERS

Trojan's Responsibility:

The Power Distribution Center (PDC) distributes power to the UV Modules and shall consist of the following:

Quantity Supplied:	Total of 4 PDC(s) will be supplied
Material of Construction:	316 stainless steel
Enclosure Rating:	Type 4X
Approximate Weight:	220 pounds (100 Kg) each

Installation Contractor's Responsibility:

R2 System = 128 lamps/3.9 mgd = 32 lamps per mgd - 4 modules (Hawaii American Water Project Basis). Includes Redundancy
R1 System = 32 lamps/mgd x 1.5 = 48 lamps/mgd - 6 modules

TROJAN UV3000 PLUS™

Staff Labor

R1 and R2 System: Add 1 operator per 1 mgd plant @ \$30/hr + 35% fringe = \$40/hr x 2080 = \$83,000/yr/mgd

System Specifications

System Characteristics	TrojanUV3000Plus
Typical Applications	Wide range of wastewater treatment plants
Lamp Type	High-efficiency Amalgam
Ballast Type	Electronic, variable output (60 to 100% power)
Input Power Per Lamp	250 Watts
Lamp Configuration	Horizontal, parallel flow
Module Configuration	4, 6 or 8 lamps per module
Level Control Device Options	ALC, fixed weir or motorized weir gate
Water Level Sensor	1 electrode low water level sensor per channel
Enclosure Ratings:	
Module Frame / Ballast Enclosure	TYPE 6P (IP68) / TYPE 6P (IP67)
All Other Enclosures	TYPE 4X (IP56)
Ballast Cooling Method	Convection; no air conditioning or forced air required
Installation Location	Indoor or outdoor
Sleeve Cleaning System:	
ActiClean Cleaning System	Optional Automatic Chemical/Mechanical Cleaning System
ActiClean-WW Gel	Non-corrosive, operator-friendly
Recommended Fouling Factor	1.0
System Control Center:	
Controller	Touch Smart Controller or PLC-based
Analog Inputs (Typical)	Flow (4-20 mA) and UVT (4-20 mA)
Discrete Outputs (Typical)	Bank status, common alarms and SCADA communication
Maximum Distance from UV Channel	500 ft. (152 m)
Electrical Requirements:	
Power Distribution Center	208Y/120V, 3 phase, 4 wire + GND, 60 Hz (Max. 8 modules per PDC) 480Y/277V, 3 phase, 4 wire + GND, 60 Hz 380Y/220V, 3 phase, 4 wire + GND, 50/60 Hz 400Y/230V, 3 phase, 4 wire + GND, 50/60 Hz 415Y/240V, 3 phase, 4 wire + GND, 50/60 Hz
System Control Center (stand alone)	120V, single phase, 2 wire + GND, 60 Hz, 1.8 kVA 220/230/240V, single phase, 2 wire + GND, 50/60 Hz, 1.8kVA
Hydraulic System Center (for Sleeve Cleaning System)	208V, 3 phase, 3 wire + GND, 60 Hz 380/400/415 V, 3 phase, 3 wire + GND, 50/60 Hz 480 V, 3 phase, 3 wire + GND, 60 Hz or 2.5kVA HSC powered from PDC
Water Level Sensor	24VDC powered from PDC

R2 UV O&M (8 lamps are redundant)

Power: 24 lamps x 0.250 kw/lamp x 8,760 hr/yr = 52,560 kwh/yr x \$0.44/kwh = \$23,126/yr

Lamp Replacement (every 2 yr): \$300/lamp x 32 lamps x 0.5 replacement/yr = \$4,800/yr

Module Replacement (every 10 yr) = \$16,700/module x 4 modules x 0.1 = \$6,680/yr

Total O&M = \$34,606 say \$35,000 / yr / mgd

December 2023 cost estimates

(13200 / 9886) x \$225/lamp = \$300/lamp

(13200 / 9886) x \$12,500/module = \$16,700/module

Hawaii - Kai 70% UVT, HI UV Disinfection System Scope of Supply

R1 UV O&M (12 lamps are redundant)

Power: 36 lamps x 0.250 kw/lamp x 8,760 hr/yr = 78,840 kwh/yr x \$0.44/kwh = \$34,690/yr

Lamp Replacement (every 2 yr): \$300/lamp x 48 lamps x 0.5 replacement/yr = \$7,200/yr

Module Replacement (every 10 yr) = \$16,700/module x 6 modules x 0.1/yr = \$10,020/yr

Total O&M = \$51,910 say \$52,000 / yr / mgd

REPLACEMENT PARTS PRICING

Complete UV Module \$ 12,500 ea.

UV Lamp \$ 225.00 ea.

Quartz Sleeve \$ 90.00 ea.

Lamp Holder Seal \$ 50.00 ea.

Head Office (Canada)

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R1 Filtration O&M (Two 6-disc filters. One is redundant. Backwash system operates 10 min/hr)

Power: 2.5 HP (0.5 HP drive + 2 HP pump) x 0.746 kw/hp x 1,460 hr/yr = 2,715 kwh/yr x \$0.44/kwh = \$1,194/yr

Cloth Replacement (every 5 yr): \$300/disk x 12 discs x 0.2 replacements/yr = \$720/yr

Total O&M = \$1,914 say \$2,000 / yr / mgd



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TOTAL R2 O&M Adder = \$35,000 + 83,000 = \$118,000 / yr / mgd

TOTAL R1 O&M Adder = \$52,000 + \$2,000 + \$83,000 = \$137,000 / yr / mgd

G-3: Alternative 1A Construction Cost and LCC Analysis

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 1A All IWS. Decentralized plants for large >15,000 gpd commercial, institutional, industrial zoning sites	DESCRIPTION	QUAN	UN			UNIT COST	TOTAL DIRECT COST
	Homeowner: IWS, incl. septic tank & leach field with new soil	5,854	EA			60,000	\$351,240,000
	Cluster treatment plant (15,000 - 50,000 gpd) for commercial and schools, assuming avg. 25,000 gpd.	14	EA			4,200,000	\$58,800,000
	Subtotal of Estimated Construction Cost						\$410,040,000
	Contingency		20%				\$82,008,000
	Total Estimated Project Cost						\$492,048,000
	Project services		20%				\$98,409,600
	TOTAL CAPITAL COST						590,457,600

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	96225	kwh	\$ 0.44	\$42,339
	Labor and Materials	\$ 5,282,600	LS	-	\$5,282,600

Annual O&M

\$5,324,939

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 5,504,619		\$5,504,619
2		\$ 5,690,361		\$5,690,361
3		\$ 5,882,371		\$5,882,371
4		\$ 6,080,860		\$6,080,860
5		\$ 6,286,047		\$6,286,047
6		\$ 6,498,157		\$6,498,157
7		\$ 6,717,425		\$6,717,425
8		\$ 6,944,091		\$6,944,091
9		\$ 7,178,406		\$7,178,406
10		\$ 7,420,627		\$7,420,627
11		\$ 7,671,021		\$7,671,021
12		\$ 7,929,865		\$7,929,865
13		\$ 8,197,443		\$8,197,443
14		\$ 8,474,049		\$8,474,049
15		\$ 8,759,989		\$8,759,989
16		\$ 9,055,578		\$9,055,578
17		\$ 9,361,140		\$9,361,140
18		\$ 9,677,014		\$9,677,014
19		\$ 10,003,546		\$10,003,546
20		\$ 10,341,095		\$10,341,095
21		\$ 10,690,035	\$ 35,413,029	\$46,103,064
22		\$ 11,050,750		\$11,050,750
23		\$ 11,423,635		\$11,423,635
24		\$ 11,809,103		\$11,809,103
25		\$ 12,207,578		\$12,207,578
26		\$ 12,619,499		\$12,619,499
27		\$ 13,045,319		\$13,045,319
28		\$ 13,485,508		\$13,485,508
29		\$ 13,940,550		\$13,940,550
30		\$ 14,410,946		\$14,410,946

Present value of O&M

\$179,294,000

replace elec./ motorized equipment

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Septic Tank and Leach Field	
Present Cost	\$ 17,640,000	\$ 41,160,000	\$ 351,240,000	
Design Life (Years)	20	50	50	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	20	
Present Value of Residual Value	\$9,524,000	\$17,778,000	\$151,711,000	\$179,013,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**590,738,600**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 1A All IWS. Decentralized plants for large >15,000 gpd commercial, institutional, industrial zoning sites	DESCRIPTION	QUAN	UN			UNIT COST	TOTAL DIRECT COST
	Homeowner: IWS, incl. septic tank & leach field with new soil Cluster treatment plant (15,000 - 50,000 gpd) for commercial and schools, assuming avg. 25,000 gpd.	5,854	EA EA			60,000 4,200,000	\$351,240,000 \$0
Future Homeowner Cost							
	Subtotal of Estimated Construction Cost Contingency Total Estimated Project Cost		20%				\$351,240,000 \$70,248,000 \$421,488,000
	Project services		20%				\$84,297,600
	TOTAL CAPITAL COST						505,785,600

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity		kWH	\$ 0.44	\$0
	Labor and Materials	\$ 5,268,600	LS	-	\$ 5,268,600

Annual O&M \$5,268,600

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 5,446,379		\$5,446,379
2		\$ 5,630,156		\$5,630,156
3		\$ 5,820,134		\$5,820,134
4		\$ 6,016,523		\$6,016,523
5		\$ 6,219,539		\$6,219,539
6		\$ 6,429,405		\$6,429,405
7		\$ 6,646,353		\$6,646,353
8		\$ 6,870,621		\$6,870,621
9		\$ 7,102,456		\$7,102,456
10		\$ 7,342,115		\$7,342,115
11		\$ 7,589,860		\$7,589,860
12		\$ 7,845,965		\$7,845,965
13		\$ 8,110,712		\$8,110,712
14		\$ 8,384,392		\$8,384,392
15		\$ 8,667,306		\$8,667,306
16		\$ 8,959,768		\$8,959,768
17		\$ 9,262,097		\$9,262,097
18		\$ 9,574,629		\$9,574,629
19		\$ 9,897,705		\$9,897,705
20		\$ 10,231,684		\$10,231,684
21		\$ 10,576,932	\$ -	\$10,576,932
22		\$ 10,933,830		\$10,933,830
23		\$ 11,302,770		\$11,302,770
24		\$ 11,684,160		\$11,684,160
25		\$ 12,078,419		\$12,078,419
26		\$ 12,485,982		\$12,485,982
27		\$ 12,907,296		\$12,907,296
28		\$ 13,342,828		\$13,342,828
29		\$ 13,793,055		\$13,793,055
30		\$ 14,258,475		\$14,258,475

Present value of O&M \$159,535,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Septic Tank and Leach Field	
Present Cost	\$ -	\$ -	\$ 351,240,000	
Design Life (Years)	20	50	50	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	20	
Present Value of Residual Value	\$0	\$0	\$151,711,000	\$151,711,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

513,609,600

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 1A All IWS. Decentralized plants for large >15,000 gpd commercial, institutional, industrial zoning sites	DESCRIPTION	QUAN	UN			UNIT COST	TOTAL DIRECT COST
	Homeowner: IWS, incl. septic tank & leach field with new soil Cluster treatment plant (15,000 - 50,000 gpd) for commercial and schools, assuming avg. 25,000 gpd.		EA EA			60,000 4,200,000	\$0 \$58,800,000
Non-Homeowner Cost							
	Subtotal of Estimated Construction Cost Contingency Total Estimated Project Cost	20%					\$58,800,000 \$11,760,000 \$70,560,000
	Project services	20%					\$14,112,000
	TOTAL CAPITAL COST						84,672,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	96225	kWH	\$ 0.44	\$42,339
	Labor and Materials	\$ 14,000	LS	-	\$14,000

Annual O&M

\$56,339

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 58,240		\$58,240
2		\$ 60,205		\$60,205
3		\$ 62,237		\$62,237
4		\$ 64,337		\$64,337
5		\$ 66,508		\$66,508
6		\$ 68,752		\$68,752
7		\$ 71,072		\$71,072
8		\$ 73,470		\$73,470
9		\$ 75,949		\$75,949
10		\$ 78,512		\$78,512
11		\$ 81,161		\$81,161
12		\$ 83,900		\$83,900
13		\$ 86,731		\$86,731
14		\$ 89,658		\$89,658
15		\$ 92,683		\$92,683
16		\$ 95,810		\$95,810
17		\$ 99,043		\$99,043
18		\$ 102,385		\$102,385
19		\$ 105,840		\$105,840
20		\$ 109,411		\$109,411
21		\$ 113,103	\$ 35,413,029	\$35,526,132
22		\$ 116,920		\$116,920
23		\$ 120,865		\$120,865
24		\$ 124,943		\$124,943
25		\$ 129,159		\$129,159
26		\$ 133,517		\$133,517
27		\$ 138,023		\$138,023
28		\$ 142,680		\$142,680
29		\$ 147,495		\$147,495
30		\$ 152,471		\$152,471

Present value of O&M

\$19,759,000

replace elec./ motorized equipment

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Septic Tank and Leach Field	
Present Cost	\$ 17,640,000	\$ 41,160,000	\$ -	
Design Life (Years)	20	50	50	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	20	
Present Value of Residual Value	\$9,524,000	\$17,778,000	\$0	\$27,302,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

77,129,000

G-4: Alternative 1B Construction Cost and LCC Analysis

Alternative 1B	DESCRIPTION Level of Treatment - R3	QUAN	UN			TOTAL DIRECT COST
Both Decentralized Onsite Treatment and LPS. No LPS or decentralized plants in existing private plant service areas or areas with low density zoning (>1 acre).	In-Street Low Pressure (2")	129,006	LF		\$ 300	\$38,701,831
	In-Street Low Pressure (3")	96,755	LF		\$ 450	\$43,539,560
	In-Street Low Pressure (4")	96,755	LF		\$ 600	\$58,052,747
	Neighborhood Pump Station Force Main (6")	6,000	LF		\$ 900	\$5,400,000
	Low pressure sewer (On-Lot)	5,854	EA		\$ 26,000	\$152,204,000
	Neighborhood Pump Station	1	EA		\$ 1,200,000	\$1,200,000
	Neighborhood On-Site treatment plant, 15,000 gpd (R3 water)	4	EA		\$ 2,500,000	\$10,000,000
	Neighborhood On-Site treatment plant, 25,000 gpd (R3 water)	3	EA		\$ 4,200,000	\$12,600,000
	Neighborhood On-Site treatment plant, 50,000 gpd (R3 water)	4	EA		\$ 5,900,000	\$23,600,000
	Neighborhood On-Site treatment plant, 75,000 gpd (R3 water)	1	EA		\$ 6,700,000	\$6,700,000
	Neighborhood On-Site treatment plant, 100,000 gpd (R3 water)	3	EA		\$ 7,400,000	\$22,200,000
	Neighborhood On-Site treatment plant, 120,000 gpd (R3 water)	2	EA		\$ 8,000,000	\$16,000,000
	Neighborhood On-Site treatment plant, 130,000 gpd (R3 water)		EA		\$ 8,300,000	\$0
	Neighborhood On-Site treatment plant, 150,000 gpd (R3 water)	1	EA		\$ 9,000,000	\$9,000,000
	Neighborhood On-Site treatment plant, 200,000 gpd (R3 water)	1	EA		\$ 10,500,000	\$10,500,000
	Neighborhood On-Site treatment plant, 250,000 gpd (R3 water)	-	EA		\$ 12,000,000	\$0
	Subtotal of Estimated Construction Cost					\$409,698,138
	Right of Way	373	Ac		\$ 20,000	\$7,453,476
	Contingency	20%				\$83,430,323
	Total Estimated Project Cost					\$500,581,937
	Project services	20%				\$100,116,387
	TOTAL CAPITAL COST					600,698,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	360158	kWH	\$ 0.44	\$158,470
	Labor and Materials	\$ 3,285,441	LS	-	\$3,285,441

Annual O&M

\$3,443,910

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 3,560,118		\$3,560,118
2		\$ 3,680,247		\$3,680,247
3		\$ 3,804,430		\$3,804,430
4		\$ 3,932,803		\$3,932,803
5		\$ 4,065,508		\$4,065,508
6		\$ 4,202,690		\$4,202,690
7		\$ 4,344,502		\$4,344,502
8		\$ 4,491,098		\$4,491,098
9		\$ 4,642,642		\$4,642,642
10		\$ 4,799,298		\$4,799,298
11		\$ 4,961,241		\$4,961,241
12		\$ 5,128,649		\$5,128,649
13		\$ 5,301,705		\$5,301,705
14		\$ 5,480,600		\$5,480,600
15		\$ 5,665,532		\$5,665,532
16		\$ 5,856,705		\$5,856,705
17		\$ 6,054,327		\$6,054,327
18		\$ 6,258,619		\$6,258,619
19		\$ 6,469,804		\$6,469,804
20		\$ 6,688,114		\$6,688,114
21		\$ 6,913,792	\$ 158,999,680	\$165,913,472
22		\$ 7,147,084		\$7,147,084
23		\$ 7,388,248		\$7,388,248
24		\$ 7,637,550		\$7,637,550
25		\$ 7,895,264		\$7,895,264
26		\$ 8,161,674		\$8,161,674
27		\$ 8,437,074		\$8,437,074
28		\$ 8,721,766		\$8,721,766
29		\$ 9,016,065		\$9,016,065
30		\$ 9,320,295		\$9,320,295

Present value of O&M \$185,337,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 79,201,200	\$ 184,802,800	\$ 145,694,138	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$42,762,000	\$79,822,000	\$94,395,000	\$216,979,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

569,056,000

Alternative 1B	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Both Decentralized Onsite Treatment and LPS. No LPS or decentralized plants in existing private plant service areas or areas with low density zoning (>1 acre)	In-Street Low Pressure (2")	5,854	LF			\$ 300	\$0
	In-Street Low Pressure (3")		LF			\$ 450	\$0
	In-Street Low Pressure (4")		LF			\$ 600	\$0
	Low pressure sewer (On-Lot)	5,854	EA			\$ 26,000	\$152,204,000
	Neighborhood On-Site treatment plant, 15,000 gpd (R3 water)		EA			\$ 2,500,000	\$0
	Neighborhood On-Site treatment plant, 25,000 gpd (R3 water)		EA			\$ 4,200,000	\$0
	Neighborhood On-Site treatment plant, 50,000 gpd (R3 water)		EA			\$ 5,900,000	\$0
	Neighborhood On-Site treatment plant, 75,000 gpd (R3 water)		EA			\$ 6,700,000	\$0
	Neighborhood On-Site treatment plant, 100,000 gpd (R3 water)		EA			\$ 7,400,000	\$0
	Neighborhood On-Site treatment plant, 120,000 gpd (R3 water)		EA			\$ 8,000,000	\$0
Future Homeowner Cost	Neighborhood On-Site treatment plant, 130,000 gpd (R3 water)	5,854	EA			\$ 8,300,000	\$0
	Neighborhood On-Site treatment plant, 150,000 gpd (R3 water)		EA			\$ 9,000,000	\$0
	Neighborhood On-Site treatment plant, 200,000 gpd (R3 water)		EA			\$ 10,500,000	\$0
	Neighborhood On-Site treatment plant, 250,000 gpd (R3 water)		-	EA		\$ 12,000,000	\$0
	Subtotal of Estimated Construction Cost						\$152,204,000
	Right of Way	20%	Ac			\$ 20,000	\$0
	Contingency						\$30,440,800
	Total Estimated Project Cost						\$182,644,800
	Project services	20%					\$36,528,960
	TOTAL CAPITAL COST						219,174,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity		kWH	\$ 0.44	\$0
	Labor and Materials	\$ 2,967,978	LS	-	\$2,967,978

Annual O&M

\$2,967,978

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 3,068,127		\$3,068,127
2		\$ 3,171,654		\$3,171,654
3		\$ 3,278,676		\$3,278,676
4		\$ 3,389,308		\$3,389,308
5		\$ 3,503,674		\$3,503,674
6		\$ 3,621,898		\$3,621,898
7		\$ 3,744,112		\$3,744,112
8		\$ 3,870,450		\$3,870,450
9		\$ 4,001,050		\$4,001,050
10		\$ 4,136,058		\$4,136,058
11		\$ 4,275,621		\$4,275,621
12		\$ 4,419,894		\$4,419,894
13		\$ 4,569,034		\$4,569,034
14		\$ 4,723,207		\$4,723,207
15		\$ 4,882,583		\$4,882,583
16		\$ 5,047,336		\$5,047,336
17		\$ 5,217,648		\$5,217,648
18		\$ 5,393,707		\$5,393,707
19		\$ 5,575,707		\$5,575,707
20		\$ 5,763,849		\$5,763,849
21		\$ 5,958,338	\$ 91,666,745	\$97,625,083
22		\$ 6,159,391		\$6,159,391
23		\$ 6,367,227		\$6,367,227
24		\$ 6,582,077		\$6,582,077
25		\$ 6,804,176		\$6,804,176
26		\$ 7,033,770		\$7,033,770
27		\$ 7,271,110		\$7,271,110
28		\$ 7,516,460		\$7,516,460
29		\$ 7,770,088		\$7,770,088
30		\$ 8,032,274		\$8,032,274

Present value of O&M

\$136,601,000

replace elec./ motorized equipment

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 45,661,200	\$ 106,542,800	\$ -	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$24,653,000	\$46,019,000	\$0	\$70,672,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

285,103,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 1B	DESCRIPTION Level of Treatment - R3	QUAN	UN			TOTAL DIRECT COST
Both Decentralized Onsite Treatment and LPS. No LPS or decentralized plants in existing private plant service areas or areas with low density zoning (>1 acre).	In-Street Low Pressure (2")	129,006	LF		\$ 300	\$38,701,831
	In-Street Low Pressure (3")	96,755	LF		\$ 450	\$43,539,560
	In-Street Low Pressure (4")	96,755	LF		\$ 600	\$58,052,747
	Neighborhood Pump Station Force Main (6")	6,000	LF		\$ 900	\$5,400,000
	Low pressure sewer (On-Lot)		EA		\$ 26,000	\$0
	Neighborhood Pump Station	1	EA		\$ 1,200,000	\$1,200,000
Non-Homeowner Cost	Neighborhood On-Site treatment plant, 15,000 gpd (R3 water)	4	EA		\$ 2,500,000	\$10,000,000
	Neighborhood On-Site treatment plant, 25,000 gpd (R3 water)	3	EA		\$ 4,200,000	\$12,600,000
	Neighborhood On-Site treatment plant, 50,000 gpd (R3 water)	4	EA		\$ 5,900,000	\$23,600,000
	Neighborhood On-Site treatment plant, 75,000 gpd (R3 water)	1	EA		\$ 6,700,000	\$6,700,000
	Neighborhood On-Site treatment plant, 100,000 gpd (R3 water)	3	EA		\$ 7,400,000	\$22,200,000
	Neighborhood On-Site treatment plant, 120,000 gpd (R3 water)	2	EA		\$ 8,000,000	\$16,000,000
	Neighborhood On-Site treatment plant, 130,000 gpd (R3 water)		EA		\$ 8,300,000	\$0
	Neighborhood On-Site treatment plant, 150,000 gpd (R3 water)	1	EA		\$ 9,000,000	\$9,000,000
	Neighborhood On-Site treatment plant, 200,000 gpd (R3 water)	1	EA		\$ 10,500,000	\$10,500,000
	Neighborhood On-Site treatment plant, 250,000 gpd (R3 water)	-	EA		\$ 12,000,000	\$0
	Subtotal of Estimated Construction Cost					\$257,494,138
	Right of Way	373	Ac		\$ 20,000	\$7,453,476
	Contingency	20%				\$52,989,523
	Total Estimated Project Cost					\$317,937,137
	Project services	20%				\$63,587,427
	TOTAL CAPITAL COST					381,525,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	360158	kWH	\$ 0.44	\$158,470
	Labor and Materials	\$ 317,463	LS	-	\$317,463

Annual O&M

\$475,932

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 491,991		\$491,991
2		\$ 508,593		\$508,593
3		\$ 525,754		\$525,754
4		\$ 543,495		\$543,495
5		\$ 561,834		\$561,834
6		\$ 580,792		\$580,792
7		\$ 600,390		\$600,390
8		\$ 620,648		\$620,648
9		\$ 641,591		\$641,591
10		\$ 663,240		\$663,240
11		\$ 685,620		\$685,620
12		\$ 708,755		\$708,755
13		\$ 732,670		\$732,670
14		\$ 757,393		\$757,393
15		\$ 782,950		\$782,950
16		\$ 809,369		\$809,369
17		\$ 836,679		\$836,679
18		\$ 864,911		\$864,911
19		\$ 894,096		\$894,096
20		\$ 924,266		\$924,266
21		\$ 955,453	\$ 67,332,935	\$68,288,388 replace elec./ motorized equipment
22		\$ 987,693		\$987,693
23		\$ 1,021,021		\$1,021,021
24		\$ 1,055,473		\$1,055,473
25		\$ 1,091,088		\$1,091,088
26		\$ 1,127,905		\$1,127,905
27		\$ 1,165,964		\$1,165,964
28		\$ 1,205,307		\$1,205,307
29		\$ 1,245,977		\$1,245,977
30		\$ 1,288,021		\$1,288,021

Present value of O&M \$48,736,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 33,540,000	\$ 78,260,000	\$ 145,694,138	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$18,109,000	\$33,803,000	\$94,395,000	\$146,307,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

283,954,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 1B	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Both Decentralized Onsite Treatment and LPS. No LPS or decentralized plants in existing private plant service areas or areas with low density zoning (>1 acre).	In-Street Low Pressure (2")	83,078	LF			\$ 300	\$24,923,309
	In-Street Low Pressure (3")	62,308	LF			\$ 450	\$28,038,722
	In-Street Low Pressure (4")	62,308	LF			\$ 600	\$37,384,963
	Low pressure sewer (On-Lot)	2,469	EA			\$ 26,000	\$64,194,000
Waimea Area - 11 decentralized plants	Neighborhood On-Site treatment plant, 15,000 gpd (R3 water)	1	EA			\$ 2,500,000	\$2,500,000
	Neighborhood On-Site treatment plant, 25,000 gpd (R3 water)	1	EA			\$ 4,200,000	\$4,200,000
	Neighborhood On-Site treatment plant, 50,000 gpd (R3 water)	1	EA			\$ 5,900,000	\$5,900,000
	Neighborhood On-Site treatment plant, 75,000 gpd (R3 water)	1	EA			\$ 6,700,000	\$6,700,000
	Neighborhood On-Site treatment plant, 100,000 gpd (R3 water)	3	EA			\$ 7,400,000	\$22,200,000
	Neighborhood On-Site treatment plant, 120,000 gpd (R3 water)	2	EA			\$ 8,000,000	\$16,000,000
	Neighborhood On-Site treatment plant, 130,000 gpd (R3 water)	-	EA			\$ 8,300,000	\$0
	Neighborhood On-Site treatment plant, 150,000 gpd (R3 water)	1	EA			\$ 9,000,000	\$9,000,000
	Neighborhood On-Site treatment plant, 200,000 gpd (R3 water)	1	EA			\$ 10,500,000	\$10,500,000
	Neighborhood On-Site treatment plant, 250,000 gpd (R3 water)	-	EA			\$ 12,000,000	\$0
	Subtotal of Estimated Construction Cost						\$231,540,994
	Right of Way	235	Ac			\$ 20,000	\$4,694,403
	Contingency	20%					\$47,247,079
	Total Estimated Project Cost						\$283,482,477
	Project services	20%					\$56,696,495
	TOTAL CAPITAL COST						340,179,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	290051	kWH	\$ 0.44	\$127,622
	Labor and Materials	\$ 1,465,092	LS	-	\$1,465,092

Annual O&M

\$1,592,715

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 1,646,458		\$1,646,458
2		\$ 1,702,014		\$1,702,014
3		\$ 1,759,445		\$1,759,445
4		\$ 1,818,814		\$1,818,814
5		\$ 1,880,187		\$1,880,187
6		\$ 1,943,630		\$1,943,630
7		\$ 2,009,214		\$2,009,214
8		\$ 2,077,011		\$2,077,011
9		\$ 2,147,095		\$2,147,095
10		\$ 2,219,545		\$2,219,545
11		\$ 2,294,439		\$2,294,439
12		\$ 2,371,860		\$2,371,860
13		\$ 2,451,894		\$2,451,894
14		\$ 2,534,628		\$2,534,628
15		\$ 2,620,155		\$2,620,155
16		\$ 2,708,566		\$2,708,566
17		\$ 2,799,962		\$2,799,962
18		\$ 2,894,441		\$2,894,441
19		\$ 2,992,108		\$2,992,108
20		\$ 3,093,071		\$3,093,071
21		\$ 3,197,441	\$ 85,035,836	\$88,233,276
22		\$ 3,305,332		\$3,305,332
23		\$ 3,416,864		\$3,416,864
24		\$ 3,532,159		\$3,532,159
25		\$ 3,651,345		\$3,651,345
26		\$ 3,774,552		\$3,774,552
27		\$ 3,901,917		\$3,901,917
28		\$ 4,033,580		\$4,033,580
29		\$ 4,169,685		\$4,169,685
30		\$ 4,310,383		\$4,310,383

Present value of O&M \$91,577,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main
Present Cost	\$ 42,358,200	\$ 98,835,800	\$ 90,346,994
Design Life (Years)	20	50	75
Residual Value at End of Design Life	\$0	\$0	\$0
Effective Interest Rate	-0.26%	-0.26%	-0.26%
Planning Cycle (Years)	30	30	30
Remaining Life	10	20	45
Present Value of Residual Value	\$22,870,000	\$42,690,000	\$58,535,000
			\$124,095,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**307,661,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 1B	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Both Decentralized Onsite Treatment and LPS. No LPS or decentralized plants in existing private plant service areas or areas with low density zoning (>1 acre).	In-Street Low Pressure (2")	12,541	LF			\$ 300	\$3,762,401
	In-Street Low Pressure (3")	9,406	LF			\$ 450	\$4,232,701
	In-Street Low Pressure (4")	9,406	LF			\$ 600	\$5,643,601
	Low pressure sewer (On-Lot)	244	EA			\$ 26,000	\$6,344,000
	Neighborhood On-Site treatment plant, 15,000 gpd (R3 water)	3	EA			\$ 2,500,000	\$7,500,000
	Neighborhood On-Site treatment plant, 25,000 gpd (R3 water)	1	EA			\$ 4,200,000	\$4,200,000
	Neighborhood On-Site treatment plant, 50,000 gpd (R3 water)	1	EA			\$ 5,900,000	\$5,900,000
	Neighborhood On-Site treatment plant, 75,000 gpd (R3 water)	-	EA			\$ 6,700,000	\$0
	Neighborhood On-Site treatment plant, 100,000 gpd (R3 water)	-	EA			\$ 7,400,000	\$0
	Neighborhood On-Site treatment plant, 120,000 gpd (R3 water)	-	EA			\$ 8,000,000	\$0
Kawaihae Area - 5 decentralized plants	Neighborhood On-Site treatment plant, 130,000 gpd (R3 water)	-	EA			\$ 8,300,000	\$0
	Neighborhood On-Site treatment plant, 150,000 gpd (R3 water)	-	EA			\$ 9,000,000	\$0
	Neighborhood On-Site treatment plant, 200,000 gpd (R3 water)	-	EA			\$ 10,500,000	\$0
	Neighborhood On-Site treatment plant, 250,000 gpd (R3 water)	-	EA			\$ 12,000,000	\$0
	Subtotal of Estimated Construction Cost						\$37,582,703
	Right of Way	49	Ac			\$ 20,000	\$975,819
	Contingency	20%					\$7,711,704
	Total Estimated Project Cost						\$46,270,226
	Project services	20%					\$9,254,045
	TOTAL CAPITAL COST						55,524,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	32992	kWH	\$ 0.44	\$14,516
	Labor and Materials	\$ 154,418	LS	-	\$154,418

Annual O&M

\$168,934

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 174,634		\$174,634
2		\$ 180,527		\$180,527
3		\$ 186,619		\$186,619
4		\$ 192,916		\$192,916
5		\$ 199,425		\$199,425
6		\$ 206,154		\$206,154
7		\$ 213,111		\$213,111
8		\$ 220,302		\$220,302
9		\$ 227,735		\$227,735
10		\$ 235,420		\$235,420
11		\$ 243,364		\$243,364
12		\$ 251,575		\$251,575
13		\$ 260,064		\$260,064
14		\$ 268,840		\$268,840
15		\$ 277,911		\$277,911
16		\$ 287,289		\$287,289
17		\$ 296,983		\$296,983
18		\$ 307,004		\$307,004
19		\$ 317,363		\$317,363
20		\$ 328,072		\$328,072
21		\$ 339,142	\$ 14,420,571	\$14,759,713 replace elec./ motorized equipment
22		\$ 350,586		\$350,586
23		\$ 362,416		\$362,416
24		\$ 374,645		\$374,645
25		\$ 387,286		\$387,286
26		\$ 400,354		\$400,354
27		\$ 413,864		\$413,864
28		\$ 427,829		\$427,829
29		\$ 442,265		\$442,265
30		\$ 457,188		\$457,188

Present value of O&M \$12,467,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main
Present Cost	\$ 7,183,200	\$ 16,760,800	\$ 13,638,703
Design Life (Years)	20	50	75
Residual Value at End of Design Life	\$0	\$0	\$0
Effective Interest Rate	-0.26%	-0.26%	-0.26%
Planning Cycle (Years)	30	30	30
Remaining Life	10	20	45
Present Value of Residual Value	\$3,878,000	\$7,240,000	\$8,836,000
			\$19,954,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**48,037,000**

Alternative 1B	DESCRIPTION Level of Treatment - R3	QUAN	UN			TOTAL DIRECT COST
Both Decentralized Onsite Treatment and LPS. No LPS or decentralized plants in existing private plant service areas or areas with low density zoning (>1 acre).	In-Street Low Pressure (2")	7,116	LF		\$ 300	\$2,134,914
	In-Street Low Pressure (3")	5,337	LF		\$ 450	\$2,401,778
	In-Street Low Pressure (4")	5,337	LF		\$ 600	\$3,202,371
	Neighborhood Pump Station Force Main (6")	6,000	LF		\$ 900	\$5,400,000
	Low pressure sewer (On-Lot)	268	EA		\$ 26,000	\$6,968,000
Puako Area - 1 decentralized plants	Neighborhood Pump Station	1	EA		\$ 1,200,000	\$1,200,000
	Neighborhood On-Site treatment plant, 15,000 gpd (R3 water)	-	EA		\$ 2,500,000	\$0
	Neighborhood On-Site treatment plant, 25,000 gpd (R3 water)	-	EA		\$ 4,200,000	\$0
	Neighborhood On-Site treatment plant, 50,000 gpd (R3 water)	1	EA		\$ 5,900,000	\$5,900,000
	Neighborhood On-Site treatment plant, 75,000 gpd (R3 water)	-	EA		\$ 6,700,000	\$0
	Neighborhood On-Site treatment plant, 100,000 gpd (R3 water)	-	EA		\$ 7,400,000	\$0
	Neighborhood On-Site treatment plant, 120,000 gpd (R3 water)	-	EA		\$ 8,000,000	\$0
	Neighborhood On-Site treatment plant, 130,000 gpd (R3 water)	-	EA		\$ 8,300,000	\$0
	Neighborhood On-Site treatment plant, 150,000 gpd (R3 water)	-	EA		\$ 9,000,000	\$0
	Neighborhood On-Site treatment plant, 200,000 gpd (R3 water)	-	EA		\$ 10,500,000	\$0
	Neighborhood On-Site treatment plant, 250,000 gpd (R3 water)	-	EA		\$ 12,000,000	\$0
	Subtotal of Estimated Construction Cost					\$27,207,063
	Right of Way	20	Ac		\$ 20,000	\$406,739
	Contingency	20%				\$5,522,760
	Total Estimated Project Cost					\$33,136,563
	Project services	20%				\$6,627,313
	TOTAL CAPITAL COST					39,764,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	16496	kWH	\$ 0.44	\$7,258
	Labor and Materials	\$ 153,465	LS	-	\$153,465

Annual O&M

\$160,723

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 166,146		\$166,146
2		\$ 171,752		\$171,752
3		\$ 177,548		\$177,548
4		\$ 183,539		\$183,539
5		\$ 189,732		\$189,732
6		\$ 196,134		\$196,134
7		\$ 202,752		\$202,752
8		\$ 209,594		\$209,594
9		\$ 216,666		\$216,666
10		\$ 223,977		\$223,977
11		\$ 231,535		\$231,535
12		\$ 239,347		\$239,347
13		\$ 247,424		\$247,424
14		\$ 255,772		\$255,772
15		\$ 264,403		\$264,403
16		\$ 273,325		\$273,325
17		\$ 282,547		\$282,547
18		\$ 292,081		\$292,081
19		\$ 301,937		\$301,937
20		\$ 312,125		\$312,125
21		\$ 322,658	\$ 8,472,627	\$8,795,285 replace elec./ motorized equipment
22		\$ 333,545		\$333,545
23		\$ 344,800		\$344,800
24		\$ 356,434		\$356,434
25		\$ 368,462		\$368,462
26		\$ 380,895		\$380,895
27		\$ 393,747		\$393,747
28		\$ 407,033		\$407,033
29		\$ 420,768		\$420,768
30		\$ 434,966		\$434,966

Present value of O&M

\$9,186,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 4,220,400	\$ 9,847,600	\$ 13,139,063	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$2,279,000	\$4,253,000	\$8,513,000	\$15,045,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

33,905,000

Alternative 1B	DESCRIPTION Level of Treatment - R3	QUAN	UN			TOTAL DIRECT COST
Both Decentralized Onsite Treatment and LPS. No LPS or decentralized plants in existing private plant service areas or areas with low density zoning (>1 acre).	In-Street Low Pressure (2")	8,508	LF		\$ 300	\$2,552,339
	In-Street Low Pressure (3")	6,381	LF		\$ 450	\$2,871,381
	In-Street Low Pressure (4")	6,381	LF		\$ 600	\$3,828,508
	Low pressure sewer (On-Lot)	63	EA		\$ 26,000	\$1,638,000
	Neighborhood On-Site treatment plant, 15,000 gpd (R3 water)	-	EA		\$ 2,500,000	\$0
	Neighborhood On-Site treatment plant, 25,000 gpd (R3 water)	1	EA		\$ 4,200,000	\$4,200,000
	Neighborhood On-Site treatment plant, 50,000 gpd (R3 water)	-	EA		\$ 5,900,000	\$0
	Neighborhood On-Site treatment plant, 75,000 gpd (R3 water)	-	EA		\$ 6,700,000	\$0
	Neighborhood On-Site treatment plant, 100,000 gpd (R3 water)	-	EA		\$ 7,400,000	\$0
	Neighborhood On-Site treatment plant, 120,000 gpd (R3 water)	-	EA		\$ 8,000,000	\$0
Waikoloa Area - 1 decentralized plants	Neighborhood On-Site treatment plant, 130,000 gpd (R3 water)	-	EA		\$ 8,300,000	\$0
	Neighborhood On-Site treatment plant, 150,000 gpd (R3 water)	-	EA		\$ 9,000,000	\$0
	Neighborhood On-Site treatment plant, 200,000 gpd (R3 water)	-	EA		\$ 10,500,000	\$0
	Neighborhood On-Site treatment plant, 250,000 gpd (R3 water)	-	EA		\$ 12,000,000	\$0
	Subtotal of Estimated Construction Cost					\$15,090,228
	Right of Way	24	Ac		\$ 20,000	\$470,624
	Contingency	20%				\$3,112,170
	Total Estimated Project Cost					\$18,673,023
	Project services	20%				\$3,734,605
	TOTAL CAPITAL COST					22,408,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	6873	kWH	\$ 0.44	\$3,024
	Labor and Materials	\$ 51,382	LS	-	\$51,382

Annual O&M

\$54,406

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 56,242		\$56,242
2		\$ 58,140		\$58,140
3		\$ 60,102		\$60,102
4		\$ 62,130		\$62,130
5		\$ 64,226		\$64,226
6		\$ 66,393		\$66,393
7		\$ 68,634		\$68,634
8		\$ 70,949		\$70,949
9		\$ 73,344		\$73,344
10		\$ 75,818		\$75,818
11		\$ 78,377		\$78,377
12		\$ 81,021		\$81,021
13		\$ 83,755		\$83,755
14		\$ 86,581		\$86,581
15		\$ 89,503		\$89,503
16		\$ 92,523		\$92,523
17		\$ 95,645		\$95,645
18		\$ 98,872		\$98,872
19		\$ 102,209		\$102,209
20		\$ 105,658		\$105,658
21		\$ 109,223	\$ 3,516,008	\$3,625,231 replace elec./ motorized equipment
22		\$ 112,908		\$112,908
23		\$ 116,718		\$116,718
24		\$ 120,657		\$120,657
25		\$ 124,728		\$124,728
26		\$ 128,937		\$128,937
27		\$ 133,287		\$133,287
28		\$ 137,785		\$137,785
29		\$ 142,434		\$142,434
30		\$ 147,240		\$147,240

Present value of O&M \$3,440,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 1,751,400	\$ 4,086,600	\$ 9,252,228	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$946,000	\$1,765,000	\$5,994,000	\$8,705,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

17,143,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 1B	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Both Decentralized Onsite Treatment and LPS. No LPS or decentralized plants in existing private plant service areas or areas with low density zoning (>1 acre).	In-Street Low Pressure (2")	17,763	LF			\$ 300	\$5,328,900
	In-Street Low Pressure (3")	13,322	LF			\$ 450	\$5,994,900
	In-Street Low Pressure (4")	13,322	LF			\$ 600	\$7,993,200
	Low pressure sewer (On-Lot)	80	EA			\$ 26,000	\$2,080,000
Waikii Area - 1 decentralized plants	Neighborhood On-Site treatment plant, 15,000 gpd (R3 water)	-	EA			\$ 2,500,000	\$0
	Neighborhood On-Site treatment plant, 25,000 gpd (R3 water)	-	EA			\$ 4,200,000	\$0
	Neighborhood On-Site treatment plant, 50,000 gpd (R3 water)	1	EA			\$ 5,900,000	\$5,900,000
	Neighborhood On-Site treatment plant, 75,000 gpd (R3 water)	-	EA			\$ 6,700,000	\$0
	Neighborhood On-Site treatment plant, 100,000 gpd (R3 water)	-	EA			\$ 7,400,000	\$0
	Neighborhood On-Site treatment plant, 120,000 gpd (R3 water)		EA			\$ 8,000,000	\$0
	Neighborhood On-Site treatment plant, 130,000 gpd (R3 water)		EA			\$ 8,300,000	\$0
	Neighborhood On-Site treatment plant, 150,000 gpd (R3 water)	-	EA			\$ 9,000,000	\$0
	Neighborhood On-Site treatment plant, 200,000 gpd (R3 water)	-	EA			\$ 10,500,000	\$0
	Neighborhood On-Site treatment plant, 250,000 gpd (R3 water)	-	EA			\$ 12,000,000	\$0
	Subtotal of Estimated Construction Cost						\$27,297,000
	Right of Way	45	Ac			\$ 20,000	\$895,556
	Contingency	20%					\$5,638,511
	Total Estimated Project Cost						\$33,831,067
	Project services	20%					\$6,766,213
	TOTAL CAPITAL COST						40,597,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	9073	kWH	\$ 0.44	\$3,992
	Labor and Materials	\$ 78,974	LS	-	\$78,974

Annual O&M

\$82,966

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 85,765		\$85,765
2		\$ 88,659		\$88,659
3		\$ 91,651		\$91,651
4		\$ 94,744		\$94,744
5		\$ 97,941		\$97,941
6		\$ 101,245		\$101,245
7		\$ 104,662		\$104,662
8		\$ 108,193		\$108,193
9		\$ 111,844		\$111,844
10		\$ 115,618		\$115,618
11		\$ 119,519		\$119,519
12		\$ 123,552		\$123,552
13		\$ 127,721		\$127,721
14		\$ 132,031		\$132,031
15		\$ 136,486		\$136,486
16		\$ 141,092		\$141,092
17		\$ 145,852		\$145,852
18		\$ 150,774		\$150,774
19		\$ 155,862		\$155,862
20		\$ 161,121		\$161,121
21		\$ 166,558	\$ 4,806,054	\$4,972,611
22		\$ 172,178		\$172,178
23		\$ 177,987		\$177,987
24		\$ 183,993		\$183,993
25		\$ 190,202		\$190,202
26		\$ 196,620		\$196,620
27		\$ 203,254		\$203,254
28		\$ 210,113		\$210,113
29		\$ 217,203		\$217,203
30		\$ 224,532		\$224,532

Present value of O&M \$4,962,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main
Present Cost	\$ 2,394,000	\$ 5,586,000	\$ 19,317,000
Design Life (Years)	20	50	75
Residual Value at End of Design Life	\$0	\$0	\$0
Effective Interest Rate	-0.26%	-0.26%	-0.26%
Planning Cycle (Years)	30	30	30
Remaining Life	10	20	45
Present Value of Residual Value	\$1,293,000	\$2,413,000	\$12,515,000
			\$16,221,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**29,338,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 1B	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Both Decentralized Onsite Treatment and LPS. No LPS or decentralized plants in existing private plant service areas or areas with low density zoning (>1 acre).	In-Street Low Pressure (2")	0	LF			\$ 300	\$0
	In-Street Low Pressure (3")	0	LF			\$ 450	\$0
	In-Street Low Pressure (4")	0	LF			\$ 600	\$0
	Low pressure sewer (On-Lot)	2,730	EA			\$ 26,000	\$70,980,000
Other Areas Including on-lot LPS in - Other non-urban area - Private sewerizing area	Neighborhood On-Site treatment plant, 15,000 gpd (R3 water)	-	EA			\$ 2,500,000	\$0
	Neighborhood On-Site treatment plant, 25,000 gpd (R3 water)	-	EA			\$ 4,200,000	\$0
	Neighborhood On-Site treatment plant, 50,000 gpd (R3 water)	-	EA			\$ 5,900,000	\$0
	Neighborhood On-Site treatment plant, 75,000 gpd (R3 water)	-	EA			\$ 6,700,000	\$0
	Neighborhood On-Site treatment plant, 100,000 gpd (R3 water)	-	EA			\$ 7,400,000	\$0
	Neighborhood On-Site treatment plant, 120,000 gpd (R3 water)		EA			\$ 8,000,000	\$0
	Neighborhood On-Site treatment plant, 130,000 gpd (R3 water)		EA			\$ 8,300,000	\$0
	Neighborhood On-Site treatment plant, 150,000 gpd (R3 water)	-	EA			\$ 9,000,000	\$0
	Neighborhood On-Site treatment plant, 200,000 gpd (R3 water)	-	EA			\$ 10,500,000	\$0
	Neighborhood On-Site treatment plant, 250,000 gpd (R3 water)	-	EA			\$ 12,000,000	\$0
	Subtotal of Estimated Construction Cost						\$70,980,000
	Right of Way	0	Ac			\$ 20,000	\$0
	Contingency	20%					\$14,196,000
	Total Estimated Project Cost						\$85,176,000
	Project services	20%					\$17,035,200
	TOTAL CAPITAL COST						102,211,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	0	kWH	\$ 0.44	\$0
	Labor and Materials	\$ 1,384,110	LS	-	\$1,384,110

Annual O&M

\$1,384,110

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 1,430,814		\$1,430,814
2		\$ 1,479,094		\$1,479,094
3		\$ 1,529,003		\$1,529,003
4		\$ 1,580,596		\$1,580,596
5		\$ 1,633,931		\$1,633,931
6		\$ 1,689,064		\$1,689,064
7		\$ 1,746,058		\$1,746,058
8		\$ 1,804,976		\$1,804,976
9		\$ 1,865,881		\$1,865,881
10		\$ 1,928,842		\$1,928,842
11		\$ 1,993,927		\$1,993,927
12		\$ 2,061,208		\$2,061,208
13		\$ 2,130,759		\$2,130,759
14		\$ 2,202,657		\$2,202,657
15		\$ 2,276,982		\$2,276,982
16		\$ 2,353,814		\$2,353,814
17		\$ 2,433,239		\$2,433,239
18		\$ 2,515,344		\$2,515,344
19		\$ 2,600,219		\$2,600,219
20		\$ 2,687,958		\$2,687,958
21		\$ 2,778,658	\$ 42,748,584	\$45,527,242
22		\$ 2,872,418		\$2,872,418
23		\$ 2,969,342		\$2,969,342
24		\$ 3,069,537		\$3,069,537
25		\$ 3,173,113		\$3,173,113
26		\$ 3,280,183		\$3,280,183
27		\$ 3,390,866		\$3,390,866
28		\$ 3,505,284		\$3,505,284
29		\$ 3,623,563		\$3,623,563
30		\$ 3,745,833		\$3,745,833

Present value of O&M \$63,704,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 21,294,000	\$ 49,686,000	\$ -	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$11,497,000	\$21,461,000	\$0	\$32,958,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**132,957,000**

Alternative 1B Both Decentralized Onsite Treatment and LPS. No LPS or decentralized plants in existing private plant service areas or areas with low density zoning (>1 acre).	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
In-Street Low Pressure (2")	129,006	LF		\$	300	\$38,701,831	
In-Street Low Pressure (3")	96,755	LF		\$	450	\$43,539,560	
In-Street Low Pressure (4")	96,755	LF		\$	600	\$58,052,747	
Neighborhood Pump Station Force Main (6")	6,000	LF		\$	900	\$5,400,000	
Low pressure sewer (On-Lot)	5,854	EA		\$	26,000	\$152,204,000	
Neighborhood Pump Station	1	EA		\$	1,200,000	\$1,200,000	
Neighborhood On-Site treatment plant, 15,000 gpd (R2 water)	4	EA		\$	2,700,000	\$10,800,000	
Neighborhood On-Site treatment plant, 25,000 gpd (R2 water)	3	EA		\$	4,500,000	\$13,500,000	
Neighborhood On-Site treatment plant, 50,000 gpd (R2 water)	4	EA		\$	6,200,000	\$24,800,000	
Neighborhood On-Site treatment plant, 75,000 gpd (R2 water)	1	EA		\$	7,000,000	\$7,000,000	
Neighborhood On-Site treatment plant, 100,000 gpd (R2 water)	3	EA		\$	7,700,000	\$23,100,000	
Neighborhood On-Site treatment plant, 120,000 gpd (R2 water)	2	EA		\$	8,300,000	\$16,600,000	
Neighborhood On-Site treatment plant, 130,000 gpd (R2 water)	-	EA		\$	8,500,000	\$0	
Neighborhood On-Site treatment plant, 150,000 gpd (R2 water)	1	EA		\$	9,100,000	\$9,100,000	
Neighborhood On-Site treatment plant, 200,000 gpd (R2 water)	1	EA		\$	10,600,000	\$10,600,000	
Neighborhood On-Site treatment plant, 250,000 gpd (R2 water)	-	EA		\$	12,000,000	\$0	
Subtotal of Estimated Construction Cost							\$414,598,138
Right of Way	373	Ac		\$	20,000	\$7,453,476	
Contingency	20%					\$84,410,323	
Total Estimated Project Cost						\$506,461,937	
Project services		20%					\$101,292,387
TOTAL CAPITAL COST							607,754,000

O&M

	Item	Q1AN.	LN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$3,443,910
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$153,400

Annual O&M

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 3,718,694		\$3,718,694
2		\$ 3,844,174		\$3,844,174
3		\$ 3,973,888		\$3,973,888
4		\$ 4,107,979		\$4,107,979
5		\$ 4,246,595		\$4,246,595
6		\$ 4,389,888		\$4,389,888
7		\$ 4,538,016		\$4,538,016
8		\$ 4,691,143		\$4,691,143
9		\$ 4,849,436		\$4,849,436
10		\$ 5,013,071		\$5,013,071
11		\$ 5,182,227		\$5,182,227
12		\$ 5,357,091		\$5,357,091
13		\$ 5,537,855		\$5,537,855
14		\$ 5,724,719		\$5,724,719
15		\$ 5,917,889		\$5,917,889
16		\$ 6,117,576		\$6,117,576
17		\$ 6,324,002		\$6,324,002
18		\$ 6,537,393		\$6,537,393
19		\$ 6,757,984		\$6,757,984
20		\$ 6,986,019		\$6,986,019
21		\$ 7,221,748	\$ 161,950,766	\$169,172,514
22		\$ 7,465,432		\$7,465,432
23		\$ 7,717,338		\$7,717,338
24		\$ 7,977,745		\$7,977,745
25		\$ 8,246,938		\$8,246,938
26		\$ 8,525,215		\$8,525,215
27		\$ 8,812,881		\$8,812,881
28		\$ 9,110,255		\$9,110,255
29		\$ 9,417,662		\$9,417,662
30		\$ 9,735,443		\$9,735,443

Present value of O&M \$191,487,000

replace elec./ motorized equipment

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 80,671,200	\$ 188,232,800	\$ 145,694,138	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$43,555,000	\$81,304,000	\$94,395,000	\$219,254,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

579,987,000

Alternative 1B	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Both Decentralized Onsite Treatment and LPS. No LPS or decentralized plants in existing private plant service areas or areas with low density zoning (>1 acre).	In-Street Low Pressure (2")	83,078	LF			\$ 300	\$24,923,309
	In-Street Low Pressure (3")	62,308	LF			\$ 450	\$28,038,722
	In-Street Low Pressure (4")	62,308	LF			\$ 600	\$37,384,963
	Low pressure sewer (On-Lot)	2,469	EA			\$ 26,000	\$64,194,000
Waimea Area - 11 decentralized plants	Neighborhood On-Site treatment plant, 15,000 gpd (R2 water)	1	EA			\$ 2,700,000	\$2,700,000
	Neighborhood On-Site treatment plant, 25,000 gpd (R2 water)	1	EA			\$ 4,500,000	\$4,500,000
	Neighborhood On-Site treatment plant, 50,000 gpd (R2 water)	1	EA			\$ 6,200,000	\$6,200,000
	Neighborhood On-Site treatment plant, 75,000 gpd (R2 water)	1	EA			\$ 7,000,000	\$7,000,000
	Neighborhood On-Site treatment plant, 100,000 gpd (R2 water)	3	EA			\$ 7,700,000	\$23,100,000
	Neighborhood On-Site treatment plant, 120,000 gpd (R2 water)	2	EA			\$ 8,300,000	\$16,600,000
	Neighborhood On-Site treatment plant, 130,000 gpd (R2 water)	-	EA			\$ 8,500,000	\$0
	Neighborhood On-Site treatment plant, 150,000 gpd (R2 water)	1	EA			\$ 9,100,000	\$9,100,000
	Neighborhood On-Site treatment plant, 200,000 gpd (R2 water)	1	EA			\$ 10,600,000	\$10,600,000
	Neighborhood On-Site treatment plant, 250,000 gpd (R2 water)	-	EA			\$ 12,000,000	\$0
	Subtotal of Estimated Construction Cost						\$234,340,994
	Right of Way	235	Ac			\$ 20,000	\$4,694,403
	Contingency	20%					\$47,807,079
	Total Estimated Project Cost						\$286,842,477
	Project services		20%				\$57,368,495
	TOTAL CAPITAL COST						344,211,000

O&M

	Item	Qtr.	LN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$1,592,715
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$124,490

Annual O&M

Year	Year	Annual S.	Additional Cost	Total
0		\$ -		\$ -
1		\$ 1,775,148		\$1,775,148
2		\$ 1,835,047		\$1,835,047
3		\$ 1,896,967		\$1,896,967
4		\$ 1,960,977		\$1,960,977
5		\$ 2,027,146		\$2,027,146
6		\$ 2,095,548		\$2,095,548
7		\$ 2,166,258		\$2,166,258
8		\$ 2,239,354		\$2,239,354
9		\$ 2,314,917		\$2,314,917
10		\$ 2,393,029		\$2,393,029
11		\$ 2,473,777		\$2,473,777
12		\$ 2,557,250		\$2,557,250
13		\$ 2,643,539		\$2,643,539
14		\$ 2,732,740		\$2,732,740
15		\$ 2,824,951		\$2,824,951
16		\$ 2,920,274		\$2,920,274
17		\$ 3,018,813		\$3,018,813
18		\$ 3,120,677		\$3,120,677
19		\$ 3,225,978		\$3,225,978
20		\$ 3,334,832		\$3,334,832
21		\$ 3,447,359	\$ 86,722,171	\$90,169,530
22		\$ 3,563,684		\$3,563,684
23		\$ 3,683,933		\$3,683,933
24		\$ 3,808,240		\$3,808,240
25		\$ 3,936,742		\$3,936,742
26		\$ 4,069,579		\$4,069,579
27		\$ 4,206,899		\$4,206,899
28		\$ 4,348,853		\$4,348,853
29		\$ 4,495,596		\$4,495,596
30		\$ 4,647,291		\$4,647,291

Present value of O&M \$96,207,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 43,198,200	\$ 100,795,800	\$ 90,346,994	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$23,323,000	\$43,537,000	\$58,535,000	\$125,395,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

315,023,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 1B	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Both Decentralized Onsite Treatment and LPS. No LPS or decentralized plants in existing private plant service areas or areas with low density zoning (>1 acre).	In-Street Low Pressure (2')	12,541	LF			\$ 300	\$3,762,401
	In-Street Low Pressure (3')	9,406	LF			\$ 450	\$4,232,701
	In-Street Low Pressure (4')	9,406	LF			\$ 600	\$5,643,601
	Low pressure sewer (On-Lot)	244	EA			\$ 26,000	\$6,344,000
Kawaihae Area - 5 decentralized plants	Neighborhood On-Site treatment plant, 15,000 gpd (R2 water)	3	EA			\$ 2,700,000	\$8,100,000
	Neighborhood On-Site treatment plant, 25,000 gpd (R2 water)	1	EA			\$ 4,500,000	\$4,500,000
	Neighborhood On-Site treatment plant, 50,000 gpd (R2 water)	1	EA			\$ 6,200,000	\$6,200,000
	Neighborhood On-Site treatment plant, 75,000 gpd (R2 water)	-	EA			\$ 7,000,000	\$0
	Neighborhood On-Site treatment plant, 100,000 gpd (R2 water)	-	EA			\$ 7,700,000	\$0
	Neighborhood On-Site treatment plant, 120,000 gpd (R2 water)	-	EA			\$ 8,300,000	\$0
	Neighborhood On-Site treatment plant, 130,000 gpd (R2 water)	-	EA			\$ 8,500,000	\$0
	Neighborhood On-Site treatment plant, 150,000 gpd (R2 water)	-	EA			\$ 9,100,000	\$0
	Neighborhood On-Site treatment plant, 200,000 gpd (R2 water)	-	EA			\$ 10,600,000	\$0
	Neighborhood On-Site treatment plant, 250,000 gpd (R2 water)	-	EA			\$ 12,000,000	\$0
	Subtotal of Estimated Construction Cost						\$38,782,703
	Right of Way	49	Ac			\$ 20,000	\$975,819
	Contingency	20%					\$7,951,704
	Total Estimated Project Cost						\$47,710,226
	Project services		20%				\$9,542,045
	TOTAL CAPITAL COST						57,252,000

O&M

	Item	Q1AN	LN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$168,934
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$14,160
Annual O&M					\$183,094

Year	Year	Annual S.	Additional Cost	Total
0		\$ -		\$ -
1		\$ 189,272		\$189,272
2		\$ 195,659		\$195,659
3		\$ 202,261		\$202,261
4		\$ 209,086		\$209,086
5		\$ 216,141		\$216,141
6		\$ 223,434		\$223,434
7		\$ 230,974		\$230,974
8		\$ 238,767		\$238,767
9		\$ 246,824		\$246,824
10		\$ 255,153		\$255,153
11		\$ 263,762		\$263,762
12		\$ 272,662		\$272,662
13		\$ 281,863		\$281,863
14		\$ 291,374		\$291,374
15		\$ 301,206		\$301,206
16		\$ 311,369		\$311,369
17		\$ 321,876		\$321,876
18		\$ 332,737		\$332,737
19		\$ 343,964		\$343,964
20		\$ 355,571		\$355,571
21		\$ 367,569	\$ 15,143,286	\$15,510,854
22		\$ 379,972		\$379,972
23		\$ 392,793		\$392,793
24		\$ 406,047		\$406,047
25		\$ 419,748		\$419,748
26		\$ 433,912		\$433,912
27		\$ 448,553		\$448,553
28		\$ 463,689		\$463,689
29		\$ 479,335		\$479,335
30		\$ 495,510		\$495,510

Present value of O&M \$13,264,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 7,543,200	\$ 17,600,800	\$ 13,638,703	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$4,073,000	\$7,602,000	\$8,836,000	\$20,511,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

50,005,000

Alternative 1B	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Both Decentralized Onsite Treatment and LPS. No LPS or decentralized plants in existing private plant service areas or areas with low density zoning (>1 acre).	In-Street Low Pressure (2")	7,116	LF			\$ 300	\$2,134,914
	In-Street Low Pressure (3")	5,337	LF			\$ 450	\$2,401,778
	In-Street Low Pressure (4")	5,337	LF			\$ 600	\$3,202,371
	Neighborhood Pump Station Force Main (6")	6,000	LF			\$ 900	\$5,400,000
	Low pressure sewer (On-Lot)	268	EA			\$ 26,000	\$6,968,000
	Neighborhood Pump Station	1	EA			\$ 1,200,000	\$1,200,000
	Neighborhood On-Site treatment plant, 15,000 gpd (R2 water)	-	EA			\$ 2,700,000	\$0
	Neighborhood On-Site treatment plant, 25,000 gpd (R2 water)	-	EA			\$ 4,500,000	\$0
	Neighborhood On-Site treatment plant, 50,000 gpd (R2 water)	1	EA			\$ 6,200,000	\$6,200,000
	Neighborhood On-Site treatment plant, 75,000 gpd (R2 water)	-	EA			\$ 7,000,000	\$0
Puako Area - 1 decentralized plants	Neighborhood On-Site treatment plant, 100,000 gpd (R2 water)	-	EA			\$ 7,700,000	\$0
	Neighborhood On-Site treatment plant, 120,000 gpd (R2 water)	-	EA			\$ 8,300,000	\$0
	Neighborhood On-Site treatment plant, 130,000 gpd (R2 water)	-	EA			\$ 8,500,000	\$0
	Neighborhood On-Site treatment plant, 150,000 gpd (R2 water)	-	EA			\$ 9,100,000	\$0
	Neighborhood On-Site treatment plant, 200,000 gpd (R2 water)	-	EA			\$ 10,600,000	\$0
	Neighborhood On-Site treatment plant, 250,000 gpd (R2 water)	-	EA			\$ 12,000,000	\$0
	Subtotal of Estimated Construction Cost						\$27,507,063
	Right of Way	21	Ac			\$ 20,000	\$417,070
	Contingency	20%					\$5,584,827
	Total Estimated Project Cost						\$33,508,960
	Project services		20%				\$6,701,792
TOTAL CAPITAL COST							40,211,000

O&M

	Item	Q1AN	LN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$160,723
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$5,900
Annual O&M					\$166,623

Year	Year	Annual S.	Additional Cost	Total
0		\$ -		\$ -
1		\$ 172,245		\$172,245
2		\$ 178,057		\$178,057
3		\$ 184,065		\$184,065
4		\$ 190,276		\$190,276
5		\$ 196,697		\$196,697
6		\$ 203,334		\$203,334
7		\$ 210,195		\$210,195
8		\$ 217,288		\$217,288
9		\$ 224,620		\$224,620
10		\$ 232,199		\$232,199
11		\$ 240,034		\$240,034
12		\$ 248,133		\$248,133
13		\$ 256,506		\$256,506
14		\$ 265,162		\$265,162
15		\$ 274,109		\$274,109
16		\$ 283,358		\$283,358
17		\$ 292,920		\$292,920
18		\$ 302,804		\$302,804
19		\$ 313,021		\$313,021
20		\$ 323,583		\$323,583
21		\$ 334,502	\$ 8,653,306	\$8,987,808
22		\$ 345,789		\$345,789
23		\$ 357,457		\$357,457
24		\$ 369,519		\$369,519
25		\$ 381,987		\$381,987
26		\$ 394,877		\$394,877
27		\$ 408,201		\$408,201
28		\$ 421,975		\$421,975
29		\$ 436,214		\$436,214
30		\$ 450,933		\$450,933

Present value of O&M \$9,457,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 4,310,400	\$ 10,057,600	\$ 13,139,063	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$2,327,000	\$4,344,000	\$8,513,000	\$15,184,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

34,484,000

Alternative 1B	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Both Decentralized Onsite Treatment and LPS. No LPS or decentralized plants in existing private plant service areas or areas with low density zoning (>1 acre).	In-Street Low Pressure (2')	8,508	LF			\$ 300	\$2,552,339
	In-Street Low Pressure (3')	6,381	LF			\$ 450	\$2,871,381
	In-Street Low Pressure (4')	6,381	LF			\$ 600	\$3,828,508
	Low pressure sewer (On-Lot)	63	EA			\$ 26,000	\$1,638,000
Waikoloa Area - 1 decentralized plants	Neighborhood On-Site treatment plant, 15,000 gpd (R2 water)	-	EA			\$ 2,700,000	\$0
	Neighborhood On-Site treatment plant, 25,000 gpd (R2 water)	1	EA			\$ 4,500,000	\$4,500,000
	Neighborhood On-Site treatment plant, 50,000 gpd (R2 water)	-	EA			\$ 6,200,000	\$0
	Neighborhood On-Site treatment plant, 75,000 gpd (R2 water)	-	EA			\$ 7,000,000	\$0
	Neighborhood On-Site treatment plant, 100,000 gpd (R2 water)	-	EA			\$ 7,700,000	\$0
	Neighborhood On-Site treatment plant, 120,000 gpd (R2 water)	-	EA			\$ 8,300,000	\$0
	Neighborhood On-Site treatment plant, 130,000 gpd (R2 water)	-	EA			\$ 8,500,000	\$0
	Neighborhood On-Site treatment plant, 150,000 gpd (R2 water)	-	EA			\$ 9,100,000	\$0
	Neighborhood On-Site treatment plant, 200,000 gpd (R2 water)	-	EA			\$ 10,600,000	\$0
	Neighborhood On-Site treatment plant, 250,000 gpd (R2 water)	-	EA			\$ 12,000,000	\$0
	Subtotal of Estimated Construction Cost						\$15,390,228
	Right of Way	24	Ac			\$ 20,000	\$470,624
	Contingency	20%					\$3,172,170
	Total Estimated Project Cost						\$19,033,023
	Project services		20%				\$3,806,605
	TOTAL CAPITAL COST						22,840,000

O&M

	Item	Qtr.	LN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$54,406
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$2,950
Annual O&M					\$57,356

Year	Year	Annual S.	Additional Cost	Total
0		\$ -		\$ -
1		\$ 59,292		\$59,292
2		\$ 61,292		\$61,292
3		\$ 63,360		\$63,360
4		\$ 65,498		\$65,498
5		\$ 67,709		\$67,709
6		\$ 69,993		\$69,993
7		\$ 72,355		\$72,355
8		\$ 74,796		\$74,796
9		\$ 77,320		\$77,320
10		\$ 79,929		\$79,929
11		\$ 82,626		\$82,626
12		\$ 85,414		\$85,414
13		\$ 88,297		\$88,297
14		\$ 91,276		\$91,276
15		\$ 94,356		\$94,356
16		\$ 97,540		\$97,540
17		\$ 100,831		\$100,831
18		\$ 104,233		\$104,233
19		\$ 107,751		\$107,751
20		\$ 111,386		\$111,386
21		\$ 115,145	\$ 3,696,687	\$3,811,832
22		\$ 119,030		\$119,030
23		\$ 123,047		\$123,047
24		\$ 127,199		\$127,199
25		\$ 131,491		\$131,491
26		\$ 135,928		\$135,928
27		\$ 140,514		\$140,514
28		\$ 145,256		\$145,256
29		\$ 150,157		\$150,157
30		\$ 155,224		\$155,224

Present value of O&M \$3,621,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 1,841,400	\$ 4,296,600	\$ 9,252,228	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$994,000	\$1,856,000	\$5,994,000	\$8,844,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

17,617,000

Alternative 1B	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Both Decentralized Onsite Treatment and LPS. No LPS or decentralized plants in existing private plant service areas or areas with low density zoning (>1 acre).	In-Street Low Pressure (2')	17,763	LF			\$ 300	\$5,328,869
	In-Street Low Pressure (3')	13,322	LF			\$ 450	\$5,994,977
	In-Street Low Pressure (4')	13,322	LF			\$ 600	\$7,993,303
	Low pressure sewer (On-Lot)	80	EA			\$ 26,000	\$2,080,000
Waiki Area - 1 decentralized plants	Neighborhood On-Site treatment plant, 15,000 gpd (R2 water)	-	EA			\$ 2,700,000	\$0
	Neighborhood On-Site treatment plant, 25,000 gpd (R2 water)	-	EA			\$ 4,500,000	\$0
	Neighborhood On-Site treatment plant, 50,000 gpd (R2 water)	1	EA			\$ 6,200,000	\$6,200,000
	Neighborhood On-Site treatment plant, 75,000 gpd (R2 water)	-	EA			\$ 7,000,000	\$0
	Neighborhood On-Site treatment plant, 100,000 gpd (R2 water)	-	EA			\$ 7,700,000	\$0
	Neighborhood On-Site treatment plant, 120,000 gpd (R2 water)	-	EA			\$ 8,300,000	\$0
	Neighborhood On-Site treatment plant, 130,000 gpd (R2 water)	-	EA			\$ 8,500,000	\$0
	Neighborhood On-Site treatment plant, 150,000 gpd (R2 water)	-	EA			\$ 9,100,000	\$0
	Neighborhood On-Site treatment plant, 200,000 gpd (R2 water)	-	EA			\$ 10,600,000	\$0
	Neighborhood On-Site treatment plant, 250,000 gpd (R2 water)	-	EA			\$ 12,000,000	\$0
Subtotal of Estimated Construction Cost							\$27,597,149
	Right of Way	45	Ac			\$ 20,000	\$895,560
	Contingency	20%					\$5,698,542
	Total Estimated Project Cost						\$34,191,251
	Project services		20%				\$6,838,250
	TOTAL CAPITAL COST						41,030,000

O&M

	Item	Q1AN	LN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$82,966
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$3,894
Annual O&M					\$86,860

Year	Year	Annual S.	Additional Cost	Total
0		\$ -		\$ -
1		\$ 89,791		\$89,791
2		\$ 92,821		\$92,821
3		\$ 95,953		\$95,953
4		\$ 99,190		\$99,190
5		\$ 102,537		\$102,537
6		\$ 105,997		\$105,997
7		\$ 109,574		\$109,574
8		\$ 113,271		\$113,271
9		\$ 117,093		\$117,093
10		\$ 121,045		\$121,045
11		\$ 125,129		\$125,129
12		\$ 129,351		\$129,351
13		\$ 133,716		\$133,716
14		\$ 138,228		\$138,228
15		\$ 142,892		\$142,892
16		\$ 147,714		\$147,714
17		\$ 152,698		\$152,698
18		\$ 157,851		\$157,851
19		\$ 163,177		\$163,177
20		\$ 168,683		\$168,683
21		\$ 174,375	\$ 4,986,733	\$5,161,107
22		\$ 180,259		\$180,259
23		\$ 186,341		\$186,341
24		\$ 192,629		\$192,629
25		\$ 199,129		\$199,129
26		\$ 205,848		\$205,848
27		\$ 212,794		\$212,794
28		\$ 219,974		\$219,974
29		\$ 227,397		\$227,397
30		\$ 235,070		\$235,070

Present value of O&M \$5,172,000

replace elec./ motorized equipment

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 2,484,000	\$ 5,796,000	\$ 19,317,149	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$1,341,000	\$2,503,000	\$12,516,000	\$16,360,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

29,842,000

Alternative 1B Both Decentralized Onsite Treatment and LPS. No LPS or decentralized plants in existing private plant service areas or areas with low density zoning (>1 acre).	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
In-Street Low Pressure (2')		0	LF			\$ 300	\$0
In-Street Low Pressure (3')		0	LF			\$ 450	\$0
In-Street Low Pressure (4')		0	LF			\$ 600	\$0
Low pressure sewer (On-Lot)		2,730	EA			\$ 26,000	\$70,980,000
Neighborhood On-Site treatment plant, 15,000 gpd (R2 water)		-	EA			\$ 2,700,000	\$0
Neighborhood On-Site treatment plant, 25,000 gpd (R2 water)		-	EA			\$ 4,500,000	\$0
Neighborhood On-Site treatment plant, 50,000 gpd (R2 water)		-	EA			\$ 6,200,000	\$0
Neighborhood On-Site treatment plant, 75,000 gpd (R2 water)		-	EA			\$ 7,000,000	\$0
Neighborhood On-Site treatment plant, 100,000 gpd (R2 water)		-	EA			\$ 7,700,000	\$0
Neighborhood On-Site treatment plant, 120,000 gpd (R2 water)		-	EA			\$ 8,300,000	\$0
Neighborhood On-Site treatment plant, 130,000 gpd (R2 water)		-	EA			\$ 8,500,000	\$0
Neighborhood On-Site treatment plant, 150,000 gpd (R2 water)		-	EA			\$ 9,100,000	\$0
Neighborhood On-Site treatment plant, 200,000 gpd (R2 water)		-	EA			\$ 10,600,000	\$0
Neighborhood On-Site treatment plant, 250,000 gpd (R2 water)		-	EA			\$ 12,000,000	\$0
Subtotal of Estimated Construction Cost							\$70,980,000
Right of Way		0	Ac			\$ 20,000	\$0
Contingency		20%					\$14,196,000
Total Estimated Project Cost							\$85,176,000
Project services			20%				\$17,035,200
TOTAL CAPITAL COST							102,211,000

O&M

	Item	Qtr.	LN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$1,384,110
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$0

Annual O&M

\$1,384,110

Year	Year	Annual S.	Additional Cost	Total
0		\$ -		\$ -
1		\$ 1,430,814		\$1,430,814
2		\$ 1,479,094		\$1,479,094
3		\$ 1,529,003		\$1,529,003
4		\$ 1,580,596		\$1,580,596
5		\$ 1,633,931		\$1,633,931
6		\$ 1,689,064		\$1,689,064
7		\$ 1,746,058		\$1,746,058
8		\$ 1,804,976		\$1,804,976
9		\$ 1,865,881		\$1,865,881
10		\$ 1,928,842		\$1,928,842
11		\$ 1,993,927		\$1,993,927
12		\$ 2,061,208		\$2,061,208
13		\$ 2,130,759		\$2,130,759
14		\$ 2,202,657		\$2,202,657
15		\$ 2,276,982		\$2,276,982
16		\$ 2,353,814		\$2,353,814
17		\$ 2,433,239		\$2,433,239
18		\$ 2,515,344		\$2,515,344
19		\$ 2,600,219		\$2,600,219
20		\$ 2,687,958		\$2,687,958
21		\$ 2,778,658	\$ 42,748,584	\$45,527,242
22		\$ 2,872,418		\$2,872,418
23		\$ 2,969,342		\$2,969,342
24		\$ 3,069,537		\$3,069,537
25		\$ 3,173,113		\$3,173,113
26		\$ 3,280,183		\$3,280,183
27		\$ 3,390,866		\$3,390,866
28		\$ 3,505,284		\$3,505,284
29		\$ 3,623,563		\$3,623,563
30		\$ 3,745,833		\$3,745,833

Present value of O&M \$63,704,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 21,294,000	\$ 49,686,000	\$ -	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$11,497,000	\$21,461,000	\$0	\$32,958,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

132,957,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 1B	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Both Decentralized Onsite Treatment and LPS. No LPS or decentralized plants in existing private plant service areas or areas with low density zoning (>1 acre).	In-Street Low Pressure (2")	129,006	LF			\$ 300	\$38,701,831
	In-Street Low Pressure (3")	96,755	LF			\$ 450	\$43,539,560
	In-Street Low Pressure (4")	96,755	LF			\$ 600	\$58,052,747
	Neighborhood Pump Station Force Main (6")	6,000	LF			\$ 900	\$5,400,000
	Low pressure sewer (On-Lot)	5,854	EA			\$ 26,000	\$152,204,000
	Neighborhood Pump Station	1	EA			\$ 1,200,000	\$1,200,000
	Neighborhood On-Site treatment plant, 15,000 gpd (R1 water)	4	EA			\$ 3,500,000	\$14,000,000
	Neighborhood On-Site treatment plant, 25,000 gpd (R1 water)	3	EA			\$ 5,800,000	\$17,400,000
	Neighborhood On-Site treatment plant, 50,000 gpd (R1 water)	4	EA			\$ 7,800,000	\$31,200,000
	Neighborhood On-Site treatment plant, 75,000 gpd (R1 water)	1	EA			\$ 8,300,000	\$8,300,000
	Neighborhood On-Site treatment plant, 100,000 gpd (R1 water)	3	EA			\$ 8,900,000	\$26,700,000
	Neighborhood On-Site treatment plant, 120,000 gpd (R1 water)	2	EA			\$ 9,300,000	\$18,600,000
	Neighborhood On-Site treatment plant, 130,000 gpd (R1 water)	-	EA			\$ 9,500,000	\$0
	Neighborhood On-Site treatment plant, 150,000 gpd (R1 water)	1	EA			\$ 9,900,000	\$9,900,000
	Neighborhood On-Site treatment plant, 200,000 gpd (R1 water)	1	EA			\$ 11,000,000	\$11,000,000
	Neighborhood On-Site treatment plant, 250,000 gpd (R1 water)	-	EA			\$ 12,000,000	\$0
	Subtotal of Estimated Construction Cost						\$436,198,138
	Right of Way	373	Ac			\$ 20,000	\$7,453,476
	Contingency	20%					\$88,730,323
	Total Estimated Project Cost						\$532,381,937
	Project services		20%				\$106,476,387
	TOTAL CAPITAL COST						638,858,000

O&M

Item	QUAN	UN	Unit cost	Total Annual
R3 level of treatment annual O&M				\$3,443,910
R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$178,100
Annual O&M				\$3,622,010

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 3,744,228		\$3,744,228
2		\$ 3,870,569		\$3,870,569
3		\$ 4,001,174		\$4,001,174
4		\$ 4,136,186		\$4,136,186
5		\$ 4,275,753		\$4,275,753
6		\$ 4,420,030		\$4,420,030
7		\$ 4,569,175		\$4,569,175
8		\$ 4,723,353		\$4,723,353
9		\$ 4,882,733		\$4,882,733
10		\$ 5,047,492		\$5,047,492
11		\$ 5,217,809		\$5,217,809
12		\$ 5,393,874		\$5,393,874
13		\$ 5,575,880		\$5,575,880
14		\$ 5,764,027		\$5,764,027
15		\$ 5,958,522		\$5,958,522
16		\$ 6,159,581		\$6,159,581
17		\$ 6,367,424		\$6,367,424
18		\$ 6,582,280		\$6,582,280
19		\$ 6,804,386		\$6,804,386
20		\$ 7,033,987		\$7,033,987
21		\$ 7,271,335	\$ 174,959,633	\$182,230,968 replace elec./ motorized equipment
22		\$ 7,516,692		\$7,516,692
23		\$ 7,770,328		\$7,770,328
24		\$ 8,032,522		\$8,032,522
25		\$ 8,303,564		\$8,303,564
26		\$ 8,583,751		\$8,583,751
27		\$ 8,873,393		\$8,873,393
28		\$ 9,172,808		\$9,172,808
29		\$ 9,482,326		\$9,482,326
30		\$ 9,802,289		\$9,802,289

Present value of O&M \$198,866,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main
Present Cost	\$ 87,151,200	\$ 203,352,800	\$ 145,694,138
Design Life (Years)	20	50	75
Residual Value at End of Design Life	\$0	\$0	\$0
Effective Interest Rate	-0.26%	-0.26%	-0.26%
Planning Cycle (Years)	30	30	30
Remaining Life	10	20	45
Present Value of Residual Value	\$47,054,000	\$87,834,000	\$94,395,000
			\$229,283,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**608,441,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 1B	DESCRIPTION Level of Treatment - R1	QUAN	UN			TOTAL DIRECT COST
Both Decentralized Onsite Treatment and LPS. No LPS or decentralized plants in existing private plant service areas or areas with low density zoning (>1 acre).	In-Street Low Pressure (2")	83,078	LF		\$ 300	\$24,923,309
	In-Street Low Pressure (3")	62,308	LF		\$ 450	\$28,038,722
	In-Street Low Pressure (4")	62,308	LF		\$ 600	\$37,384,963
	Low pressure sewer (On-Lot)	2,469	EA		\$ 26,000	\$64,194,000
Waimea Area - 11 decentralized plants	Neighborhood On-Site treatment plant, 15,000 gpd (R1 water)	1	EA		\$ 3,500,000	\$3,500,000
	Neighborhood On-Site treatment plant, 25,000 gpd (R1 water)	1	EA		\$ 5,800,000	\$5,800,000
	Neighborhood On-Site treatment plant, 50,000 gpd (R1 water)	1	EA		\$ 7,800,000	\$7,800,000
	Neighborhood On-Site treatment plant, 75,000 gpd (R1 water)	1	EA		\$ 8,300,000	\$8,300,000
	Neighborhood On-Site treatment plant, 100,000 gpd (R1 water)	3	EA		\$ 8,900,000	\$26,700,000
	Neighborhood On-Site treatment plant, 120,000 gpd (R1 water)	2	EA		\$ 9,300,000	\$18,600,000
	Neighborhood On-Site treatment plant, 130,000 gpd (R1 water)	-	EA		\$ 9,500,000	\$0
	Neighborhood On-Site treatment plant, 150,000 gpd (R1 water)	1	EA		\$ 9,900,000	\$9,900,000
	Neighborhood On-Site treatment plant, 200,000 gpd (R1 water)	1	EA		\$ 11,000,000	\$11,000,000
	Neighborhood On-Site treatment plant, 250,000 gpd (R1 water)	-	EA		\$ 12,000,000	\$0
	Subtotal of Estimated Construction Cost					\$246,140,994
	Right of Way	235	Ac		\$ 20,000	\$4,694,403
	Contingency	20%				\$50,167,079
	Total Estimated Project Cost					\$301,002,477
	Project services	20%				\$60,200,495
	TOTAL CAPITAL COST					361,203,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$1,592,715
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$144,535

Annual O&M

\$1,737,250

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 1,795,870		\$1,795,870
2		\$ 1,856,468		\$1,856,468
3		\$ 1,919,111		\$1,919,111
4		\$ 1,983,867		\$1,983,867
5		\$ 2,050,809		\$2,050,809
6		\$ 2,120,010		\$2,120,010
7		\$ 2,191,545		\$2,191,545
8		\$ 2,265,494		\$2,265,494
9		\$ 2,341,939		\$2,341,939
10		\$ 2,420,963		\$2,420,963
11		\$ 2,502,654		\$2,502,654
12		\$ 2,587,101		\$2,587,101
13		\$ 2,674,398		\$2,674,398
14		\$ 2,764,640		\$2,764,640
15		\$ 2,857,927		\$2,857,927
16		\$ 2,954,362		\$2,954,362
17		\$ 3,054,051		\$3,054,051
18		\$ 3,157,104		\$3,157,104
19		\$ 3,263,635		\$3,263,635
20		\$ 3,373,760		\$3,373,760
21		\$ 3,487,601	\$ 93,828,867	\$97,316,467
22		\$ 3,605,283		\$3,605,283
23		\$ 3,726,936		\$3,726,936
24		\$ 3,852,694		\$3,852,694
25		\$ 3,982,696		\$3,982,696
26		\$ 4,117,084		\$4,117,084
27		\$ 4,256,007		\$4,256,007
28		\$ 4,399,617		\$4,399,617
29		\$ 4,548,074		\$4,548,074
30		\$ 4,701,539		\$4,701,539

Present value of O&M

\$100,437,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 46,738,200	\$ 109,055,800	\$ 90,346,994	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$25,235,000	\$47,105,000	\$58,535,000	\$130,875,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

330,765,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 1B	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Both Decentralized Onsite Treatment and LPS. No LPS or decentralized plants in existing private plant service areas or areas with low density zoning (>1 acre).	In-Street Low Pressure (2")	12,541	LF			\$ 300	\$3,762,401
	In-Street Low Pressure (3")	9,406	LF			\$ 450	\$4,232,701
	In-Street Low Pressure (4")	9,406	LF			\$ 600	\$5,643,601
	Low pressure sewer (On-Lot)	244	EA			\$ 26,000	\$6,344,000
Kawaihae Area - 5 decentralized plants	Neighborhood On-Site treatment plant, 15,000 gpd (R1 water)	3	EA			\$ 3,500,000	\$10,500,000
	Neighborhood On-Site treatment plant, 25,000 gpd (R1 water)	1	EA			\$ 5,800,000	\$5,800,000
	Neighborhood On-Site treatment plant, 50,000 gpd (R1 water)	1	EA			\$ 7,800,000	\$7,800,000
	Neighborhood On-Site treatment plant, 75,000 gpd (R1 water)	-	EA			\$ 8,300,000	\$0
	Neighborhood On-Site treatment plant, 100,000 gpd (R1 water)	-	EA			\$ 8,900,000	\$0
	Neighborhood On-Site treatment plant, 120,000 gpd (R1 water)	-	EA			\$ 9,300,000	\$0
	Neighborhood On-Site treatment plant, 130,000 gpd (R1 water)	-	EA			\$ 9,500,000	\$0
	Neighborhood On-Site treatment plant, 150,000 gpd (R1 water)	-	EA			\$ 9,900,000	\$0
	Neighborhood On-Site treatment plant, 200,000 gpd (R1 water)	-	EA			\$ 11,000,000	\$0
	Neighborhood On-Site treatment plant, 250,000 gpd (R1 water)	-	EA			\$ 12,000,000	\$0
	Subtotal of Estimated Construction Cost						\$44,082,703
	Right of Way	49	Ac			\$ 20,000	\$975,819
	Contingency	20%					\$9,011,704
	Total Estimated Project Cost						\$54,070,226
	Project services	20%					\$10,814,045
	TOTAL CAPITAL COST						64,884,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$168,934
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$16,440

Annual O&M

\$185,374

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 191,629		\$191,629
2		\$ 198,095		\$198,095
3		\$ 204,780		\$204,780
4		\$ 211,689		\$211,689
5		\$ 218,833		\$218,833
6		\$ 226,217		\$226,217
7		\$ 233,850		\$233,850
8		\$ 241,741		\$241,741
9		\$ 249,898		\$249,898
10		\$ 258,330		\$258,330
11		\$ 267,047		\$267,047
12		\$ 276,058		\$276,058
13		\$ 285,373		\$285,373
14		\$ 295,002		\$295,002
15		\$ 304,956		\$304,956
16		\$ 315,247		\$315,247
17		\$ 325,884		\$325,884
18		\$ 336,880		\$336,880
19		\$ 348,248		\$348,248
20		\$ 359,999		\$359,999
21		\$ 372,146	\$ 18,335,276	\$18,707,422
22		\$ 384,703		\$384,703
23		\$ 397,684		\$397,684
24		\$ 411,103		\$411,103
25		\$ 424,975		\$424,975
26		\$ 439,315		\$439,315
27		\$ 454,139		\$454,139
28		\$ 469,463		\$469,463
29		\$ 485,304		\$485,304
30		\$ 501,680		\$501,680

Present value of O&M \$14,960,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main
Present Cost	\$ 9,133,200	\$ 21,310,800	\$ 13,638,703
Design Life (Years)	20	50	75
Residual Value at End of Design Life	\$0	\$0	\$0
Effective Interest Rate	-0.26%	-0.26%	-0.26%
Planning Cycle (Years)	30	30	30
Remaining Life	10	20	45
Present Value of Residual Value	\$4,931,000	\$9,205,000	\$8,836,000
			\$22,972,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**56,872,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 1B	DESCRIPTION Level of Treatment - R1	QUAN	UN			TOTAL DIRECT COST
Both Decentralized Onsite Treatment and LPS. No LPS or decentralized plants in existing private plant service areas or areas with low density zoning (>1 acre).	In-Street Low Pressure (2")	7,116	LF		\$ 300	\$2,134,914
	In-Street Low Pressure (3")	5,337	LF		\$ 450	\$2,401,778
	In-Street Low Pressure (4")	5,337	LF		\$ 600	\$3,202,371
	Neighborhood Pump Station Force Main (6")	6,000	LF		\$ 900	\$5,400,000
	Low pressure sewer (On-Lot)	268	EA		\$ 26,000	\$6,968,000
Puako Area - 1 decentralized plants	Neighborhood Pump Station	1	EA		\$ 1,200,000	\$1,200,000
	Neighborhood On-Site treatment plant, 15,000 gpd (R1 water)	-	EA		\$ 3,500,000	\$0
	Neighborhood On-Site treatment plant, 25,000 gpd (R1 water)	-	EA		\$ 5,800,000	\$0
	Neighborhood On-Site treatment plant, 50,000 gpd (R1 water)	1	EA		\$ 7,800,000	\$7,800,000
	Neighborhood On-Site treatment plant, 75,000 gpd (R1 water)	-	EA		\$ 8,300,000	\$0
	Neighborhood On-Site treatment plant, 100,000 gpd (R1 water)	-	EA		\$ 8,900,000	\$0
	Neighborhood On-Site treatment plant, 120,000 gpd (R1 water)	-	EA		\$ 9,300,000	\$0
	Neighborhood On-Site treatment plant, 130,000 gpd (R1 water)	-	EA		\$ 9,500,000	\$0
	Neighborhood On-Site treatment plant, 150,000 gpd (R1 water)	-	EA		\$ 9,900,000	\$0
	Neighborhood On-Site treatment plant, 200,000 gpd (R1 water)	-	EA		\$ 11,000,000	\$0
	Neighborhood On-Site treatment plant, 250,000 gpd (R1 water)	-	EA		\$ 12,000,000	\$0
	Subtotal of Estimated Construction Cost					\$29,107,063
	Right of Way	21	Ac		\$ 20,000	\$417,070
	Contingency	20%				\$5,904,827
	Total Estimated Project Cost					\$35,428,960
	Project services	20%				\$7,085,792
	TOTAL CAPITAL COST					42,515,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$160,723
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$6,850

Annual O&M

\$167,573

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 173,227		\$173,227
2		\$ 179,072		\$179,072
3		\$ 185,115		\$185,115
4		\$ 191,361		\$191,361
5		\$ 197,818		\$197,818
6		\$ 204,493		\$204,493
7		\$ 211,393		\$211,393
8		\$ 218,526		\$218,526
9		\$ 225,900		\$225,900
10		\$ 233,523		\$233,523
11		\$ 241,403		\$241,403
12		\$ 249,548		\$249,548
13		\$ 257,969		\$257,969
14		\$ 266,673		\$266,673
15		\$ 275,672		\$275,672
16		\$ 284,974		\$284,974
17		\$ 294,590		\$294,590
18		\$ 304,530		\$304,530
19		\$ 314,806		\$314,806
20		\$ 325,428		\$325,428
21		\$ 336,409	\$ 9,616,926	\$9,953,335 replace elec./ motorized equipment
22		\$ 347,761		\$347,761
23		\$ 359,495		\$359,495
24		\$ 371,626		\$371,626
25		\$ 384,165		\$384,165
26		\$ 397,128		\$397,128
27		\$ 410,529		\$410,529
28		\$ 424,381		\$424,381
29		\$ 438,701		\$438,701
30		\$ 453,504		\$453,504

Present value of O&M

\$9,977,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 4,790,400	\$ 11,177,600	\$ 13,139,063	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$2,586,000	\$4,828,000	\$8,513,000	\$15,927,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

36,565,000

Alternative 1B	DESCRIPTION Level of Treatment - R1	QUAN	UN			TOTAL DIRECT COST
Both Decentralized Onsite Treatment and LPS. No LPS or decentralized plants in existing private plant service areas or areas with low density zoning (>1 acre).	In-Street Low Pressure (2")	8,508	LF		\$ 300	\$2,552,339
	In-Street Low Pressure (3")	6,381	LF		\$ 450	\$2,871,381
	In-Street Low Pressure (4")	6,381	LF		\$ 600	\$3,828,508
	Low pressure sewer (On-Lot)	63	EA		\$ 26,000	\$1,638,000
	Neighborhood On-Site treatment plant, 15,000 gpd (R1 water)	-	EA		\$ 3,500,000	\$0
	Neighborhood On-Site treatment plant, 25,000 gpd (R1 water)	1	EA		\$ 5,800,000	\$5,800,000
	Neighborhood On-Site treatment plant, 50,000 gpd (R1 water)	-	EA		\$ 7,800,000	\$0
	Neighborhood On-Site treatment plant, 75,000 gpd (R1 water)	-	EA		\$ 8,300,000	\$0
	Neighborhood On-Site treatment plant, 100,000 gpd (R1 water)	-	EA		\$ 8,900,000	\$0
	Neighborhood On-Site treatment plant, 120,000 gpd (R1 water)	-	EA		\$ 9,300,000	\$0
Waikoloa Area - 1 decentralized plants	Neighborhood On-Site treatment plant, 130,000 gpd (R1 water)	-	EA		\$ 9,500,000	\$0
	Neighborhood On-Site treatment plant, 150,000 gpd (R1 water)	-	EA		\$ 9,900,000	\$0
	Neighborhood On-Site treatment plant, 200,000 gpd (R1 water)	-	EA		\$ 11,000,000	\$0
	Neighborhood On-Site treatment plant, 250,000 gpd (R1 water)	-	EA		\$ 12,000,000	\$0
	Subtotal of Estimated Construction Cost					\$16,690,228
	Right of Way	24	Ac		\$ 20,000	\$470,624
	Contingency	20%				\$3,432,170
	Total Estimated Project Cost					\$20,593,023
	Project services	20%				\$4,118,605
	TOTAL CAPITAL COST					24,712,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$54,406
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$3,425

Annual O&M

\$57,831

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 59,783		\$59,783
2		\$ 61,800		\$61,800
3		\$ 63,885		\$63,885
4		\$ 66,041		\$66,041
5		\$ 68,269		\$68,269
6		\$ 70,573		\$70,573
7		\$ 72,954		\$72,954
8		\$ 75,416		\$75,416
9		\$ 77,961		\$77,961
10		\$ 80,591		\$80,591
11		\$ 83,311		\$83,311
12		\$ 86,122		\$86,122
13		\$ 89,028		\$89,028
14		\$ 92,032		\$92,032
15		\$ 95,137		\$95,137
16		\$ 98,348		\$98,348
17		\$ 101,666		\$101,666
18		\$ 105,097		\$105,097
19		\$ 108,643		\$108,643
20		\$ 112,309		\$112,309
21		\$ 116,099	\$ 4,479,628	\$4,595,726
22		\$ 120,016		\$120,016
23		\$ 124,066		\$124,066
24		\$ 128,252		\$128,252
25		\$ 132,580		\$132,580
26		\$ 137,053		\$137,053
27		\$ 141,678		\$141,678
28		\$ 146,459		\$146,459
29		\$ 151,401		\$151,401
30		\$ 156,509		\$156,509

Present value of O&M

\$4,035,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 2,231,400	\$ 5,206,600	\$ 9,252,228	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$1,205,000	\$2,249,000	\$5,994,000	\$9,448,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

19,299,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 1B	DESCRIPTION Level of Treatment - R1	QUAN	UN			TOTAL DIRECT COST
Both Decentralized Onsite Treatment and LPS. No LPS or decentralized plants in existing private plant service areas or areas with low density zoning (>1 acre). Waikii Area - 1 decentralized plants	In-Street Low Pressure (2")	17,763	LF		\$ 300	\$5,328,869
	In-Street Low Pressure (3")	13,322	LF		\$ 450	\$5,994,977
	In-Street Low Pressure (4")	13,322	LF		\$ 600	\$7,993,303
	Low pressure sewer (On-Lot)	80	EA		\$ 26,000	\$2,080,000
	Neighborhood On-Site treatment plant, 15,000 gpd (R1 water)	-	EA		\$ 3,500,000	\$0
	Neighborhood On-Site treatment plant, 25,000 gpd (R1 water)	-	EA		\$ 5,800,000	\$0
	Neighborhood On-Site treatment plant, 50,000 gpd (R1 water)	1	EA		\$ 7,800,000	\$7,800,000
	Neighborhood On-Site treatment plant, 75,000 gpd (R1 water)	-	EA		\$ 8,300,000	\$0
	Neighborhood On-Site treatment plant, 100,000 gpd (R1 water)	-	EA		\$ 8,900,000	\$0
	Neighborhood On-Site treatment plant, 120,000 gpd (R1 water)	-	EA		\$ 9,300,000	\$0
	Neighborhood On-Site treatment plant, 130,000 gpd (R1 water)	-	EA		\$ 9,500,000	\$0
	Neighborhood On-Site treatment plant, 150,000 gpd (R1 water)	-	EA		\$ 9,900,000	\$0
	Neighborhood On-Site treatment plant, 200,000 gpd (R1 water)	-	EA		\$ 11,000,000	\$0
	Neighborhood On-Site treatment plant, 250,000 gpd (R1 water)	-	EA		\$ 12,000,000	\$0
Subtotal of Estimated Construction Cost						\$29,197,149
Right of Way				45	Ac	\$ 895,560
Contingency				20%		\$6,018,542
Total Estimated Project Cost						\$36,111,251
Project services				20%		\$7,222,250
TOTAL CAPITAL COST						43,334,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$82,966
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$4,521

Annual O&M

\$87,487

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 90,439		\$90,439
2		\$ 93,491		\$93,491
3		\$ 96,645		\$96,645
4		\$ 99,906		\$99,906
5		\$ 103,278		\$103,278
6		\$ 106,762		\$106,762
7		\$ 110,365		\$110,365
8		\$ 114,089		\$114,089
9		\$ 117,939		\$117,939
10		\$ 121,918		\$121,918
11		\$ 126,032		\$126,032
12		\$ 130,285		\$130,285
13		\$ 134,681		\$134,681
14		\$ 139,226		\$139,226
15		\$ 143,924		\$143,924
16		\$ 148,780		\$148,780
17		\$ 153,800		\$153,800
18		\$ 158,990		\$158,990
19		\$ 164,355		\$164,355
20		\$ 169,901		\$169,901
21		\$ 175,634	\$ 5,950,352	\$6,125,986 replace elec./ motorized equipment
22		\$ 181,560		\$181,560
23		\$ 187,686		\$187,686
24		\$ 194,020		\$194,020
25		\$ 200,566		\$200,566
26		\$ 207,334		\$207,334
27		\$ 214,330		\$214,330
28		\$ 221,562		\$221,562
29		\$ 229,038		\$229,038
30		\$ 236,767		\$236,767

Present value of O&M

\$5,682,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 2,964,000	\$ 6,916,000	\$ 19,317,149	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$1,600,000	\$2,987,000	\$12,516,000	\$17,103,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

31,913,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 1B	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Both Decentralized Onsite Treatment and LPS. No LPS or decentralized plants in existing private plant service areas or areas with low density zoning (>1 acre).	In-Street Low Pressure (2")	0	LF			\$ 300	\$0
	In-Street Low Pressure (3")	0	LF			\$ 450	\$0
	In-Street Low Pressure (4")	0	LF			\$ 600	\$0
	Low pressure sewer (On-Lot)	2,730	EA			\$ 26,000	\$70,980,000
Other Areas Including on-lot LPS in - Other non-urban area - Private sewerizing area	Neighborhood On-Site treatment plant, 15,000 gpd (R1 water)	-	EA			\$ 3,500,000	\$0
	Neighborhood On-Site treatment plant, 25,000 gpd (R1 water)	-	EA			\$ 5,800,000	\$0
	Neighborhood On-Site treatment plant, 50,000 gpd (R1 water)	-	EA			\$ 7,800,000	\$0
	Neighborhood On-Site treatment plant, 75,000 gpd (R1 water)	-	EA			\$ 8,300,000	\$0
	Neighborhood On-Site treatment plant, 100,000 gpd (R1 water)	-	EA			\$ 8,900,000	\$0
	Neighborhood On-Site treatment plant, 120,000 gpd (R1 water)	-	EA			\$ 9,300,000	\$0
	Neighborhood On-Site treatment plant, 130,000 gpd (R1 water)	-	EA			\$ 9,500,000	\$0
	Neighborhood On-Site treatment plant, 150,000 gpd (R1 water)	-	EA			\$ 9,900,000	\$0
	Neighborhood On-Site treatment plant, 200,000 gpd (R1 water)	-	EA			\$ 11,000,000	\$0
	Neighborhood On-Site treatment plant, 250,000 gpd (R1 water)	-	EA			\$ 12,000,000	\$0
	Subtotal of Estimated Construction Cost						\$70,980,000
	Right of Way	0	Ac			\$ 20,000	\$0
	Contingency	20%					\$14,196,000
	Total Estimated Project Cost						\$85,176,000
	Project services	20%					\$17,035,200
	TOTAL CAPITAL COST						102,211,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$1,384,110
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$0

Annual O&M

\$1,384,110

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 1,430,814		\$1,430,814
2		\$ 1,479,094		\$1,479,094
3		\$ 1,529,003		\$1,529,003
4		\$ 1,580,596		\$1,580,596
5		\$ 1,633,931		\$1,633,931
6		\$ 1,689,064		\$1,689,064
7		\$ 1,746,058		\$1,746,058
8		\$ 1,804,976		\$1,804,976
9		\$ 1,865,881		\$1,865,881
10		\$ 1,928,842		\$1,928,842
11		\$ 1,993,927		\$1,993,927
12		\$ 2,061,208		\$2,061,208
13		\$ 2,130,759		\$2,130,759
14		\$ 2,202,657		\$2,202,657
15		\$ 2,276,982		\$2,276,982
16		\$ 2,353,814		\$2,353,814
17		\$ 2,433,239		\$2,433,239
18		\$ 2,515,344		\$2,515,344
19		\$ 2,600,219		\$2,600,219
20		\$ 2,687,958		\$2,687,958
21		\$ 2,778,658	\$ 42,748,584	\$45,527,242
22		\$ 2,872,418		\$2,872,418
23		\$ 2,969,342		\$2,969,342
24		\$ 3,069,537		\$3,069,537
25		\$ 3,173,113		\$3,173,113
26		\$ 3,280,183		\$3,280,183
27		\$ 3,390,866		\$3,390,866
28		\$ 3,505,284		\$3,505,284
29		\$ 3,623,563		\$3,623,563
30		\$ 3,745,833		\$3,745,833

Present value of O&M \$63,704,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 21,294,000	\$ 49,686,000	\$ -	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$11,497,000	\$21,461,000	\$0	\$32,958,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**132,957,000**

G-5: Alternative 2A Construction Cost and LCC Analysis

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2A	DESCRIPTION Level of Treatment - R3	QUAN	UN			TOTAL DIRECT COST
					UNIT COST	
Same as 2C, but sewer sizing is bigger to accommodate redevelopment of existing parcels with IWS. Includes one Mauka COH Plant, Urban Sewering w/ Private and County Plants, All Gravity Sewers. Cross country sewers with new easements are used to reduce the number of pump stations. All current and future flow from Makai areas conveyed to existing private WWTPs. IWS for all low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to existing private WWPS or WWTP in Makai areas. COH sewers/WWPS from high density (commercial or <1 acre lots) from Mauka (Waimea) area to new COH WWTP.	Gravity Sewer 8 inch	234,573	LF		\$ 1,600	\$ 375,316,064
	Gravity Sewer 12 inch	2,113	LF		\$ 3,070	\$ 6,486,726
	Gravity Sewer 16 inch	6,544	LF		\$ 5,800	\$ 37,954,272
	Gravity Sewer 18 inch	34,879	LF		\$ 6,525	\$ 227,583,518
	Gravity Sewer 24 inch	-	LF		\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF		\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF		\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF		\$ 15,200	\$ -
	Force main 4 inch	-	LF		\$ 600	\$ -
	Force main 6 inch	75,828	LF		\$ 900	\$ 68,244,903
	Force main 8 inch	-	LF		\$ 1,600	\$ -
	Force main 10 inch	9,435	LF		\$ 1,700	\$ 16,039,500
	Force main 12 inch	-	LF		\$ 3,070	\$ -
	Force main 14 inch	-	LF		\$ 4,430	\$ -
	Force main 16 inch	-	LF		\$ 5,800	\$ -
	Force main 18 inch	-	LF		\$ 6,525	\$ -
	Force main 24 inch	-	LF		\$ 8,700	\$ -
	Force main 30 inch	-	LF		\$ 10,875	\$ -
	Force main 36 inch	-	LF		\$ 13,050	\$ -
	Force main 42 inch	-	LF		\$ 15,200	\$ -
	Regional PS	14	EA		\$ 7,000,000	\$ 98,000,000
	Neighborhood PS	45	EA		\$ 1,200,000	\$ 54,000,000
	COH WWTPs (3 total), level of treatment - R3		LS		\$ 28,200,000	\$ 28,200,000
	Subtotal of Estimated Construction Cost					\$ 911,824,982
	Right of Way	378	Ac		\$ 20,000	\$ 7,562,979
	Contingency	20%				\$ 183,877,592
	Total Estimated Project Cost					\$ 1,103,265,553
	Project services		20%			\$ 220,653,111
	TOTAL CAPITAL COST					\$ 1,323,919,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	531898	kwh	\$ 0.44	\$234,035
	Labor and Materials	55,513	LS	-	\$55,513

Annual O&M

\$289,548

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 299,318		\$299,318
2		\$ 309,418		\$309,418
3		\$ 319,859		\$319,859
4		\$ 330,652		\$330,652
5		\$ 341,809		\$341,809
6		\$ 353,343		\$353,343
7		\$ 365,265		\$365,265
8		\$ 377,591		\$377,591
9		\$ 390,332		\$390,332
10		\$ 403,503		\$403,503
11		\$ 417,118		\$417,118
12		\$ 431,193		\$431,193
13		\$ 445,743		\$445,743
14		\$ 460,783		\$460,783
15		\$ 476,331		\$476,331
16		\$ 492,404		\$492,404
17		\$ 509,020		\$509,020
18		\$ 526,195		\$526,195
19		\$ 543,951		\$543,951
20		\$ 562,305		\$562,305
21		\$ 581,279	\$ 108,527,683	\$109,108,962
22		\$ 600,893		\$600,893
23		\$ 621,169	\$ 3,893,512	\$4,514,682
24		\$ 642,129		\$642,129
25		\$ 663,797		\$663,797
26		\$ 686,195		\$686,195
27		\$ 709,350		\$709,350
28		\$ 733,285		\$733,285
29		\$ 758,029		\$758,029
30		\$ 783,607		\$783,607

Present value of O&M

\$65,960,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 54,060,000	\$ 126,140,000	\$ 731,624,982	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$29,188,000	\$54,484,000	\$474,017,000	\$557,689,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

832,190,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2A	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waimea Area							
- 3 COH WWTPs							
- East Waimea WWTP	Gravity Sewer 8 inch	169,204	LF			\$ 1,600	\$ 270,726,400
- Waimea Town WWTP	Gravity Sewer 12 inch	2,113	LF			\$ 3,070	\$ 6,486,726
- West Waimea WWTP	Gravity Sewer 16 inch	6,544	LF			\$ 5,800	\$ 37,954,272
	Gravity Sewer 18 inch	29,833	LF			\$ 6,525	\$ 194,663,327
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	37,885	LF			\$ 900	\$ 34,096,878
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch	9,435	LF			\$ 1,700	\$ 16,039,500
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	33	EA			\$ 1,200,000	\$ 39,600,000
	COH WWTPs (3 total), level of treatment - R3		LS			\$ 28,200,000	\$ 28,200,000
	Subtotal of Estimated Construction Cost						\$ 655,767,102
	Right of Way	267	Ac			\$ 20,000	\$ 5,345,696
	Contingency	20%					\$ 132,222,560
	Total Estimated Project Cost						\$ 793,335,358
	Project services		20%				\$ 158,667,072
	TOTAL CAPITAL COST						\$ 952,002,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	436955	kWH	\$ 0.44	\$192,260
	Labor and Materials	\$ 38,795	LS	-	\$38,795

Annual O&M

\$231,056

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 238,852		\$238,852
2		\$ 246,912		\$246,912
3		\$ 255,243		\$255,243
4		\$ 263,856		\$263,856
5		\$ 272,759		\$272,759
6		\$ 281,963		\$281,963
7		\$ 291,477		\$291,477
8		\$ 301,313		\$301,313
9		\$ 311,480		\$311,480
10		\$ 321,990		\$321,990
11		\$ 332,855		\$332,855
12		\$ 344,087		\$344,087
13		\$ 355,697		\$355,697
14		\$ 367,699		\$367,699
15		\$ 380,107		\$380,107
16		\$ 392,933		\$392,933
17		\$ 406,191		\$406,191
18		\$ 419,897		\$419,897
19		\$ 434,066		\$434,066
20		\$ 448,713		\$448,713
21		\$ 463,854	\$ 57,696,737	\$58,160,591
22		\$ 479,506		\$479,506
23		\$ 495,686	\$ 2,907,719	\$3,403,405
24		\$ 512,411		\$512,411
25		\$ 529,702		\$529,702
26		\$ 547,576		\$547,576
27		\$ 566,052		\$566,052
28		\$ 585,153		\$585,153
29		\$ 604,898		\$604,898
30		\$ 625,309		\$625,309

Present value of O&M

\$37,803,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 28,740,000	\$ 67,060,000	\$ 559,967,102	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$15,517,000	\$28,965,000	\$362,801,000	\$407,283,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

582,522,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2A	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area	Gravity Sewer 8 inch	26,308	LF			\$ 1,600	\$ 42,092,960
- To exist. S. Kohala	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
WRF	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	5,045	LF			\$ 6,525	\$ 32,920,191
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch		LF			\$ 600	\$ -
	Force main 6 inch	23,440	LF			\$ 900	\$ 21,095,658
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Regional PS	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	8	EA			\$ 1,200,000	\$ 9,600,000
			LS			\$ -	\$ -
	Subtotal of Estimated Construction Cost					\$ 154,708,809	
	Right of Way	58	Ac			\$ 20,000	\$ 1,161,257
	Contingency	20%				\$ -	\$ 31,174,013
	Total Estimated Project Cost					\$ -	\$ 187,044,080
	Project services		20%			\$ -	\$ 37,408,816
	TOTAL CAPITAL COST						\$ 224,453,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	68916	kwh	\$ 0.44	\$30,323
	Labor and Materials	\$ 12,641	LS	-	\$12,641

Annual O&M

\$42,964

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 44,414		\$44,414
2		\$ 45,913		\$45,913
3		\$ 47,462		\$47,462
4		\$ 49,063		\$49,063
5		\$ 50,719		\$50,719
6		\$ 52,430		\$52,430
7		\$ 54,199		\$54,199
8		\$ 56,028		\$56,028
9		\$ 57,919		\$57,919
10		\$ 59,873		\$59,873
11		\$ 61,893		\$61,893
12		\$ 63,982		\$63,982
13		\$ 66,141		\$66,141
14		\$ 68,373		\$68,373
15		\$ 70,680		\$70,680
16		\$ 73,065		\$73,065
17		\$ 75,530		\$75,530
18		\$ 78,079		\$78,079
19		\$ 80,713		\$80,713
20		\$ 83,437		\$83,437
21		\$ 86,252	\$ 35,292,576	\$35,378,828
22		\$ 89,163		\$89,163
23		\$ 92,171	\$ 438,947	\$531,118
24		\$ 95,281		\$95,281
25		\$ 98,497		\$98,497
26		\$ 101,820		\$101,820
27		\$ 105,256		\$105,256
28		\$ 108,807		\$108,807
29		\$ 112,479		\$112,479
30		\$ 116,274		\$116,274

Present value of O&M

\$19,503,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 17,580,000	\$ 41,020,000	\$ 96,108,809	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$9,492,000	\$17,718,000	\$62,269,000	\$89,479,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

154,477,000

JOB #: South Kohala Wastewater Master Plan
DATE: June 7, 2024
LOCATION: South Kohala, County of Hawaii
PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
Construction Cost Estimate
Conceptual Level
Wastewater Master Plan Estimates

Alternative 2A	DESCRIPTION Level of Treatment - R3	QUAN	UN			TOTAL DIRECT COST
					UNIT COST	
Puako Area						
- To exist. Mauna Lani						
WWTP	Gravity Sewer 8 inch	17,791	LF		\$ 1,600	\$ 28,465,520
	Gravity Sewer 12 inch		LF		\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF		\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF		\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF		\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF		\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF		\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF		\$ 15,200	\$ -
	Force main 4 inch	-	LF		\$ 600	\$ -
	Force main 6 inch	12,266	LF		\$ 900	\$ 11,039,004
	Force main 8 inch		LF		\$ 1,600	\$ -
	Force main 10 inch		LF		\$ 1,700	\$ -
	Force main 12 inch		LF		\$ 3,070	\$ -
	Force main 14 inch	-	LF		\$ 4,430	\$ -
	Force main 16 inch	-	LF		\$ 5,800	\$ -
	Force main 18 inch	-	LF		\$ 6,525	\$ -
	Force main 24 inch	-	LF		\$ 8,700	\$ -
	Force main 30 inch	-	LF		\$ 10,875	\$ -
	Force main 36 inch	-	LF		\$ 13,050	\$ -
	Force main 42 inch	-	LF		\$ 15,200	\$ -
Regional PS		3	EA		\$ 7,000,000	\$ 21,000,000
Neighborhood PS		3	EA		\$ 1,200,000	\$ 3,600,000
			LS		\$	-
	Subtotal of Estimated Construction Cost					\$ 64,104,524
	Right of Way	31	Ac		\$ 20,000	\$ 613,985
	Contingency	20%				\$ 12,943,702
	Total Estimated Project Cost					\$ 77,662,211
Project services		20%				\$ 15,532,442
	TOTAL CAPITAL COST					\$ 93,195,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	23277	kwh	\$ 0.44	\$10,242
	Labor and Materials	\$ 3,967	LS	-	\$3,967

Annual O&M \$14,209

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 14,689		\$14,689
2		\$ 15,185		\$15,185
3		\$ 15,697		\$15,697
4		\$ 16,227		\$16,227
5		\$ 16,774		\$16,774
6		\$ 17,340		\$17,340
7		\$ 17,925		\$17,925
8		\$ 18,530		\$18,530
9		\$ 19,155		\$19,155
10		\$ 19,802		\$19,802
11		\$ 20,470		\$20,470
12		\$ 21,161		\$21,161
13		\$ 21,875		\$21,875
14		\$ 22,613		\$22,613
15		\$ 23,376		\$23,376
16		\$ 24,165		\$24,165
17		\$ 24,980		\$24,980
18		\$ 25,823		\$25,823
19		\$ 26,694		\$26,694
20		\$ 27,595		\$27,595
21		\$ 28,526	\$ 14,815,655	\$14,844,181
22		\$ 29,489		\$29,489
23		\$ 30,484	\$ 249,073	\$279,557
24		\$ 31,512		\$31,512
25		\$ 32,576		\$32,576
26		\$ 33,675		\$33,675
27		\$ 34,811		\$34,811
28		\$ 35,986		\$35,986
29		\$ 37,200		\$37,200
30		\$ 38,455		\$38,455

Present value of O&M \$8,102,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 7,380,000	\$ 17,220,000	\$ 39,504,524	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,985,000	\$7,438,000	\$25,595,000	\$37,018,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

64,279,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2A	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikoloa Area							
- To exist. Waikoloa							
Village WWTP	Gravity Sewer 8 inch	21,269	LF			\$ 1,600	\$ 34,031,184
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	2,237	LF			\$ 900	\$ 2,013,363
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
			LS			\$ -	
	Subtotal of Estimated Construction Cost						\$ 37,244,547
	Right of Way	22	Ac			\$ 20,000	\$ 442,040
	Contingency	20%					\$ 7,537,317
	Total Estimated Project Cost						\$ 45,223,904
	Project services		20%				\$ 9,044,781
	TOTAL CAPITAL COST						\$ 54,269,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	2749	kWH	\$ 0.44	\$1,210
	Labor and Materials	\$ 109	LS	-	\$109

Annual O&M

\$1,319

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 1,363		\$1,363
2		\$ 1,409		\$1,409
3		\$ 1,457		\$1,457
4		\$ 1,506		\$1,506
5		\$ 1,557		\$1,557
6		\$ 1,609		\$1,609
7		\$ 1,663		\$1,663
8		\$ 1,720		\$1,720
9		\$ 1,778		\$1,778
10		\$ 1,838		\$1,838
11		\$ 1,900		\$1,900
12		\$ 1,964		\$1,964
13		\$ 2,030		\$2,030
14		\$ 2,098		\$2,098
15		\$ 2,169		\$2,169
16		\$ 2,242		\$2,242
17		\$ 2,318		\$2,318
18		\$ 2,396		\$2,396
19		\$ 2,477		\$2,477
20		\$ 2,561		\$2,561
21		\$ 2,647	\$ 722,715	\$725,362
22		\$ 2,736		\$2,736
23		\$ 2,829	\$ 297,773	\$300,602
24		\$ 2,924		\$2,924
25		\$ 3,023		\$3,023
26		\$ 3,125		\$3,125
27		\$ 3,230		\$3,230
28		\$ 3,339		\$3,339
29		\$ 3,452		\$3,452
30		\$ 3,569		\$3,569

Present value of O&M

\$551,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 360,000	\$ 840,000	\$ 36,044,547	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$194,000	\$363,000	\$23,353,000	\$23,910,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

30,910,000

Alternative 2A Same as 2C, but sewer sizing is bigger to accomodate redevelopment of existing parcels with IWS. Includes one Mauka COH Plant, Urban Sewering w/ Private and County Plants. All Gravity Sewers. Cross country sewers with new easements are used to reduce the number of pump stations. All current and future flow from Makai areas conveyed to existing private WWTPs. IWS for all low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to existing private WWPS or WWTP in Makai areas. COH sewers/WWPS from high density (commercial or <1 acre lots) from Mauka (Waimea) area to new COH WWTP.	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Gravity Sewer 8 inch	234,573	LF			\$ 1,600	\$ 375,316,064	
Gravity Sewer 12 inch	2,113	LF			\$ 3,070	\$ 6,486,726	
Gravity Sewer 16 inch	6,544	LF			\$ 5,800	\$ 37,954,272	
Gravity Sewer 18 inch	34,879	LF			\$ 6,525	\$ 227,583,518	
Gravity Sewer 24 inch	-	LF			\$ 8,700	\$ -	
Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -	
Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -	
Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -	
Force main 4 inch	-	LF			\$ 600	\$ -	
Force main 6 inch	75,828	LF			\$ 900	\$ 68,244,903	
Force main 8 inch	-	LF			\$ 1,600	\$ -	
Force main 10 inch	9,435	LF			\$ 1,700	\$ 16,039,500	
Force main 12 inch	-	LF			\$ 3,070	\$ -	
Force main 14 inch	-	LF			\$ 4,430	\$ -	
Force main 16 inch	-	LF			\$ 5,800	\$ -	
Force main 18 inch	-	LF			\$ 6,525	\$ -	
Force main 24 inch	-	LF			\$ 8,700	\$ -	
Force main 30 inch	-	LF			\$ 10,875	\$ -	
Force main 36 inch	-	LF			\$ 13,050	\$ -	
Force main 42 inch	-	LF			\$ 15,200	\$ -	
Regional PS	14	EA			\$ 7,000,000	\$ 98,000,000	
Neighborhood PS	45	EA			\$ 1,200,000	\$ 54,000,000	
COH WWTPs (3 total), level of treatment - R2		LS			\$ 30,145,800	\$ 30,145,800	
Subtotal of Estimated Construction Cost						\$ 913,770,782	
Right of Way	378	Ac			\$ 20,000	\$ 7,562,979	
Contingency	20%					\$ 184,266,752	
Total Estimated Project Cost						\$ 1,105,600,513	
Project services		20%				\$ 221,120,103	
TOTAL CAPITAL COST						\$ 1,326,721,000	

O&M

	Item	QUN.	LN.	Unit cost	Total Amt(ia)
	R3 level of treatment annual O&M				\$289,548
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$109,740
Annual O&M					\$399,288

Year	Year	Amt(ia)	Additional Cost	Total
0		\$ -		\$ -
1		\$ 412,761		\$412,761
2		\$ 426,689		\$426,689
3		\$ 441,087		\$441,087
4		\$ 455,970		\$455,970
5		\$ 471,356		\$471,356
6		\$ 487,261		\$487,261
7		\$ 503,703		\$503,703
8		\$ 520,699		\$520,699
9		\$ 538,269		\$538,269
10		\$ 556,432		\$556,432
11		\$ 575,208		\$575,208
12		\$ 594,617		\$594,617
13		\$ 614,681		\$614,681
14		\$ 635,422		\$635,422
15		\$ 656,863		\$656,863
16		\$ 679,028		\$679,028
17		\$ 701,940		\$701,940
18		\$ 725,626		\$725,626
19		\$ 750,111		\$750,111
20		\$ 775,422		\$775,422
21		\$ 801,587	\$ 109,699,565	\$110,501,152
22		\$ 828,635		\$828,635
23		\$ 856,595	\$ 3,893,512	\$4,750,108
24		\$ 885,500		\$885,500
25		\$ 915,379		\$915,379
26		\$ 946,267		\$946,267
27		\$ 978,197		\$978,197
28		\$ 1,011,204		\$1,011,204
29		\$ 1,045,325		\$1,045,325
30		\$ 1,080,597		\$1,080,597

Present value of O&M \$69,880,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 54,643,740	\$ 127,502,060	\$ 731,624,982	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$29,503,000	\$55,072,000	\$474,017,000	\$558,592,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

838,009,000

Alternative 2A	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waimea Area							
- 3 COH WWTPs							
- East Waimea WWTP	Gravity Sewer 8 inch	169,204	LF			\$ 1,600	\$ 270,726,400
- Waimea Town WWTP	Gravity Sewer 12 inch	2,113	LF			\$ 3,070	\$ 6,486,726
- West Waimea WWTP	Gravity Sewer 16 inch	6,544	LF			\$ 5,800	\$ 37,954,272
	Gravity Sewer 18 inch	29,833	LF			\$ 6,525	\$ 194,663,327
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	37,885	LF			\$ 900	\$ 34,096,878
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch	9,435	LF			\$ 1,700	\$ 16,039,500
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	33	EA			\$ 1,200,000	\$ 39,600,000
	COH WWTPs (3 total), level of treatment - R2		LS			\$ 30,145,800	\$ 30,145,800
	Subtotal of Estimated Construction Cost						\$ 657,712,902
	Right of Way	267	Ac			\$ 20,000	\$ 5,345,696
	Contingency	20%					\$ 132,611,720
	Total Estimated Project Cost						\$ 795,670,318
	Project services		20%				\$ 159,134,064
	TOTAL CAPITAL COST						\$ 954,804,000

O&M

Item	QUAN	UN	Unit cost	Total Annual
R3 level of treatment annual O&M				\$231,056
R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$109,740

Annual O&M

\$340,796

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 352,295		\$352,295
2		\$ 364,183		\$364,183
3		\$ 376,471		\$376,471
4		\$ 389,175		\$389,175
5		\$ 402,306		\$402,306
6		\$ 415,881		\$415,881
7		\$ 429,915		\$429,915
8		\$ 444,421		\$444,421
9		\$ 459,417		\$459,417
10		\$ 474,919		\$474,919
11		\$ 490,945		\$490,945
12		\$ 507,511		\$507,511
13		\$ 524,636		\$524,636
14		\$ 542,338		\$542,338
15		\$ 560,639		\$560,639
16		\$ 579,556		\$579,556
17		\$ 599,112		\$599,112
18		\$ 619,328		\$619,328
19		\$ 640,226		\$640,226
20		\$ 661,829		\$661,829
21		\$ 684,161	\$ 58,868,619	\$59,552,780
22		\$ 707,247		\$707,247
23		\$ 731,112	\$ 2,907,719	\$3,638,831
24		\$ 755,782		\$755,782
25		\$ 781,284		\$781,284
26		\$ 807,647		\$807,647
27		\$ 834,899		\$834,899
28		\$ 863,071		\$863,071
29		\$ 892,194		\$892,194
30		\$ 922,299		\$922,299

Present value of O&M \$41,724,000

replace elec./ motorized equipment
sewer inspection at yr 10 of serviceResidual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 29,323,740	\$ 68,422,060	\$ 559,967,102	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$15,832,000	\$29,554,000	\$362,801,000	\$408,187,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

588,341,000

Alternative 2A	DESCRIPTION	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area	Level of Treatment - R2						
- To exist. S. Kohala							
WRF	Gravity Sewer 8 inch	26,308	LF			\$ 1,600	\$ 42,092,960
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	5,045	LF			\$ 6,525	\$ 32,920,191
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	23,440	LF			\$ 900	\$ 21,095,658
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	8	EA			\$ 1,200,000	\$ 9,600,000
			LS			\$	\$ -
	Subtotal of Estimated Construction Cost						\$ 154,708,809
	Right of Way	58	Ac			\$ 20,000	\$ 1,161,257
	Contingency	20%					\$ 31,174,013
	Total Estimated Project Cost						\$ 187,044,080
	Project services		20%				\$ 37,408,816
	TOTAL CAPITAL COST						\$ 224,453,000

O&M

Item	QUAN	UN	Unit cost	Total Annual
R3 level of treatment annual O&M				\$42,964
R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$0

Annual O&M

\$42,964

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 44,414		\$44,414
2		\$ 45,913		\$45,913
3		\$ 47,462		\$47,462
4		\$ 49,063		\$49,063
5		\$ 50,719		\$50,719
6		\$ 52,430		\$52,430
7		\$ 54,199		\$54,199
8		\$ 56,028		\$56,028
9		\$ 57,919		\$57,919
10		\$ 59,873		\$59,873
11		\$ 61,893		\$61,893
12		\$ 63,982		\$63,982
13		\$ 66,141		\$66,141
14		\$ 68,373		\$68,373
15		\$ 70,680		\$70,680
16		\$ 73,065		\$73,065
17		\$ 75,530		\$75,530
18		\$ 78,079		\$78,079
19		\$ 80,713		\$80,713
20		\$ 83,437		\$83,437
21		\$ 86,252	\$ 35,292,576	\$35,378,828 replace elec./ motorized equipment
22		\$ 89,163		\$89,163
23		\$ 92,171	\$ 438,947	\$531,118 sewer inspection at yr 10 of service
24		\$ 95,281		\$95,281
25		\$ 98,497		\$98,497
26		\$ 101,820		\$101,820
27		\$ 105,256		\$105,256
28		\$ 108,807		\$108,807
29		\$ 112,479		\$112,479
30		\$ 116,274		\$116,274

Present value of O&M \$19,503,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 17,580,000	\$ 41,020,000	\$ 96,108,809	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$9,492,000	\$17,718,000	\$62,269,000	\$89,479,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

154,477,000

Alternative 2A	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area	Gravity Sewer 8 inch	17,791	LF			\$ 1,600	\$ 28,465,520
- To exist. Mauna Lani	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
WWTP	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	12,266	LF			\$ 900	\$ 11,039,004
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	3	EA			\$ 7,000,000	\$ 21,000,000
	Neighborhood PS	3	EA			\$ 1,200,000	\$ 3,600,000
			LS			\$	\$ -
	Subtotal of Estimated Construction Cost						\$ 64,104,524
	Right of Way	31	Ac			\$ 20,000	\$ 613,985
	Contingency	20%					\$ 12,943,702
	Total Estimated Project Cost						\$ 77,662,211
	Project services	20%					\$ 15,532,442
	TOTAL CAPITAL COST						\$ 93,195,000

O&M

Item	QUAN	UN	Unit cost	Total Annual
R3 level of treatment annual O&M				\$14,209
R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$0

Annual O&M

\$14,209

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 14,689		\$14,689
2		\$ 15,185		\$15,185
3		\$ 15,697		\$15,697
4		\$ 16,227		\$16,227
5		\$ 16,774		\$16,774
6		\$ 17,340		\$17,340
7		\$ 17,925		\$17,925
8		\$ 18,530		\$18,530
9		\$ 19,155		\$19,155
10		\$ 19,802		\$19,802
11		\$ 20,470		\$20,470
12		\$ 21,161		\$21,161
13		\$ 21,875		\$21,875
14		\$ 22,613		\$22,613
15		\$ 23,376		\$23,376
16		\$ 24,165		\$24,165
17		\$ 24,980		\$24,980
18		\$ 25,823		\$25,823
19		\$ 26,694		\$26,694
20		\$ 27,595		\$27,595
21		\$ 28,526	\$ 14,815,655	\$14,844,181
22		\$ 29,489		\$29,489
23		\$ 30,484	\$ 249,073	\$279,557
24		\$ 31,512		\$31,512
25		\$ 32,576		\$32,576
26		\$ 33,675		\$33,675
27		\$ 34,811		\$34,811
28		\$ 35,986		\$35,986
29		\$ 37,200		\$37,200
30		\$ 38,455		\$38,455

Present value of O&M \$8,102,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 7,380,000	\$ 17,220,000	\$ 39,504,524	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,985,000	\$7,438,000	\$25,595,000	\$37,018,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

64,279,000

Alternative 2A Waikoloa Area - To exist. Waikoloa Village WWTP	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Gravity Sewer 8 inch		21,269	LF			\$ 1,600	\$ 34,031,184
Gravity Sewer 12 inch			LF			\$ 3,070	\$ -
Gravity Sewer 16 inch			LF			\$ 5,800	\$ -
Gravity Sewer 18 inch			LF			\$ 6,525	\$ -
Gravity Sewer 24 inch			LF			\$ 8,700	\$ -
Gravity Sewer 30 inch		-	LF			\$ 10,875	\$ -
Gravity Sewer 36 inch		-	LF			\$ 13,050	\$ -
Gravity Sewer 42 inch		-	LF			\$ 15,200	\$ -
Force main 4 inch		-	LF			\$ 600	\$ -
Force main 6 inch		2,237	LF			\$ 900	\$ 2,013,363
Force main 8 inch			LF			\$ 1,600	\$ -
Force main 10 inch			LF			\$ 1,700	\$ -
Force main 12 inch			LF			\$ 3,070	\$ -
Force main 14 inch		-	LF			\$ 4,430	\$ -
Force main 16 inch		-	LF			\$ 5,800	\$ -
Force main 18 inch		-	LF			\$ 6,525	\$ -
Force main 24 inch		-	LF			\$ 8,700	\$ -
Force main 30 inch		-	LF			\$ 10,875	\$ -
Force main 36 inch		-	LF			\$ 13,050	\$ -
Force main 42 inch		-	LF			\$ 15,200	\$ -
Regional PS		-	EA			\$ 7,000,000	\$ -
Neighborhood PS		1	EA			\$ 1,200,000	\$ 1,200,000
			LS			\$ -	\$ -
Subtotal of Estimated Construction Cost						\$ 37,244,547	
Right of Way	22	Ac				\$ 20,000	\$ 442,040
Contingency	20%					\$ -	\$ 7,537,317
Total Estimated Project Cost						\$ -	\$ 45,223,904
Project services		20%				\$ -	\$ 9,044,781
TOTAL CAPITAL COST							\$ 54,269,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$1,319
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$0

Annual O&M

\$1,319

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 1,363		\$1,363
2		\$ 1,409		\$1,409
3		\$ 1,457		\$1,457
4		\$ 1,506		\$1,506
5		\$ 1,557		\$1,557
6		\$ 1,609		\$1,609
7		\$ 1,663		\$1,663
8		\$ 1,720		\$1,720
9		\$ 1,778		\$1,778
10		\$ 1,838		\$1,838
11		\$ 1,900		\$1,900
12		\$ 1,964		\$1,964
13		\$ 2,030		\$2,030
14		\$ 2,098		\$2,098
15		\$ 2,169		\$2,169
16		\$ 2,242		\$2,242
17		\$ 2,318		\$2,318
18		\$ 2,396		\$2,396
19		\$ 2,477		\$2,477
20		\$ 2,561		\$2,561
21		\$ 2,647	\$ 722,715	\$725,362
22		\$ 2,736		\$2,736
23		\$ 2,829	\$ 297,773	\$300,602
24		\$ 2,924		\$2,924
25		\$ 3,023		\$3,023
26		\$ 3,125		\$3,125
27		\$ 3,230		\$3,230
28		\$ 3,339		\$3,339
29		\$ 3,452		\$3,452
30		\$ 3,569		\$3,569

Present value of O&M

\$551,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 360,000	\$ 840,000	\$ 36,044,547	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$194,000	\$363,000	\$23,353,000	\$23,910,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

30,910,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2A	DESCRIPTION Level of Treatment - R1	QUAN	UN			TOTAL DIRECT COST
					UNIT COST	
Same as 2C, but sewer sizing is bigger to accommodate redevelopment of existing parcels with IWS. Includes one Mauka COH Plant, Urban Sewering w/ Private and County Plants, All Gravity Sewers. Cross country sewers with new easements are used to reduce the number of pump stations. All current and future flow from Makai areas conveyed to existing private WWTPs. IWS for all low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to existing private WWPS or WWTP in Makai areas. COH sewers/WWPS from high density (commercial or <1 acre lots) from Mauka (Waimea) area to new COH WWTP.	Gravity Sewer 8 inch	234,573	LF	\$ 1,600	\$ 375,316,064	
	Gravity Sewer 12 inch	2,113	LF	\$ 3,070	\$ 6,486,726	
	Gravity Sewer 16 inch	6,544	LF	\$ 5,800	\$ 37,954,272	
	Gravity Sewer 18 inch	34,879	LF	\$ 6,525	\$ 227,583,518	
	Gravity Sewer 24 inch	-	LF	\$ 8,700	\$ -	
	Gravity Sewer 30 inch	-	LF	\$ 10,875	\$ -	
	Gravity Sewer 36 inch	-	LF	\$ 13,050	\$ -	
	Gravity Sewer 42 inch	-	LF	\$ 15,200	\$ -	
	Force main 4 inch	-	LF	\$ 600	\$ -	
	Force main 6 inch	75,828	LF	\$ 900	\$ 68,244,903	
	Force main 8 inch	-	LF	\$ 1,600	\$ -	
	Force main 10 inch	9,435	LF	\$ 1,700	\$ 16,039,500	
	Force main 12 inch	-	LF	\$ 3,070	\$ -	
	Force main 14 inch	-	LF	\$ 4,430	\$ -	
	Force main 16 inch	-	LF	\$ 5,800	\$ -	
	Force main 18 inch	-	LF	\$ 6,525	\$ -	
	Force main 24 inch	-	LF	\$ 8,700	\$ -	
	Force main 30 inch	-	LF	\$ 10,875	\$ -	
	Force main 36 inch	-	LF	\$ 13,050	\$ -	
	Force main 42 inch	-	LF	\$ 15,200	\$ -	
	Regional PS	14	EA	\$ 7,000,000	\$ 98,000,000	
	Neighborhood PS	45	EA	\$ 1,200,000	\$ 54,000,000	
	COH WWTPs (3 total), level of treatment - R1		LS	\$ 39,189,540	\$ 39,189,540	
	Subtotal of Estimated Construction Cost				\$ 922,814,522	
	Right of Way	378	Ac	\$ 20,000	\$ 7,562,979	
	Contingency	20%			\$ 186,075,500	
	Total Estimated Project Cost				\$ 1,116,453,001	
	Project services		20%		\$ 223,290,600	
	TOTAL CAPITAL COST				\$ 1,339,744,000	

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$289,548
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$127,410

Annual O&M

\$416,958

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 431,027		\$431,027
2		\$ 445,571		\$445,571
3		\$ 460,606		\$460,606
4		\$ 476,149		\$476,149
5		\$ 492,215		\$492,215
6		\$ 508,824		\$508,824
7		\$ 525,993		\$525,993
8		\$ 543,742		\$543,742
9		\$ 562,090		\$562,090
10		\$ 581,056		\$581,056
11		\$ 600,663		\$600,663
12		\$ 620,931		\$620,931
13		\$ 641,883		\$641,883
14		\$ 663,542		\$663,542
15		\$ 685,932		\$685,932
16		\$ 709,077		\$709,077
17		\$ 733,004		\$733,004
18		\$ 757,738		\$757,738
19		\$ 783,306		\$783,306
20		\$ 809,737		\$809,737
21		\$ 837,060	\$ 115,146,269	\$115,983,329
22		\$ 865,305		\$865,305
23		\$ 894,503	\$ 3,893,512	\$4,788,015
24		\$ 924,686		\$924,686
25		\$ 955,888		\$955,888
26		\$ 988,143		\$988,143
27		\$ 1,021,485		\$1,021,485
28		\$ 1,055,954		\$1,055,954
29		\$ 1,091,585		\$1,091,585
30		\$ 1,128,418		\$1,128,418

Present value of O&M

\$73,192,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 57,356,862	\$ 133,832,678	\$ 731,624,982	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$30,968,000	\$57,806,000	\$474,017,000	\$562,791,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

850,145,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2A	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waimea Area							
- 3 COH WWTPs	Gravity Sewer 8 inch	169,204	LF			\$ 1,600	\$ 270,726,400
- East Waimea WWTP	Gravity Sewer 12 inch	2,113	LF			\$ 3,070	\$ 6,486,726
- Waimea Town WWTP	Gravity Sewer 16 inch	6,544	LF			\$ 5,800	\$ 37,954,272
- West Waimea WWTP	Gravity Sewer 18 inch	29,833	LF			\$ 6,525	\$ 194,663,327
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	37,885	LF			\$ 900	\$ 34,096,878
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch	9,435	LF			\$ 1,700	\$ 16,039,500
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	33	EA			\$ 1,200,000	\$ 39,600,000
	COH WWTPs (3 total), level of treatment - R1		LS			\$ 39,189,540	\$ 39,189,540
	Subtotal of Estimated Construction Cost						\$ 666,756,642
	Right of Way	267	Ac			\$ 20,000	\$ 5,345,696
	Contingency	20%					\$ 134,420,468
	Total Estimated Project Cost						\$ 806,522,806
	Project services		20%				\$ 161,304,561
	TOTAL CAPITAL COST						\$ 967,827,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$231,056
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$127,410
Annual O&M					\$358,466

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 370,561		\$370,561
2		\$ 383,065		\$383,065
3		\$ 395,991		\$395,991
4		\$ 409,353		\$409,353
5		\$ 423,166		\$423,166
6		\$ 437,445		\$437,445
7		\$ 452,205		\$452,205
8		\$ 467,464		\$467,464
9		\$ 483,238		\$483,238
10		\$ 499,544		\$499,544
11		\$ 516,400		\$516,400
12		\$ 533,825		\$533,825
13		\$ 551,838		\$551,838
14		\$ 570,458		\$570,458
15		\$ 589,707		\$589,707
16		\$ 609,606		\$609,606
17		\$ 630,176		\$630,176
18		\$ 651,440		\$651,440
19		\$ 673,421		\$673,421
20		\$ 696,145		\$696,145
21		\$ 719,635	\$ 64,315,324	\$65,034,958
22		\$ 743,917		\$743,917
23		\$ 769,019	\$ 2,907,719	\$3,676,739
24		\$ 794,968		\$794,968
25		\$ 821,793		\$821,793
26		\$ 849,523		\$849,523
27		\$ 878,188		\$878,188
28		\$ 907,821		\$907,821
29		\$ 938,454		\$938,454
30		\$ 970,120		\$970,120

Present value of O&M

\$45,035,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 32,036,862	\$ 74,752,678	\$ 559,967,102	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$17,297,000	\$32,288,000	\$362,801,000	\$412,386,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

600,476,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2A	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area	Gravity Sewer 8 inch	26,308	LF			\$ 1,600	\$ 42,092,960
- To exist. S. Kohala	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
WRF	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	5,045	LF			\$ 6,525	\$ 32,920,191
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch		LF			\$ 600	\$ -
	Force main 6 inch	23,440	LF			\$ 900	\$ 21,095,658
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Regional PS	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	8	EA			\$ 1,200,000	\$ 9,600,000
			LS			\$ -	\$ -
	Subtotal of Estimated Construction Cost					\$ 154,708,809	
	Right of Way	58	Ac			\$ 20,000	\$ 1,161,257
	Contingency	20%				\$ -	\$ 31,174,013
	Total Estimated Project Cost					\$ -	\$ 187,044,080
	Project services		20%			\$ -	\$ 37,408,816
	TOTAL CAPITAL COST						\$ 224,453,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$42,964
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$0

Annual O&M

\$42,964

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 44,414		\$44,414
2		\$ 45,913		\$45,913
3		\$ 47,462		\$47,462
4		\$ 49,063		\$49,063
5		\$ 50,719		\$50,719
6		\$ 52,430		\$52,430
7		\$ 54,199		\$54,199
8		\$ 56,028		\$56,028
9		\$ 57,919		\$57,919
10		\$ 59,873		\$59,873
11		\$ 61,893		\$61,893
12		\$ 63,982		\$63,982
13		\$ 66,141		\$66,141
14		\$ 68,373		\$68,373
15		\$ 70,680		\$70,680
16		\$ 73,065		\$73,065
17		\$ 75,530		\$75,530
18		\$ 78,079		\$78,079
19		\$ 80,713		\$80,713
20		\$ 83,437		\$83,437
21		\$ 86,252	\$ 35,292,576	\$35,378,828
22		\$ 89,163		\$89,163
23		\$ 92,171	\$ 438,947	\$531,118
24		\$ 95,281		\$95,281
25		\$ 98,497		\$98,497
26		\$ 101,820		\$101,820
27		\$ 105,256		\$105,256
28		\$ 108,807		\$108,807
29		\$ 112,479		\$112,479
30		\$ 116,274		\$116,274

Present value of O&M

\$19,503,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 17,580,000	\$ 41,020,000	\$ 96,108,809	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$9,492,000	\$17,718,000	\$62,269,000	\$89,479,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

154,477,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2A	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area							
- To exist. Mauna Lani							
WWTP	Gravity Sewer 8 inch	17,791	LF			\$ 1,600	\$ 28,465,520
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	12,266	LF			\$ 900	\$ 11,039,004
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	3	EA			\$ 7,000,000	\$ 21,000,000
	Neighborhood PS	3	EA			\$ 1,200,000	\$ 3,600,000
			LS			\$ -	
	Subtotal of Estimated Construction Cost						\$ 64,104,524
	Right of Way	31	Ac			\$ 20,000	\$ 613,985
	Contingency	20%					\$ 12,943,702
	Total Estimated Project Cost						\$ 77,662,211
	Project services		20%				\$ 15,532,442
	TOTAL CAPITAL COST						\$ 93,195,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$14,209
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$0
Annual O&M					\$14,209

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 14,689		\$14,689
2		\$ 15,185		\$15,185
3		\$ 15,697		\$15,697
4		\$ 16,227		\$16,227
5		\$ 16,774		\$16,774
6		\$ 17,340		\$17,340
7		\$ 17,925		\$17,925
8		\$ 18,530		\$18,530
9		\$ 19,155		\$19,155
10		\$ 19,802		\$19,802
11		\$ 20,470		\$20,470
12		\$ 21,161		\$21,161
13		\$ 21,875		\$21,875
14		\$ 22,613		\$22,613
15		\$ 23,376		\$23,376
16		\$ 24,165		\$24,165
17		\$ 24,980		\$24,980
18		\$ 25,823		\$25,823
19		\$ 26,694		\$26,694
20		\$ 27,595		\$27,595
21		\$ 28,526	\$ 14,815,655	\$14,844,181
22		\$ 29,489		\$29,489
23		\$ 30,484	\$ 249,073	\$279,557
24		\$ 31,512		\$31,512
25		\$ 32,576		\$32,576
26		\$ 33,675		\$33,675
27		\$ 34,811		\$34,811
28		\$ 35,986		\$35,986
29		\$ 37,200		\$37,200
30		\$ 38,455		\$38,455
Present value of O&M				\$8,102,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 7,380,000	\$ 17,220,000	\$ 39,504,524	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,985,000	\$7,438,000	\$25,595,000	\$37,018,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

64,279,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2A	DESCRIPTION Level of Treatment - R1	QUAN	UN			TOTAL DIRECT COST
					UNIT COST	
Waikoloa Area	Gravity Sewer 8 inch	21,269	LF		\$ 1,600	\$ 34,031,184
- To exist. Waikoloa Village WWTP	Gravity Sewer 12 inch		LF		\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF		\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF		\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF		\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF		\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF		\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF		\$ 15,200	\$ -
	Force main 4 inch	-	LF		\$ 600	\$ -
	Force main 6 inch	2,237	LF		\$ 900	\$ 2,013,363
	Force main 8 inch		LF		\$ 1,600	\$ -
	Force main 10 inch		LF		\$ 1,700	\$ -
	Force main 12 inch		LF		\$ 3,070	\$ -
	Force main 14 inch	-	LF		\$ 4,430	\$ -
	Force main 16 inch	-	LF		\$ 5,800	\$ -
	Force main 18 inch	-	LF		\$ 6,525	\$ -
	Force main 24 inch	-	LF		\$ 8,700	\$ -
	Force main 30 inch	-	LF		\$ 10,875	\$ -
	Force main 36 inch	-	LF		\$ 13,050	\$ -
	Force main 42 inch	-	LF		\$ 15,200	\$ -
	Regional PS	-	EA		\$ 7,000,000	\$ -
	Neighborhood PS	1	EA		\$ 1,200,000	\$ 1,200,000
			LS			\$ -
	Subtotal of Estimated Construction Cost					\$ 37,244,547
	Right of Way	22	Ac		\$ 20,000	\$ 442,040
	Contingency	20%				\$ 7,537,317
	Total Estimated Project Cost					\$ 45,223,904
	Project services		20%			\$ 9,044,781
	TOTAL CAPITAL COST					\$ 54,269,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$1,319
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$0

Annual O&M \$1,319

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 1,363		\$1,363
2		\$ 1,409		\$1,409
3		\$ 1,457		\$1,457
4		\$ 1,506		\$1,506
5		\$ 1,557		\$1,557
6		\$ 1,609		\$1,609
7		\$ 1,663		\$1,663
8		\$ 1,720		\$1,720
9		\$ 1,778		\$1,778
10		\$ 1,838		\$1,838
11		\$ 1,900		\$1,900
12		\$ 1,964		\$1,964
13		\$ 2,030		\$2,030
14		\$ 2,098		\$2,098
15		\$ 2,169		\$2,169
16		\$ 2,242		\$2,242
17		\$ 2,318		\$2,318
18		\$ 2,396		\$2,396
19		\$ 2,477		\$2,477
20		\$ 2,561		\$2,561
21		\$ 2,647	\$ 722,715	\$725,362
22		\$ 2,736		\$2,736
23		\$ 2,829	\$ 297,773	\$300,602
24		\$ 2,924		\$2,924
25		\$ 3,023		\$3,023
26		\$ 3,125		\$3,125
27		\$ 3,230		\$3,230
28		\$ 3,339		\$3,339
29		\$ 3,452		\$3,452
30		\$ 3,569		\$3,569

Present value of O&M \$551,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 360,000	\$ 840,000	\$ 36,044,547	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$194,000	\$363,000	\$23,353,000	\$23,910,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

30,910,000

G-6: Alternative 2B Construction Cost and LCC Analysis

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2B	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Includes three COH Plant, Urban Sewering w/ Private and County Plants, both gravity sewers and LPS to reduce the number of neighborhood pump stations.	Gravity Sewer 8 inch	159,737	LF			\$ 1,600	\$ 255,579,008
	Gravity Sewer 12 inch	2,113	LF			\$ 3,070	\$ 6,486,726
	Gravity Sewer 16 inch	6,544	LF			\$ 5,800	\$ 37,954,272
	Gravity Sewer 18 inch	34,879	LF			\$ 6,525	\$ 227,583,518
	Gravity Sewer 24 inch	-	LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	34,705	LF			\$ 900	\$ 31,234,869
	Force main 8 inch	-	LF			\$ 1,600	\$ -
	Force main 10 inch	9,435	LF			\$ 1,700	\$ 16,039,500
	Force main 12 inch	-	LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	75,508	LF			\$ 450	\$ 33,978,618
	Low pressure sewer (On-Lot)	1,879	EA			\$ 26,000	\$ 48,854,000
	Regional PS (including exist. PS that receives additional flow)	12	EA			\$ 7,000,000	\$ 84,000,000
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
	COH WWTPs (3 total), level of treatment - R3		LS			\$ 28,200,000	\$ 28,200,000
	Subtotal of Estimated Construction Cost						\$ 771,110,510
	Right of Way	317	Ac			\$ 20,000	\$ 6,344,891
	Contingency	20%					\$ 155,491,080
	Total Estimated Project Cost						\$ 932,946,481
	Project services		20%				\$ 186,589,296
	TOTAL CAPITAL COST						\$ 1,119,536,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	402497	kWH	\$ 0.44	\$177,099
	Labor and Materials	\$ 1,063,246	LS	-	\$1,063,246

Annual O&M
\$1,240,345

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 1,282,198		\$1,282,198
2		\$ 1,325,463		\$1,325,463
3		\$ 1,370,188		\$1,370,188
4		\$ 1,416,423		\$1,416,423
5		\$ 1,464,217		\$1,464,217
6		\$ 1,513,624		\$1,513,624
7		\$ 1,564,698		\$1,564,698
8		\$ 1,617,496		\$1,617,496
9		\$ 1,672,075		\$1,672,075
10		\$ 1,728,496		\$1,728,496
11		\$ 1,786,821		\$1,786,821
12		\$ 1,847,114		\$1,847,114
13		\$ 1,909,441		\$1,909,441
14		\$ 1,973,871		\$1,973,871
15		\$ 2,040,476		\$2,040,476
16		\$ 2,109,327		\$2,109,327
17		\$ 2,180,502		\$2,180,502
18		\$ 2,254,079		\$2,254,079
19		\$ 2,330,139		\$2,330,139
20		\$ 2,408,765		\$2,408,765
21		\$ 2,490,044	\$ 97,719,482	\$100,209,526
22		\$ 2,574,065		\$2,574,065
23		\$ 2,660,922	\$ 2,845,813	\$5,506,735
24		\$ 2,750,710		\$2,750,710
25		\$ 2,843,527		\$2,843,527
26		\$ 2,939,476		\$2,939,476
27		\$ 3,038,663		\$3,038,663
28		\$ 3,141,197		\$3,141,197
29		\$ 3,247,190		\$3,247,190
30		\$ 3,356,760		\$3,356,760

Present value of O&M
\$88,738,000
Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 48,676,200	\$ 113,577,800	\$ 608,856,510	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$26,281,000	\$49,058,000	\$394,476,000	\$469,815,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)
738,459,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2B	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waimea Area							
- 3 COH WWTPs	Gravity Sewer 8 inch	121,916	LF			\$ 1,600	\$ 195,066,384
- East Waimea WWTP	Gravity Sewer 12 inch	2,113	LF			\$ 3,070	\$ 6,486,726
- Waimea Town WWTP	Gravity Sewer 16 inch	6,544	LF			\$ 5,800	\$ 37,954,272
- West Waimea WWTP	Gravity Sewer 18 inch	29,833	LF			\$ 6,525	\$ 194,663,327
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	6,217	LF			\$ 900	\$ 5,595,048
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch	9,435	LF			\$ 1,700	\$ 16,039,500
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	47,288	LF			\$ 450	\$ 21,279,380
	Low pressure sewer (On-Lot)	1,336	EA			\$ 26,000	\$ 34,736,000
	Regional PS (inclding exist. PS that receives additional flow)	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	-	EA			\$ 1,200,000	\$ -
	COH WWTPs (3 total), level of treatment - R3		LS			\$ 28,200,000	\$ 28,200,000
	Subtotal of Estimated Construction Cost						\$ 568,020,636
	Right of Way	221	Ac			\$ 20,000	\$ 4,423,176
	Contingency	20%					\$ 114,488,762
	Total Estimated Project Cost						\$ 686,932,575
	Project services	20%					\$ 137,386,515
	TOTAL CAPITAL COST						\$ 824,319,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	346228	kwh	\$ 0.44	\$152,340
	Labor and Materials	\$ 751,329	LS	-	\$751,329

Annual O&M

\$903,670

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 934,162		\$934,162
2		\$ 965,684		\$965,684
3		\$ 998,269		\$998,269
4		\$ 1,031,954		\$1,031,954
5		\$ 1,066,775		\$1,066,775
6		\$ 1,102,771		\$1,102,771
7		\$ 1,139,982		\$1,139,982
8		\$ 1,178,448		\$1,178,448
9		\$ 1,218,213		\$1,218,213
10		\$ 1,259,319		\$1,259,319
11		\$ 1,301,812		\$1,301,812
12		\$ 1,345,739		\$1,345,739
13		\$ 1,391,149		\$1,391,149
14		\$ 1,438,090		\$1,438,090
15		\$ 1,486,616		\$1,486,616
16		\$ 1,536,779		\$1,536,779
17		\$ 1,588,634		\$1,588,634
18		\$ 1,642,240		\$1,642,240
19		\$ 1,697,654		\$1,697,654
20		\$ 1,754,938		\$1,754,938
21		\$ 1,814,155	\$ 54,767,333	\$56,581,487
22		\$ 1,875,370		\$1,875,370
23		\$ 1,938,650	\$ 2,245,694	\$4,184,345
24		\$ 2,004,066		\$2,004,066
25		\$ 2,071,690		\$2,071,690
26		\$ 2,141,595		\$2,141,595
27		\$ 2,213,859		\$2,213,859
28		\$ 2,288,561		\$2,288,561
29		\$ 2,365,784		\$2,365,784
30		\$ 2,445,613		\$2,445,613

Present value of O&M \$56,359,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 27,280,800	\$ 63,655,200	\$ 477,084,636	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$14,729,000	\$27,495,000	\$309,101,000	\$351,325,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

529,353,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2B	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area							
- To exist. S. Kohala							
WRF	Gravity Sewer 8 inch	18,788	LF			\$ 1,600	\$ 30,060,752
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	5,045	LF			\$ 6,525	\$ 32,920,191
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	19,564	LF			\$ 900	\$ 17,607,339
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	7,490	LF			\$ 450	\$ 3,370,559
	Low pressure sewer (On-Lot)	212	EA			\$ 26,000	\$ 5,512,000
	Regional PS (including exist. PS that receives additional flow)	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	-	EA LS			\$ 1,200,000	\$ -
						\$	\$ -
	Subtotal of Estimated Construction Cost						\$ 138,470,841
	Right of Way	50	Ac			\$ 20,000	\$ 1,006,879
	Contingency	20%					\$ 27,895,544
	Total Estimated Project Cost						\$ 167,373,263
	Project services		20%				\$ 33,474,653
	TOTAL CAPITAL COST						\$ 200,848,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	46921	kWH	\$ 0.44	\$20,645
	Labor and Materials	\$ 125,396	LS	-	\$125,396

Annual O&M

\$146,041

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 150,969		\$150,969
2		\$ 156,063		\$156,063
3		\$ 161,329		\$161,329
4		\$ 166,773		\$166,773
5		\$ 172,401		\$172,401
6		\$ 178,218		\$178,218
7		\$ 184,232		\$184,232
8		\$ 190,448		\$190,448
9		\$ 196,874		\$196,874
10		\$ 203,517		\$203,517
11		\$ 210,385		\$210,385
12		\$ 217,484		\$217,484
13		\$ 224,822		\$224,822
14		\$ 232,409		\$232,409
15		\$ 240,251		\$240,251
16		\$ 248,357		\$248,357
17		\$ 256,738		\$256,738
18		\$ 265,401		\$265,401
19		\$ 274,356		\$274,356
20		\$ 283,614		\$283,614
21		\$ 293,184	\$ 32,830,527	\$33,123,711
22		\$ 303,077		\$303,077
23		\$ 313,304	\$ 333,665	\$646,969
24		\$ 323,875		\$323,875
25		\$ 334,804		\$334,804
26		\$ 346,101		\$346,101
27		\$ 357,780		\$357,780
28		\$ 369,852		\$369,852
29		\$ 382,332		\$382,332
30		\$ 395,233		\$395,233

Present value of O&M

\$21,319,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 16,353,600	\$ 38,158,400	\$ 83,958,841	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$8,830,000	\$16,482,000	\$54,397,000	\$79,709,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**142,458,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2B	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area							
- To exist. Mauna Lani							
WWTP	Gravity Sewer 8 inch	0	LF			\$ 1,600	\$ -
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	8,925	LF			\$ 900	\$ 8,032,482
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	18,493	LF			\$ 450	\$ 8,321,999
	Low pressure sewer (On-Lot)	268	EA			\$ 26,000	\$ 6,968,000
	Regional PS (including exist. PS that receives additional flow)	1	EA			\$ 7,000,000	\$ 7,000,000
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
			LS			\$ -	
	Subtotal of Estimated Construction Cost						\$ 31,522,481
	Right of Way	26	Ac			\$ 20,000	\$ 524,211
	Contingency	20%					\$ 6,409,338
	Total Estimated Project Cost						\$ 38,456,030
	Project services		20%				\$ 7,691,206
	TOTAL CAPITAL COST						\$ 46,147,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	9348	kWH	\$ 0.44	\$4,113
	Labor and Materials	\$ 152,745	LS	-	\$152,745

Annual O&M

\$156,858

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 162,151		\$162,151
2		\$ 167,623		\$167,623
3		\$ 173,279		\$173,279
4		\$ 179,126		\$179,126
5		\$ 185,170		\$185,170
6		\$ 191,418		\$191,418
7		\$ 197,877		\$197,877
8		\$ 204,554		\$204,554
9		\$ 211,456		\$211,456
10		\$ 218,592		\$218,592
11		\$ 225,968		\$225,968
12		\$ 233,592		\$233,592
13		\$ 241,474		\$241,474
14		\$ 249,623		\$249,623
15		\$ 258,046		\$258,046
16		\$ 266,753		\$266,753
17		\$ 275,754		\$275,754
18		\$ 285,059		\$285,059
19		\$ 294,677		\$294,677
20		\$ 304,621		\$304,621
21		\$ 314,900	\$ 9,135,116	\$9,450,015
22		\$ 325,525		\$325,525
23		\$ 336,509	\$ -	\$336,509
24		\$ 347,864		\$347,864
25		\$ 359,602		\$359,602
26		\$ 371,736		\$371,736
27		\$ 384,280		\$384,280
28		\$ 397,247		\$397,247
29		\$ 410,651		\$410,651
30		\$ 424,508		\$424,508

Present value of O&M \$9,407,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 4,550,400	\$ 10,617,600	\$ 16,354,481	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$2,457,000	\$4,586,000	\$10,596,000	\$17,639,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

37,915,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2B	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikoloa Area							
- To exist. Waikoloa							
Village WWTP	Gravity Sewer 8 inch	19,032	LF			\$ 1,600	\$ 30,451,872
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	-	LF			\$ 900	\$ -
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	2,237	LF			\$ 450	\$ 1,006,682
	Low pressure sewer (On-Lot)	63	EA			\$ 26,000	\$ 1,638,000
	Regional PS (including exist. PS that receives additional flow)	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS		EA			\$ 1,200,000	\$ -
			LS			\$	\$ -
	Subtotal of Estimated Construction Cost						\$ 33,096,554
	Right of Way	20	Ac			\$ 20,000	\$ 390,624
	Contingency	20%					\$ 6,697,436
	Total Estimated Project Cost						\$ 40,184,613
	Project services		20%				\$ 8,036,923
	TOTAL CAPITAL COST						\$ 48,222,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	0	kWH	\$ 0.44	\$0
	Labor and Materials	\$ 33,775	LS	-	\$33,775

Annual O&M

\$33,775

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 34,915		\$34,915
2		\$ 36,093		\$36,093
3		\$ 37,311		\$37,311
4		\$ 38,570		\$38,570
5		\$ 39,872		\$39,872
6		\$ 41,217		\$41,217
7		\$ 42,608		\$42,608
8		\$ 44,045		\$44,045
9		\$ 45,532		\$45,532
10		\$ 47,068		\$47,068
11		\$ 48,656		\$48,656
12		\$ 50,298		\$50,298
13		\$ 51,995		\$51,995
14		\$ 53,750		\$53,750
15		\$ 55,563		\$55,563
16		\$ 57,438		\$57,438
17		\$ 59,376		\$59,376
18		\$ 61,380		\$61,380
19		\$ 63,451		\$63,451
20		\$ 65,592		\$65,592
21		\$ 67,806	\$ 986,506	\$1,054,311
22		\$ 70,093		\$70,093
23		\$ 72,459	\$ 266,454	\$338,913
24		\$ 74,904		\$74,904
25		\$ 77,431		\$77,431
26		\$ 80,044		\$80,044
27		\$ 82,745		\$82,745
28		\$ 85,537		\$85,537
29		\$ 88,423		\$88,423
30		\$ 91,407		\$91,407

Present value of O&M

\$1,653,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 491,400	\$ 1,146,600	\$ 31,458,554	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$265,000	\$495,000	\$20,382,000	\$21,142,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

28,733,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2B Includes three COH Plant, Urban Sewering w/ Private and County Plants, both gravity sewers and LPS to reduce the number of neighborhood pump stations.	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Gravity Sewer 8 inch		159,737	LF			\$ 1,600	\$ 255,579,008
Gravity Sewer 12 inch		2,113	LF			\$ 3,070	\$ 6,486,726
Gravity Sewer 16 inch		6,544	LF			\$ 5,800	\$ 37,954,272
Gravity Sewer 18 inch		34,879	LF			\$ 6,525	\$ 227,583,518
Gravity Sewer 24 inch		-	LF			\$ 8,700	\$ -
Gravity Sewer 30 inch		-	LF			\$ 10,875	\$ -
Gravity Sewer 36 inch		-	LF			\$ 13,050	\$ -
Gravity Sewer 42 inch		-	LF			\$ 15,200	\$ -
Force main 4 inch		-	LF			\$ 600	\$ -
Force main 6 inch		34,705	LF			\$ 900	\$ 31,234,869
Force main 8 inch		-	LF			\$ 1,600	\$ -
Force main 10 inch		9,435	LF			\$ 1,700	\$ 16,039,500
Force main 12 inch		-	LF			\$ 3,070	\$ -
Force main 14 inch		-	LF			\$ 4,430	\$ -
Force main 16 inch		-	LF			\$ 5,800	\$ -
Force main 18 inch		-	LF			\$ 6,525	\$ -
Force main 24 inch		-	LF			\$ 8,700	\$ -
Force main 30 inch		-	LF			\$ 10,875	\$ -
Force main 36 inch		-	LF			\$ 13,050	\$ -
Force main 42 inch		-	LF			\$ 15,200	\$ -
Low Pressure Sewer In-Street (3 inch average)		75,508	LF			\$ 450	\$ 33,978,618
Low pressure sewer (On-Lot)		1,879	EA			\$ 26,000	\$ 48,854,000
Regional PS (including exist. PS that receives additional flow)		12	EA			\$ 7,000,000	\$ 84,000,000
Neighborhood PS		1	EA			\$ 1,200,000	\$ 1,200,000
COH WWTPs (3 total), level of treatment - R2			LS			\$ 30,145,800	\$ 30,145,800
Subtotal of Estimated Construction Cost							\$ 773,056,310
Right of Way				317	Ac	\$ 20,000	\$ 6,344,891
Contingency				20%			\$ 155,880,240
Total Estimated Project Cost							\$ 935,281,441
Project services				20%			\$ 187,056,288
TOTAL CAPITAL COST							\$ 1,122,338,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$1,240,345
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$109,740
Annual O&M					\$1,350,085

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 1,395,641		\$1,395,641
2		\$ 1,442,734		\$1,442,734
3		\$ 1,491,416		\$1,491,416
4		\$ 1,541,741		\$1,541,741
5		\$ 1,593,764		\$1,593,764
6		\$ 1,647,543		\$1,647,543
7		\$ 1,703,136		\$1,703,136
8		\$ 1,760,605		\$1,760,605
9		\$ 1,820,013		\$1,820,013
10		\$ 1,881,426		\$1,881,426
11		\$ 1,944,911		\$1,944,911
12		\$ 2,010,538		\$2,010,538
13		\$ 2,078,379		\$2,078,379
14		\$ 2,148,510		\$2,148,510
15		\$ 2,221,007		\$2,221,007
16		\$ 2,295,951		\$2,295,951
17		\$ 2,373,423		\$2,373,423
18		\$ 2,453,510		\$2,453,510
19		\$ 2,536,299		\$2,536,299
20		\$ 2,621,881		\$2,621,881
21		\$ 2,710,351	\$ 98,891,364	\$101,601,715
22		\$ 2,801,807		\$2,801,807
23		\$ 2,896,348	\$ 2,845,813	\$5,742,161
24		\$ 2,994,080		\$2,994,080
25		\$ 3,095,109		\$3,095,109
26		\$ 3,199,547		\$3,199,547
27		\$ 3,307,510		\$3,307,510
28		\$ 3,419,115		\$3,419,115
29		\$ 3,534,487		\$3,534,487
30		\$ 3,653,751		\$3,653,751

Present value of O&M

\$92,658,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 49,259,940	\$ 114,939,860	\$ 608,856,510	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$26,596,000	\$49,646,000	\$394,476,000	\$470,718,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

744,278,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2B Waimea Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
- 3 COH WWTPs							
- East Waimea WWTP	Gravity Sewer 8 inch	121,916	LF			\$ 1,600	\$ 195,066,384
- Waimea Town WWTP	Gravity Sewer 12 inch	2,113	LF			\$ 3,070	\$ 6,486,726
- West Waimea WWTP	Gravity Sewer 16 inch	6,544	LF			\$ 5,800	\$ 37,954,272
	Gravity Sewer 18 inch	29,833	LF			\$ 6,525	\$ 194,663,327
	Gravity Sewer 24 inch	-	LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	6,217	LF			\$ 900	\$ 5,595,048
	Force main 8 inch	-	LF			\$ 1,600	\$ -
	Force main 10 inch	9,435	LF			\$ 1,700	\$ 16,039,500
	Force main 12 inch	-	LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	47,288	LF			\$ 450	\$ 21,279,380
	Low pressure sewer (On-Lot)	1,336	EA			\$ 26,000	\$ 34,736,000
	Regional PS (including exist. PS that receives additional flow)	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	-	EA			\$ 1,200,000	\$ -
	COH WWTPs (3 total), level of treatment - R2	-	LS			\$ 30,145,800	\$ 30,145,800
	Subtotal of Estimated Construction Cost						\$ 569,966,436
	Right of Way	221	Ac			\$ 20,000	\$ 4,423,176
	Contingency	20%					\$ 114,877,922
	Total Estimated Project Cost						\$ 689,267,535
	Project services		20%				\$ 137,853,507
	TOTAL CAPITAL COST						\$ 827,121,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$903,670
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$109,740

Annual O&M

\$1,013,410

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 1,047,605		\$1,047,605
2		\$ 1,082,955		\$1,082,955
3		\$ 1,119,497		\$1,119,497
4		\$ 1,157,272		\$1,157,272
5		\$ 1,196,322		\$1,196,322
6		\$ 1,236,690		\$1,236,690
7		\$ 1,278,419		\$1,278,419
8		\$ 1,321,557		\$1,321,557
9		\$ 1,366,150		\$1,366,150
10		\$ 1,412,248		\$1,412,248
11		\$ 1,459,902		\$1,459,902
12		\$ 1,509,163		\$1,509,163
13		\$ 1,560,087		\$1,560,087
14		\$ 1,612,729		\$1,612,729
15		\$ 1,667,148		\$1,667,148
16		\$ 1,723,402		\$1,723,402
17		\$ 1,781,555		\$1,781,555
18		\$ 1,841,670		\$1,841,670
19		\$ 1,903,814		\$1,903,814
20		\$ 1,968,054		\$1,968,054
21		\$ 2,034,462	\$ 55,939,215	\$57,973,677
22		\$ 2,103,111		\$2,103,111
23		\$ 2,174,076	\$ 2,245,694	\$4,419,771
24		\$ 2,247,436		\$2,247,436
25		\$ 2,323,272		\$2,323,272
26		\$ 2,401,666		\$2,401,666
27		\$ 2,482,705		\$2,482,705
28		\$ 2,566,479		\$2,566,479
29		\$ 2,653,080		\$2,653,080
30		\$ 2,742,603		\$2,742,603

Present value of O&M

\$60,280,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 27,864,540	\$ 65,017,260	\$ 477,084,636	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$15,044,000	\$28,083,000	\$309,101,000	\$352,228,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

535,173,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2B Kawaihae Area - To exist. S. Kohala WRF	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Gravity Sewer 8 inch		18,788	LF			\$ 1,600	\$ 30,060,752
Gravity Sewer 12 inch			LF			\$ 3,070	\$ -
Gravity Sewer 16 inch			LF			\$ 5,800	\$ -
Gravity Sewer 18 inch		5,045	LF			\$ 6,525	\$ 32,920,191
Gravity Sewer 24 inch			LF			\$ 8,700	\$ -
Gravity Sewer 30 inch		-	LF			\$ 10,875	\$ -
Gravity Sewer 36 inch		-	LF			\$ 13,050	\$ -
Gravity Sewer 42 inch		-	LF			\$ 15,200	\$ -
Force main 4 inch		-	LF			\$ 600	\$ -
Force main 6 inch		19,564	LF			\$ 900	\$ 17,607,339
Force main 8 inch			LF			\$ 1,600	\$ -
Force main 10 inch			LF			\$ 1,700	\$ -
Force main 12 inch			LF			\$ 3,070	\$ -
Force main 14 inch		-	LF			\$ 4,430	\$ -
Force main 16 inch		-	LF			\$ 5,800	\$ -
Force main 18 inch		-	LF			\$ 6,525	\$ -
Force main 24 inch		-	LF			\$ 8,700	\$ -
Force main 30 inch		-	LF			\$ 10,875	\$ -
Force main 36 inch		-	LF			\$ 13,050	\$ -
Force main 42 inch		-	LF			\$ 15,200	\$ -
Low Pressure Sewer In-Street (3 inch average)		7,490	LF			\$ 450	\$ 3,370,559
Low pressure sewer (On-Lot)		212	EA			\$ 26,000	\$ 5,512,000
Regional PS (including exist. PS that receives additional flow)		7	EA			\$ 7,000,000	\$ 49,000,000
Neighborhood PS		-	EA			\$ 1,200,000	\$ -
			LS			\$ -	\$ -
Subtotal of Estimated Construction Cost							\$ 138,470,841
Right of Way	50	Ac				\$ 20,000	\$ 1,006,879
Contingency	20%						\$ 27,895,544
Total Estimated Project Cost							\$ 167,373,263
Project services		20%					\$ 33,474,653
TOTAL CAPITAL COST							\$ 200,848,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$146,041
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$0

Annual O&M

\$146,041

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 150,969		\$150,969
2		\$ 156,063		\$156,063
3		\$ 161,329		\$161,329
4		\$ 166,773		\$166,773
5		\$ 172,401		\$172,401
6		\$ 178,218		\$178,218
7		\$ 184,232		\$184,232
8		\$ 190,448		\$190,448
9		\$ 196,874		\$196,874
10		\$ 203,517		\$203,517
11		\$ 210,385		\$210,385
12		\$ 217,484		\$217,484
13		\$ 224,822		\$224,822
14		\$ 232,409		\$232,409
15		\$ 240,251		\$240,251
16		\$ 248,357		\$248,357
17		\$ 256,738		\$256,738
18		\$ 265,401		\$265,401
19		\$ 274,356		\$274,356
20		\$ 283,614		\$283,614
21		\$ 293,184	\$ 32,830,527	\$33,123,711
22		\$ 303,077		\$303,077
23		\$ 313,304	\$ 333,665	\$646,969
24		\$ 323,875		\$323,875
25		\$ 334,804		\$334,804
26		\$ 346,101		\$346,101
27		\$ 357,780		\$357,780
28		\$ 369,852		\$369,852
29		\$ 382,332		\$382,332
30		\$ 395,233		\$395,233

Present value of O&M

\$21,319,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 16,353,600	\$ 38,158,400	\$ 83,958,841	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$8,830,000	\$16,482,000	\$54,397,000	\$79,709,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

142,458,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2B Puako Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
- To exist. Mauna Lani WWTP	Gravity Sewer 8 inch	0	LF			\$ 1,600	\$ -
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch		LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	8,925	LF			\$ 900	\$ 8,032,482
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	18,493	LF			\$ 450	\$ 8,321,999
	Low pressure sewer (On-Lot)	268	EA			\$ 26,000	\$ 6,968,000
	Regional PS (including exist. PS that receives additional flow)	1	EA			\$ 7,000,000	\$ 7,000,000
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
			LS			\$ -	
	Subtotal of Estimated Construction Cost					\$ 31,522,481	
	Right of Way	26	Ac			\$ 20,000	\$ 524,211
	Contingency	20%				\$ -	\$ 6,409,338
	Total Estimated Project Cost					\$ -	\$ 38,456,030
	Project services		20%			\$ -	\$ 7,691,206
	TOTAL CAPITAL COST						\$ 46,147,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$156,858
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$0

Annual O&M

\$156,858

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 162,151		\$162,151
2		\$ 167,623		\$167,623
3		\$ 173,279		\$173,279
4		\$ 179,126		\$179,126
5		\$ 185,170		\$185,170
6		\$ 191,418		\$191,418
7		\$ 197,877		\$197,877
8		\$ 204,554		\$204,554
9		\$ 211,456		\$211,456
10		\$ 218,592		\$218,592
11		\$ 225,968		\$225,968
12		\$ 233,592		\$233,592
13		\$ 241,474		\$241,474
14		\$ 249,623		\$249,623
15		\$ 258,046		\$258,046
16		\$ 266,753		\$266,753
17		\$ 275,754		\$275,754
18		\$ 285,059		\$285,059
19		\$ 294,677		\$294,677
20		\$ 304,621		\$304,621
21		\$ 314,900	\$ 9,135,116	\$9,450,015
22		\$ 325,525		\$325,525
23		\$ 336,509	\$ -	\$336,509
24		\$ 347,864		\$347,864
25		\$ 359,602		\$359,602
26		\$ 371,736		\$371,736
27		\$ 384,280		\$384,280
28		\$ 397,247		\$397,247
29		\$ 410,651		\$410,651
30		\$ 424,508		\$424,508

Present value of O&M

\$9,407,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 4,550,400	\$ 10,617,600	\$ 16,354,481	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$2,457,000	\$4,586,000	\$10,596,000	\$17,639,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

37,915,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2B Waikoloa Area - To exist. Waikoloa Village WWTP	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Gravity Sewer 8 inch		19,032	LF			\$ 1,600	\$ 30,451,872
Gravity Sewer 12 inch			LF			\$ 3,070	\$ -
Gravity Sewer 16 inch			LF			\$ 5,800	\$ -
Gravity Sewer 18 inch			LF			\$ 6,525	\$ -
Gravity Sewer 24 inch			LF			\$ 8,700	\$ -
Gravity Sewer 30 inch			LF			\$ 10,875	\$ -
Gravity Sewer 36 inch			LF			\$ 13,050	\$ -
Gravity Sewer 42 inch			LF			\$ 15,200	\$ -
Force main 4 inch			LF			\$ 600	\$ -
Force main 6 inch			LF			\$ 900	\$ -
Force main 8 inch			LF			\$ 1,600	\$ -
Force main 10 inch			LF			\$ 1,700	\$ -
Force main 12 inch			LF			\$ 3,070	\$ -
Force main 14 inch			LF			\$ 4,430	\$ -
Force main 16 inch			LF			\$ 5,800	\$ -
Force main 18 inch			LF			\$ 6,525	\$ -
Force main 24 inch			LF			\$ 8,700	\$ -
Force main 30 inch			LF			\$ 10,875	\$ -
Force main 36 inch			LF			\$ 13,050	\$ -
Force main 42 inch			LF			\$ 15,200	\$ -
Low Pressure Sewer In-Street (3 inch average)		2,237	LF			\$ 450	\$ 1,006,682
Low pressure sewer (On-Lot)		63	EA			\$ 26,000	\$ 1,638,000
Regional PS (including exist. PS that receives additional flow)			EA			\$ 7,000,000	\$ -
Neighborhood PS			EA			\$ 1,200,000	\$ -
			LS			\$ -	\$ -
Subtotal of Estimated Construction Cost							\$ 33,096,554
Right of Way	20	Ac				\$ 20,000	\$ 390,624
Contingency	20%						\$ 6,697,436
Total Estimated Project Cost							\$ 40,184,613
Project services		20%					\$ 8,036,923
TOTAL CAPITAL COST							\$ 48,222,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$33,775
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$0

Annual O&M

\$33,775

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 34,915		\$34,915
2		\$ 36,093		\$36,093
3		\$ 37,311		\$37,311
4		\$ 38,570		\$38,570
5		\$ 39,872		\$39,872
6		\$ 41,217		\$41,217
7		\$ 42,608		\$42,608
8		\$ 44,045		\$44,045
9		\$ 45,532		\$45,532
10		\$ 47,068		\$47,068
11		\$ 48,656		\$48,656
12		\$ 50,298		\$50,298
13		\$ 51,995		\$51,995
14		\$ 53,750		\$53,750
15		\$ 55,563		\$55,563
16		\$ 57,438		\$57,438
17		\$ 59,376		\$59,376
18		\$ 61,380		\$61,380
19		\$ 63,451		\$63,451
20		\$ 65,592		\$65,592
21		\$ 67,806	\$ 986,506	\$1,054,311
22		\$ 70,093		\$70,093
23		\$ 72,459	\$ 266,454	\$338,913
24		\$ 74,904		\$74,904
25		\$ 77,431		\$77,431
26		\$ 80,044		\$80,044
27		\$ 82,745		\$82,745
28		\$ 85,537		\$85,537
29		\$ 88,423		\$88,423
30		\$ 91,407		\$91,407

Present value of O&M

\$1,653,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 491,400	\$ 1,146,600	\$ 31,458,554	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$265,000	\$495,000	\$20,382,000	\$21,142,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

28,733,000

Alternative 2B	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Includes three COH Plant, Urban Sewering w/ Private and County Plants, both gravity sewers and LPS to reduce the number of neighborhood pump stations.	Gravity Sewer 8 inch	159,737	LF			\$ 1,600	\$ 255,579,008
	Gravity Sewer 12 inch	2,113	LF			\$ 3,070	\$ 6,486,726
	Gravity Sewer 16 inch	6,544	LF			\$ 5,800	\$ 37,954,272
	Gravity Sewer 18 inch	34,879	LF			\$ 6,525	\$ 227,583,518
	Gravity Sewer 24 inch	-	LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	34,705	LF			\$ 900	\$ 31,234,869
	Force main 8 inch	-	LF			\$ 1,600	\$ -
	Force main 10 inch	9,435	LF			\$ 1,700	\$ 16,039,500
	Force main 12 inch	-	LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	75,508	LF			\$ 450	\$ 33,978,618
	Low pressure sewer (On-Lot)	1,879	EA			\$ 26,000	\$ 48,854,000
	Regional PS (including exist. PS that receives additional flow)	12	EA			\$ 7,000,000	\$ 84,000,000
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
	COH WWTPs (3 total), level of treatment - R1		LS			\$ 39,189,540	\$ 39,189,540
	Subtotal of Estimated Construction Cost						\$ 782,100,050
	Right of Way	317	Ac			\$ 20,000	\$ 6,344,891
	Contingency	20%					\$ 157,688,988
	Total Estimated Project Cost						\$ 946,133,929
	Project services		20%				\$ 189,226,786
	TOTAL CAPITAL COST						\$ 1,135,361,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$1,240,345
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$127,410

Annual O&M

\$1,367,755

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 1,413,907		\$1,413,907
2		\$ 1,461,617		\$1,461,617
3		\$ 1,510,936		\$1,510,936
4		\$ 1,561,920		\$1,561,920
5		\$ 1,614,623		\$1,614,623
6		\$ 1,669,106		\$1,669,106
7		\$ 1,725,426		\$1,725,426
8		\$ 1,783,648		\$1,783,648
9		\$ 1,843,833		\$1,843,833
10		\$ 1,906,050		\$1,906,050
11		\$ 1,970,366		\$1,970,366
12		\$ 2,036,852		\$2,036,852
13		\$ 2,105,581		\$2,105,581
14		\$ 2,176,630		\$2,176,630
15		\$ 2,250,076		\$2,250,076
16		\$ 2,326,000		\$2,326,000
17		\$ 2,404,487		\$2,404,487
18		\$ 2,485,621		\$2,485,621
19		\$ 2,569,494		\$2,569,494
20		\$ 2,656,196		\$2,656,196
21		\$ 2,745,824	\$ 104,338,069	\$107,083,893
22		\$ 2,838,477		\$2,838,477
23		\$ 2,934,256	\$ 2,845,813	\$5,780,069
24		\$ 3,033,266		\$3,033,266
25		\$ 3,135,618		\$3,135,618
26		\$ 3,241,423		\$3,241,423
27		\$ 3,350,799		\$3,350,799
28		\$ 3,463,865		\$3,463,865
29		\$ 3,580,746		\$3,580,746
30		\$ 3,701,571		\$3,701,571

Present value of O&M

\$95,970,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 51,973,062	\$ 121,270,478	\$ 608,856,510	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$28,061,000	\$52,380,000	\$394,476,000	\$474,917,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**756,414,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2B	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waimea Area							
- 3 COH WWTPs							
- East Waimea WWTP	Gravity Sewer 8 inch	121,916	LF			\$ 1,600	\$ 195,066,384
- Waimea Town WWTP	Gravity Sewer 12 inch	2,113	LF			\$ 3,070	\$ 6,486,726
- West Waimea WWTP	Gravity Sewer 16 inch	6,544	LF			\$ 5,800	\$ 37,954,272
	Gravity Sewer 18 inch	29,833	LF			\$ 6,525	\$ 194,663,327
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	6,217	LF			\$ 900	\$ 5,595,048
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch	9,435	LF			\$ 1,700	\$ 16,039,500
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	47,288	LF			\$ 450	\$ 21,279,380
	Low pressure sewer (On-Lot)	1,336	EA			\$ 26,000	\$ 34,736,000
	Regional PS (including exist. PS that receives additional flow)	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	-	EA			\$ 1,200,000	\$ -
	COH WWTPs (3 total), level of treatment - R1		LS			\$ 39,189,540	\$ 39,189,540
	Subtotal of Estimated Construction Cost						\$ 579,010,176
	Right of Way	221	Ac			\$ 20,000	\$ 4,423,176
	Contingency	20%					\$ 116,686,670
	Total Estimated Project Cost						\$ 700,120,023
	Project services		20%				\$ 140,024,005
	TOTAL CAPITAL COST						\$ 840,144,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$903,670
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$127,410

Annual O&M

\$1,031,080

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 1,065,872		\$1,065,872
2		\$ 1,101,837		\$1,101,837
3		\$ 1,139,017		\$1,139,017
4		\$ 1,177,451		\$1,177,451
5		\$ 1,217,181		\$1,217,181
6		\$ 1,258,253		\$1,258,253
7		\$ 1,300,710		\$1,300,710
8		\$ 1,344,600		\$1,344,600
9		\$ 1,389,971		\$1,389,971
10		\$ 1,436,873		\$1,436,873
11		\$ 1,485,357		\$1,485,357
12		\$ 1,535,477		\$1,535,477
13		\$ 1,587,289		\$1,587,289
14		\$ 1,640,849		\$1,640,849
15		\$ 1,696,216		\$1,696,216
16		\$ 1,753,452		\$1,753,452
17		\$ 1,812,619		\$1,812,619
18		\$ 1,873,782		\$1,873,782
19		\$ 1,937,009		\$1,937,009
20		\$ 2,002,369		\$2,002,369
21		\$ 2,069,935	\$ 61,385,919	\$63,455,855
				replace elec./ motorized equipment
22		\$ 2,139,781		\$2,139,781
23		\$ 2,211,984	\$ 2,245,694	\$4,457,678
				sewer inspection at yr 10 of service
24		\$ 2,286,623		\$2,286,623
25		\$ 2,363,781		\$2,363,781
26		\$ 2,443,542		\$2,443,542
27		\$ 2,525,994		\$2,525,994
28		\$ 2,611,229		\$2,611,229
29		\$ 2,699,340		\$2,699,340
30		\$ 2,790,424		\$2,790,424

Present value of O&M

\$63,592,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 30,577,662	\$ 71,347,878	\$ 477,084,636	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$16,509,000	\$30,817,000	\$309,101,000	\$356,427,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

547,309,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2B	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area							
- To exist. S. Kohala							
WRF	Gravity Sewer 8 inch	18,788	LF			\$ 1,600	\$ 30,060,752
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	5,045	LF			\$ 6,525	\$ 32,920,191
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	19,564	LF			\$ 900	\$ 17,607,339
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	7,490	LF			\$ 450	\$ 3,370,559
	Low pressure sewer (On-Lot)	212	EA			\$ 26,000	\$ 5,512,000
	Regional PS (including exist. PS that receives additional flow)	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	-	EA LS			\$ 1,200,000	\$ -
						\$	\$ -
	Subtotal of Estimated Construction Cost						\$ 138,470,841
	Right of Way	50	Ac			\$ 20,000	\$ 1,006,879
	Contingency	20%					\$ 27,895,544
	Total Estimated Project Cost						\$ 167,373,263
	Project services		20%				\$ 33,474,653
	TOTAL CAPITAL COST						\$ 200,848,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$146,041
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$0

Annual O&M

\$146,041

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 150,969		\$150,969
2		\$ 156,063		\$156,063
3		\$ 161,329		\$161,329
4		\$ 166,773		\$166,773
5		\$ 172,401		\$172,401
6		\$ 178,218		\$178,218
7		\$ 184,232		\$184,232
8		\$ 190,448		\$190,448
9		\$ 196,874		\$196,874
10		\$ 203,517		\$203,517
11		\$ 210,385		\$210,385
12		\$ 217,484		\$217,484
13		\$ 224,822		\$224,822
14		\$ 232,409		\$232,409
15		\$ 240,251		\$240,251
16		\$ 248,357		\$248,357
17		\$ 256,738		\$256,738
18		\$ 265,401		\$265,401
19		\$ 274,356		\$274,356
20		\$ 283,614		\$283,614
21		\$ 293,184	\$ 32,830,527	\$33,123,711
22		\$ 303,077		\$303,077
23		\$ 313,304	\$ 333,665	\$646,969
24		\$ 323,875		\$323,875
25		\$ 334,804		\$334,804
26		\$ 346,101		\$346,101
27		\$ 357,780		\$357,780
28		\$ 369,852		\$369,852
29		\$ 382,332		\$382,332
30		\$ 395,233		\$395,233

Present value of O&M

\$21,319,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 16,353,600	\$ 38,158,400	\$ 83,958,841	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$8,830,000	\$16,482,000	\$54,397,000	\$79,709,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**142,458,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2B	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area							
- To exist. Mauna Lani							
WWTP	Gravity Sewer 8 inch	0	LF			\$ 1,600	\$ -
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch		LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch		LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch		LF			\$ 15,200	\$ -
	Force main 4 inch		LF			\$ 600	\$ -
	Force main 6 inch	8,925	LF			\$ 900	\$ 8,032,482
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	18,493	LF			\$ 450	\$ 8,321,999
	Low pressure sewer (On-Lot)	268	EA			\$ 26,000	\$ 6,968,000
	Regional PS (including exist. PS that receives additional flow)	1	EA			\$ 7,000,000	\$ 7,000,000
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
			LS				\$ -
	Subtotal of Estimated Construction Cost						\$ 31,522,481
	Right of Way	26	Ac			\$ 20,000	\$ 524,211
	Contingency	20%					\$ 6,409,338
	Total Estimated Project Cost						\$ 38,456,030
	Project services		20%				\$ 7,691,206
	TOTAL CAPITAL COST						\$ 46,147,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$156,858
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$0

Annual O&M

\$156,858

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 162,151		\$162,151
2		\$ 167,623		\$167,623
3		\$ 173,279		\$173,279
4		\$ 179,126		\$179,126
5		\$ 185,170		\$185,170
6		\$ 191,418		\$191,418
7		\$ 197,877		\$197,877
8		\$ 204,554		\$204,554
9		\$ 211,456		\$211,456
10		\$ 218,592		\$218,592
11		\$ 225,968		\$225,968
12		\$ 233,592		\$233,592
13		\$ 241,474		\$241,474
14		\$ 249,623		\$249,623
15		\$ 258,046		\$258,046
16		\$ 266,753		\$266,753
17		\$ 275,754		\$275,754
18		\$ 285,059		\$285,059
19		\$ 294,677		\$294,677
20		\$ 304,621		\$304,621
21		\$ 314,900	\$ 9,135,116	\$9,450,015
22		\$ 325,525		\$325,525
23		\$ 336,509	\$ -	\$336,509
24		\$ 347,864		\$347,864
25		\$ 359,602		\$359,602
26		\$ 371,736		\$371,736
27		\$ 384,280		\$384,280
28		\$ 397,247		\$397,247
29		\$ 410,651		\$410,651
30		\$ 424,508		\$424,508

Present value of O&M

\$9,407,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 4,550,400	\$ 10,617,600	\$ 16,354,481	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$2,457,000	\$4,586,000	\$10,596,000	\$17,639,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

37,915,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2B	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikoloa Area - To exist. Waikoloa Village WWTP	Gravity Sewer 8 inch	19,032	LF			\$ 1,600	\$ 30,451,872
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	-	LF			\$ 900	\$ -
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	2,237	LF			\$ 450	\$ 1,006,682
	Low pressure sewer (On-Lot)	63	EA			\$ 26,000	\$ 1,638,000
	Regional PS (including exist. PS that receives additional flow)	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS		EA LS			\$ 1,200,000	\$ -
						\$	\$ -
	Subtotal of Estimated Construction Cost						\$ 33,096,554
	Right of Way	20	Ac			\$ 20,000	\$ 390,624
	Contingency	20%					\$ 6,697,436
	Total Estimated Project Cost						\$ 40,184,613
	Project services		20%				\$ 8,036,923
	TOTAL CAPITAL COST						\$ 48,222,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$33,775
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$0
Annual O&M					\$33,775

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 34,915		\$34,915
2		\$ 36,093		\$36,093
3		\$ 37,311		\$37,311
4		\$ 38,570		\$38,570
5		\$ 39,872		\$39,872
6		\$ 41,217		\$41,217
7		\$ 42,608		\$42,608
8		\$ 44,045		\$44,045
9		\$ 45,532		\$45,532
10		\$ 47,068		\$47,068
11		\$ 48,656		\$48,656
12		\$ 50,298		\$50,298
13		\$ 51,995		\$51,995
14		\$ 53,750		\$53,750
15		\$ 55,563		\$55,563
16		\$ 57,438		\$57,438
17		\$ 59,376		\$59,376
18		\$ 61,380		\$61,380
19		\$ 63,451		\$63,451
20		\$ 65,592		\$65,592
21		\$ 67,806	\$ 986,506	\$1,054,311
22		\$ 70,093		\$70,093
23		\$ 72,459	\$ 266,454	\$338,913
24		\$ 74,904		\$74,904
25		\$ 77,431		\$77,431
26		\$ 80,044		\$80,044
27		\$ 82,745		\$82,745
28		\$ 85,537		\$85,537
29		\$ 88,423		\$88,423
30		\$ 91,407		\$91,407
Present value of O&M				\$1,653,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 491,400	\$ 1,146,600	\$ 31,458,554	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$265,000	\$495,000	\$20,382,000	\$21,142,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

28,733,000

G-7: Alternative 2C Construction Cost and LCC Analysis

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2C	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Includes three COH Plant, Urban Sewering w/ Private and County Plants. All Gravity Sewers. Cross country sewers with new easements are used to reduce the number of pump stations. All current and future flow from Makai areas conveyed to existing private WWTPs. IWS for all low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to existing private WWPS or WWTP in Makai areas. COH sewers/WWPS from high density (commercial or <1 acre lots) from Mauka (Waimea) area to new COH WWTP.	Gravity Sewer 8 inch	248,186	LF			\$ 1,600	\$ 397,097,840
	Gravity Sewer 12 inch	2,113	LF			\$ 3,070	\$ 6,486,726
	Gravity Sewer 16 inch	6,544	LF			\$ 5,800	\$ 37,954,272
	Gravity Sewer 18 inch	34,879	LF			\$ 6,525	\$ 227,583,518
	Gravity Sewer 24 inch	-	LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	40,414	LF			\$ 900	\$ 36,373,032
	Force main 8 inch	-	LF			\$ 1,600	\$ -
	Force main 10 inch	9,435	LF			\$ 1,700	\$ 16,039,500
	Force main 12 inch	-	LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	14	EA			\$ 7,000,000	\$ 98,000,000
	Neighborhood PS	8	EA			\$ 1,200,000	\$ 9,600,000
	COH WWTPs (3 total), level of treatment - R3		LS			\$ 28,200,000	\$ 28,200,000
	Subtotal of Estimated Construction Cost					\$ 857,334,887	
	Right of Way	339	Ac			\$ 20,000	\$ 6,780,388
	Contingency	20%					\$ 172,823,055
	Total Estimated Project Cost						\$ 1,036,938,330
	Project services		20%				\$ 207,387,666
	TOTAL CAPITAL COST						\$ 1,244,326,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	430173	kWH	\$ 0.44	\$189,276
	Labor and Materials	51,484	LS	-	\$51,484

Annual O&M

\$240,760

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 248,884		\$248,884
2		\$ 257,282		\$257,282
3		\$ 265,964		\$265,964
4		\$ 274,938		\$274,938
5		\$ 284,215		\$284,215
6		\$ 293,805		\$293,805
7		\$ 303,719		\$303,719
8		\$ 313,968		\$313,968
9		\$ 324,562		\$324,562
10		\$ 335,514		\$335,514
11		\$ 346,835		\$346,835
12		\$ 358,538		\$358,538
13		\$ 370,636		\$370,636
14		\$ 383,143		\$383,143
15		\$ 396,071		\$396,071
16		\$ 409,436		\$409,436
17		\$ 423,251		\$423,251
18		\$ 437,533		\$437,533
19		\$ 452,297		\$452,297
20		\$ 467,559		\$467,559
21		\$ 483,336	\$ 81,787,233	\$82,270,568
22		\$ 499,645		\$499,645
23		\$ 516,504	\$ 4,084,103	\$4,600,607
24		\$ 533,933		\$533,933
25		\$ 551,949		\$551,949
26		\$ 570,574		\$570,574
27		\$ 589,827		\$589,827
28		\$ 609,729		\$609,729
29		\$ 630,303		\$630,303
30		\$ 651,572		\$651,572

Present value of O&M

\$50,942,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 40,740,000	\$ 95,060,000	\$ 721,534,887	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$21,996,000	\$41,059,000	\$467,480,000	\$530,535,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

764,733,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2C	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waimea Area							
- 3 COH WWTPs							
- East Waimea WWTP	Gravity Sewer 8 inch	181,535	LF			\$ 1,600	\$ 290,456,448
- Waimea Town WWTP	Gravity Sewer 12 inch	2,113	LF			\$ 3,070	\$ 6,486,726
- West Waimea WWTP	Gravity Sewer 16 inch	6,544	LF			\$ 5,800	\$ 37,954,272
	Gravity Sewer 18 inch	29,833	LF			\$ 6,525	\$ 194,663,327
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	9,159	LF			\$ 900	\$ 8,243,496
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch	9,435	LF			\$ 1,700	\$ 16,039,500
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	2	EA			\$ 1,200,000	\$ 2,400,000
	COH WWTPs (3 total), level of treatment - R3		LS			\$ 28,200,000	\$ 28,200,000
	Subtotal of Estimated Construction Cost						\$ 612,443,768
	Right of Way	236	Ac			\$ 20,000	\$ 4,724,352
	Contingency	20%					\$ 123,433,624
	Total Estimated Project Cost						\$ 740,601,744
	Project services		20%				\$ 148,120,349
	TOTAL CAPITAL COST						\$ 888,722,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	351727	kWH	\$ 0.44	\$154,760
	Labor and Materials	\$ 35,420	LS	-	\$35,420

Annual O&M

\$190,179

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 196,597		\$196,597
2		\$ 203,230		\$203,230
3		\$ 210,088		\$210,088
4		\$ 217,177		\$217,177
5		\$ 224,505		\$224,505
6		\$ 232,081		\$232,081
7		\$ 239,912		\$239,912
8		\$ 248,007		\$248,007
9		\$ 256,376		\$256,376
10		\$ 265,026		\$265,026
11		\$ 273,969		\$273,969
12		\$ 283,214		\$283,214
13		\$ 292,770		\$292,770
14		\$ 302,649		\$302,649
15		\$ 312,862		\$312,862
16		\$ 323,418		\$323,418
17		\$ 334,332		\$334,332
18		\$ 345,613		\$345,613
19		\$ 357,275		\$357,275
20		\$ 369,331		\$369,331
21		\$ 381,793	\$ 35,292,576	\$35,674,369
22		\$ 394,676		\$394,676
23		\$ 407,993	\$ 3,080,357	\$3,488,351
24		\$ 421,760		\$421,760
25		\$ 435,992		\$435,992
26		\$ 450,703		\$450,703
27		\$ 465,911		\$465,911
28		\$ 481,633		\$481,633
29		\$ 497,884		\$497,884
30		\$ 514,685		\$514,685

Present value of O&M

\$25,227,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 17,580,000	\$ 41,020,000	\$ 553,843,768	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$9,492,000	\$17,718,000	\$358,833,000	\$386,043,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

527,906,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2C	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area							
- To exist. S. Kohala							
WRF	Gravity Sewer 8 inch	25,985	LF			\$ 1,600	\$ 41,576,448
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	5,045	LF			\$ 6,525	\$ 32,920,191
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	18,989	LF			\$ 900	\$ 17,090,532
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	3	EA			\$ 1,200,000	\$ 3,600,000
			LS			\$	-
	Subtotal of Estimated Construction Cost						\$ 144,187,171
	Right of Way	51	Ac			\$ 20,000	\$ 1,021,947
	Contingency	20%					\$ 29,041,824
	Total Estimated Project Cost						\$ 174,250,941
	Project services		20%				\$ 34,850,188
	TOTAL CAPITAL COST						\$ 209,101,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	55169	kWH	\$ 0.44	\$24,274
	Labor and Materials	\$ 12,097	LS	-	\$12,097

Annual O&M

\$36,371

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 37,598		\$37,598
2		\$ 38,867		\$38,867
3		\$ 40,179		\$40,179
4		\$ 41,534		\$41,534
5		\$ 42,936		\$42,936
6		\$ 44,385		\$44,385
7		\$ 45,882		\$45,882
8		\$ 47,431		\$47,431
9		\$ 49,031		\$49,031
10		\$ 50,685		\$50,685
11		\$ 52,396		\$52,396
12		\$ 54,164		\$54,164
13		\$ 55,991		\$55,991
14		\$ 57,881		\$57,881
15		\$ 59,834		\$59,834
16		\$ 61,853		\$61,853
17		\$ 63,940		\$63,940
18		\$ 66,097		\$66,097
19		\$ 68,328		\$68,328
20		\$ 70,633		\$70,633
21		\$ 73,017	\$ 31,679,002	\$31,752,018
22		\$ 75,480		\$75,480
23		\$ 78,027	\$ 434,427	\$512,455
24		\$ 80,660		\$80,660
25		\$ 83,382		\$83,382
26		\$ 86,196		\$86,196
27		\$ 89,104		\$89,104
28		\$ 92,111		\$92,111
29		\$ 95,219		\$95,219
30		\$ 98,432		\$98,432

Present value of O&M

\$17,459,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 15,780,000	\$ 36,820,000	\$ 91,587,171	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$8,520,000	\$15,904,000	\$59,339,000	\$83,763,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

142,797,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2C	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area							
- To exist. Mauna Lani							
WWTP	Gravity Sewer 8 inch	17,791	LF			\$ 1,600	\$ 28,465,520
	Gravity Sewer 12 inch	-	LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch	-	LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	-	LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch	-	LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	12,266	LF			\$ 900	\$ 11,039,004
	Force main 8 inch	-	LF			\$ 1,600	\$ -
	Force main 10 inch	-	LF			\$ 1,700	\$ -
	Force main 12 inch	-	LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	3	EA			\$ 7,000,000	\$ 21,000,000
	Neighborhood PS	3	EA			\$ 1,200,000	\$ 3,600,000
			LS			\$ -	
	Subtotal of Estimated Construction Cost						\$ 64,104,524
	Right of Way	31	Ac			\$ 20,000	\$ 613,985
	Contingency	20%					\$ 12,943,702
	Total Estimated Project Cost						\$ 77,662,211
	Project services		20%				\$ 15,532,442
	TOTAL CAPITAL COST						\$ 93,195,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	23277	kWH	\$ 0.44	\$10,242
	Labor and Materials	\$ 3,967	LS	-	\$3,967

Annual O&M

\$14,209

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 14,689		\$14,689
2		\$ 15,185		\$15,185
3		\$ 15,697		\$15,697
4		\$ 16,227		\$16,227
5		\$ 16,774		\$16,774
6		\$ 17,340		\$17,340
7		\$ 17,925		\$17,925
8		\$ 18,530		\$18,530
9		\$ 19,155		\$19,155
10		\$ 19,802		\$19,802
11		\$ 20,470		\$20,470
12		\$ 21,161		\$21,161
13		\$ 21,875		\$21,875
14		\$ 22,613		\$22,613
15		\$ 23,376		\$23,376
16		\$ 24,165		\$24,165
17		\$ 24,980		\$24,980
18		\$ 25,823		\$25,823
19		\$ 26,694		\$26,694
20		\$ 27,595		\$27,595
21		\$ 28,526	\$ 14,815,655	\$14,844,181
22		\$ 29,489		\$29,489
23		\$ 30,484	\$ 249,073	\$279,557
24		\$ 31,512		\$31,512
25		\$ 32,576		\$32,576
26		\$ 33,675		\$33,675
27		\$ 34,811		\$34,811
28		\$ 35,986		\$35,986
29		\$ 37,200		\$37,200
30		\$ 38,455		\$38,455

Present value of O&M

\$8,102,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 7,380,000	\$ 17,220,000	\$ 39,504,524	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,985,000	\$7,438,000	\$25,595,000	\$37,018,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

64,279,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2C	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikoloa Area							
- To exist. Waikoloa							
Village WWTP	Gravity Sewer 8 inch	22,875	LF			\$ 1,600	\$ 36,599,424
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch		LF			\$ 900	\$ -
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS		EA			\$ 7,000,000	\$ -
	Neighborhood PS	-	EA			\$ 1,200,000	\$ -
			LS			\$	\$ -
	Subtotal of Estimated Construction Cost						\$ 36,599,424
	Right of Way	21	Ac			\$ 20,000	\$ 420,104
	Contingency	20%					\$ 7,403,906
	Total Estimated Project Cost						\$ 44,423,433
	Project services		20%				\$ 8,884,687
	TOTAL CAPITAL COST						\$ 53,308,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	0	kWH	\$ 0.44	\$0
	Labor and Materials	\$ -	LS	-	\$0

Annual O&M

\$0

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ -		\$0
2		\$ -		\$0
3		\$ -		\$0
4		\$ -		\$0
5		\$ -		\$0
6		\$ -		\$0
7		\$ -		\$0
8		\$ -		\$0
9		\$ -		\$0
10		\$ -		\$0
11		\$ -		\$0
12		\$ -		\$0
13		\$ -		\$0
14		\$ -		\$0
15		\$ -		\$0
16		\$ -		\$0
17		\$ -		\$0
18		\$ -		\$0
19		\$ -		\$0
20		\$ -		\$0
21		\$ -	\$ -	\$0
				replace elec./motorized equipment
22		\$ -		\$0
23		\$ -	\$ 320,245	\$320,245
				sewer inspection at yr 10 of service
24		\$ -		\$0
25		\$ -		\$0
26		\$ -		\$0
27		\$ -		\$0
28		\$ -		\$0
29		\$ -		\$0
30		\$ -		\$0

Present value of O&M

\$154,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ -	\$ -	\$ 36,599,424	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$0	\$0	\$23,713,000	\$23,713,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**29,749,000**

Alternative 2C	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Includes three COH Plant, Urban Sewering w/ Private and County Plants, All Gravity Sewers. Cross country sewers with new easements are used to reduce the number of pump stations. All current and future flow from Makai areas conveyed to existing private WWTPs. IWS for all low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to existing private WWPS or WWTP in Makai areas. COH sewers/WWPS from high density (commercial or <1 acre lots) from Mauka (Waimea) area to new COH WWTP.	Gravity Sewer 8 inch	248,186	LF			\$ 1,600	\$ 397,097,840
	Gravity Sewer 12 inch	2,113	LF			\$ 3,070	\$ 6,486,726
	Gravity Sewer 16 inch	6,544	LF			\$ 5,800	\$ 37,954,272
	Gravity Sewer 18 inch	34,879	LF			\$ 6,525	\$ 227,583,518
	Gravity Sewer 24 inch	-	LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	40,414	LF			\$ 900	\$ 36,373,032
	Force main 8 inch	-	LF			\$ 1,600	\$ -
	Force main 10 inch	9,435	LF			\$ 1,700	\$ 16,039,500
	Force main 12 inch	-	LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	14	EA			\$ 7,000,000	\$ 98,000,000
	Neighborhood PS	8	EA			\$ 1,200,000	\$ 9,600,000
	COH WWTPs (3 total), level of treatment - R2		LS			\$ 30,145,800	\$ 30,145,800
	Subtotal of Estimated Construction Cost						\$ 859,280,687
	Right of Way	339	Ac			\$ 20,000	\$ 6,780,388
	Contingency	20%					\$ 173,212,215
	Total Estimated Project Cost						\$ 1,039,273,290
	Project services		20%				\$ 207,854,658
	TOTAL CAPITAL COST						\$ 1,247,128,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$240,760
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$109,740

Annual O&M

\$350,500

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 362,327		\$362,327
2		\$ 374,553		\$374,553
3		\$ 387,191		\$387,191
4		\$ 400,256		\$400,256
5		\$ 413,762		\$413,762
6		\$ 427,724		\$427,724
7		\$ 442,157		\$442,157
8		\$ 457,076		\$457,076
9		\$ 472,499		\$472,499
10		\$ 488,443		\$488,443
11		\$ 504,925		\$504,925
12		\$ 521,962		\$521,962
13		\$ 539,575		\$539,575
14		\$ 557,782		\$557,782
15		\$ 576,603		\$576,603
16		\$ 596,059		\$596,059
17		\$ 616,172		\$616,172
18		\$ 636,964		\$636,964
19		\$ 658,457		\$658,457
20		\$ 680,675		\$680,675
21		\$ 703,643	\$ 82,959,115	\$83,662,758
22		\$ 727,386		\$727,386
23		\$ 751,930	\$ 4,084,103	\$4,836,033
24		\$ 777,303		\$777,303
25		\$ 803,531		\$803,531
26		\$ 830,645		\$830,645
27		\$ 858,673		\$858,673
28		\$ 887,648		\$887,648
29		\$ 917,600		\$917,600
30		\$ 948,562		\$948,562

Present value of O&M

\$54,862,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 41,323,740	\$ 96,422,060	\$ 721,534,887	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$22,311,000	\$41,648,000	\$467,480,000	\$531,439,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

770,551,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2C Waimea Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
- 3 COH WWTPs							
- East Waimea WWTP	Gravity Sewer 8 inch	181,535	LF			\$ 1,600	\$ 290,456,448
- Waimea Town WWTP	Gravity Sewer 12 inch	2,113	LF			\$ 3,070	\$ 6,486,726
- West Waimea WWTP	Gravity Sewer 16 inch	6,544	LF			\$ 5,800	\$ 37,954,272
	Gravity Sewer 18 inch	29,833	LF			\$ 6,525	\$ 194,663,327
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch		LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch		LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch		LF			\$ 15,200	\$ -
	Force main 4 inch		LF			\$ 600	\$ -
	Force main 6 inch	9,159	LF			\$ 900	\$ 8,243,496
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch	9,435	LF			\$ 1,700	\$ 16,039,500
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Regional PS	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	2	EA			\$ 1,200,000	\$ 2,400,000
	COH WWTPs (3 total), level of treatment - R2		LS			\$ 30,145,800	\$ 30,145,800
	Subtotal of Estimated Construction Cost						\$ 614,389,568
	Right of Way	236	Ac			\$ 20,000	\$ 4,724,352
	Contingency	20%					\$ 123,822,784
	Total Estimated Project Cost						\$ 742,936,704
	Project services		20%				\$ 148,587,341
	TOTAL CAPITAL COST						\$ 891,524,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$190,179
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$109,740

Annual O&M

\$299,919

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 310,040		\$310,040
2		\$ 320,501		\$320,501
3		\$ 331,316		\$331,316
4		\$ 342,495		\$342,495
5		\$ 354,052		\$354,052
6		\$ 365,999		\$365,999
7		\$ 378,349		\$378,349
8		\$ 391,116		\$391,116
9		\$ 404,313		\$404,313
10		\$ 417,956		\$417,956
11		\$ 432,059		\$432,059
12		\$ 446,638		\$446,638
13		\$ 461,709		\$461,709
14		\$ 477,288		\$477,288
15		\$ 493,393		\$493,393
16		\$ 510,042		\$510,042
17		\$ 527,252		\$527,252
18		\$ 545,043		\$545,043
19		\$ 563,435		\$563,435
20		\$ 582,447		\$582,447
21		\$ 602,100	\$ 36,464,458	\$37,066,559
22		\$ 622,417		\$622,417
23		\$ 643,419	\$ 3,080,357	\$3,723,777
24		\$ 665,130		\$665,130
25		\$ 687,574		\$687,574
26		\$ 710,775		\$710,775
27		\$ 734,758		\$734,758
28		\$ 759,551		\$759,551
29		\$ 785,181		\$785,181
30		\$ 811,675		\$811,675

Present value of O&M

\$29,147,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 18,163,740	\$ 42,382,060	\$ 553,843,768	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$9,807,000	\$18,306,000	\$358,833,000	\$386,946,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

533,725,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2C Kawaihae Area - To exist. S. Kohala WRF	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Gravity Sewer 8 inch		25,985	LF			\$ 1,600	\$ 41,576,448
Gravity Sewer 12 inch			LF			\$ 3,070	\$ -
Gravity Sewer 16 inch			LF			\$ 5,800	\$ -
Gravity Sewer 18 inch		5,045	LF			\$ 6,525	\$ 32,920,191
Gravity Sewer 24 inch			LF			\$ 8,700	\$ -
Gravity Sewer 30 inch		-	LF			\$ 10,875	\$ -
Gravity Sewer 36 inch		-	LF			\$ 13,050	\$ -
Gravity Sewer 42 inch		-	LF			\$ 15,200	\$ -
Force main 4 inch		-	LF			\$ 600	\$ -
Force main 6 inch		18,989	LF			\$ 900	\$ 17,090,532
Force main 8 inch			LF			\$ 1,600	\$ -
Force main 10 inch			LF			\$ 1,700	\$ -
Force main 12 inch			LF			\$ 3,070	\$ -
Force main 14 inch			LF			\$ 4,430	\$ -
Force main 16 inch		-	LF			\$ 5,800	\$ -
Force main 18 inch		-	LF			\$ 6,525	\$ -
Force main 24 inch		-	LF			\$ 8,700	\$ -
Force main 30 inch		-	LF			\$ 10,875	\$ -
Force main 36 inch		-	LF			\$ 13,050	\$ -
Force main 42 inch		-	LF			\$ 15,200	\$ -
Regional PS	7	EA				\$ 7,000,000	\$ 49,000,000
Neighborhood PS	3	EA				\$ 1,200,000	\$ 3,600,000
		LS				\$ -	\$ -
Subtotal of Estimated Construction Cost							\$ 144,187,171
Right of Way	51	Ac				\$ 20,000	\$ 1,021,947
Contingency	20%						\$ 29,041,824
Total Estimated Project Cost							\$ 174,250,941
Project services		20%					\$ 34,850,188
TOTAL CAPITAL COST							\$ 209,101,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$36,371
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$0

Annual O&M

\$36,371

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 37,598		\$37,598
2		\$ 38,867		\$38,867
3		\$ 40,179		\$40,179
4		\$ 41,534		\$41,534
5		\$ 42,936		\$42,936
6		\$ 44,385		\$44,385
7		\$ 45,882		\$45,882
8		\$ 47,431		\$47,431
9		\$ 49,031		\$49,031
10		\$ 50,685		\$50,685
11		\$ 52,396		\$52,396
12		\$ 54,164		\$54,164
13		\$ 55,991		\$55,991
14		\$ 57,881		\$57,881
15		\$ 59,834		\$59,834
16		\$ 61,853		\$61,853
17		\$ 63,940		\$63,940
18		\$ 66,097		\$66,097
19		\$ 68,328		\$68,328
20		\$ 70,633		\$70,633
21		\$ 73,017	\$ 31,679,002	\$31,752,018
22		\$ 75,480		\$75,480
23		\$ 78,027	\$ 434,427	\$512,455
24		\$ 80,660		\$80,660
25		\$ 83,382		\$83,382
26		\$ 86,196		\$86,196
27		\$ 89,104		\$89,104
28		\$ 92,111		\$92,111
29		\$ 95,219		\$95,219
30		\$ 98,432		\$98,432

Present value of O&M

\$17,459,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 15,780,000	\$ 36,820,000	\$ 91,587,171	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$8,520,000	\$15,904,000	\$59,339,000	\$83,763,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

142,797,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2C Puako Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
- To exist. Mauna Lani WWTP	Gravity Sewer 8 inch	17,791	LF			\$ 1,600	\$ 28,465,520
	Gravity Sewer 12 inch	-	LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch	-	LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	-	LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch	-	LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	12,266	LF			\$ 900	\$ 11,039,004
	Force main 8 inch	-	LF			\$ 1,600	\$ -
	Force main 10 inch	-	LF			\$ 1,700	\$ -
	Force main 12 inch	-	LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	3	EA			\$ 7,000,000	\$ 21,000,000
	Neighborhood PS	3	EA			\$ 1,200,000	\$ 3,600,000
			LS			\$	\$ -
	Subtotal of Estimated Construction Cost						\$ 64,104,524
	Right of Way	31	Ac			\$ 20,000	\$ 613,985
	Contingency	20%					\$ 12,943,702
	Total Estimated Project Cost						\$ 77,662,211
	Project services		20%				\$ 15,532,442
	TOTAL CAPITAL COST						\$ 93,195,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$14,209
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$0

Annual O&M

\$14,209

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 14,689		\$14,689
2		\$ 15,185		\$15,185
3		\$ 15,697		\$15,697
4		\$ 16,227		\$16,227
5		\$ 16,774		\$16,774
6		\$ 17,340		\$17,340
7		\$ 17,925		\$17,925
8		\$ 18,530		\$18,530
9		\$ 19,155		\$19,155
10		\$ 19,802		\$19,802
11		\$ 20,470		\$20,470
12		\$ 21,161		\$21,161
13		\$ 21,875		\$21,875
14		\$ 22,613		\$22,613
15		\$ 23,376		\$23,376
16		\$ 24,165		\$24,165
17		\$ 24,980		\$24,980
18		\$ 25,823		\$25,823
19		\$ 26,694		\$26,694
20		\$ 27,595		\$27,595
21		\$ 28,526	\$ 14,815,655	\$14,844,181
22		\$ 29,489		\$29,489
23		\$ 30,484	\$ 249,073	\$279,557
24		\$ 31,512		\$31,512
25		\$ 32,576		\$32,576
26		\$ 33,675		\$33,675
27		\$ 34,811		\$34,811
28		\$ 35,986		\$35,986
29		\$ 37,200		\$37,200
30		\$ 38,455		\$38,455

Present value of O&M

\$8,102,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 7,380,000	\$ 17,220,000	\$ 39,504,524	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,985,000	\$7,438,000	\$25,595,000	\$37,018,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

64,279,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2C Waikoloa Area - To exist. Waikoloa Village WWTP	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Gravity Sewer 8 inch		22,875	LF			\$ 1,600	\$ 36,599,424
Gravity Sewer 12 inch			LF			\$ 3,070	\$ -
Gravity Sewer 16 inch			LF			\$ 5,800	\$ -
Gravity Sewer 18 inch			LF			\$ 6,525	\$ -
Gravity Sewer 24 inch			LF			\$ 8,700	\$ -
Gravity Sewer 30 inch		-	LF			\$ 10,875	\$ -
Gravity Sewer 36 inch		-	LF			\$ 13,050	\$ -
Gravity Sewer 42 inch		-	LF			\$ 15,200	\$ -
Force main 4 inch		-	LF			\$ 600	\$ -
Force main 6 inch		-	LF			\$ 900	\$ -
Force main 8 inch			LF			\$ 1,600	\$ -
Force main 10 inch			LF			\$ 1,700	\$ -
Force main 12 inch			LF			\$ 3,070	\$ -
Force main 14 inch		-	LF			\$ 4,430	\$ -
Force main 16 inch		-	LF			\$ 5,800	\$ -
Force main 18 inch		-	LF			\$ 6,525	\$ -
Force main 24 inch		-	LF			\$ 8,700	\$ -
Force main 30 inch		-	LF			\$ 10,875	\$ -
Force main 36 inch		-	LF			\$ 13,050	\$ -
Force main 42 inch		-	LF			\$ 15,200	\$ -
Regional PS		-	EA			\$ 7,000,000	\$ -
Neighborhood PS		-	EA			\$ 1,200,000	\$ -
			LS			\$ -	\$ -
Subtotal of Estimated Construction Cost						\$ 36,599,424	
Right of Way	21	Ac				\$ 20,000	\$ 420,104
Contingency	20%					\$ -	\$ 7,403,906
Total Estimated Project Cost						\$ -	\$ 44,423,433
Project services		20%				\$ -	\$ 8,884,687
TOTAL CAPITAL COST							\$ 53,308,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$0
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$0

Annual O&M

\$0

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ -		\$0
2		\$ -		\$0
3		\$ -		\$0
4		\$ -		\$0
5		\$ -		\$0
6		\$ -		\$0
7		\$ -		\$0
8		\$ -		\$0
9		\$ -		\$0
10		\$ -		\$0
11		\$ -		\$0
12		\$ -		\$0
13		\$ -		\$0
14		\$ -		\$0
15		\$ -		\$0
16		\$ -		\$0
17		\$ -		\$0
18		\$ -		\$0
19		\$ -		\$0
20		\$ -		\$0
21		\$ -	\$ -	\$0
22		\$ -		\$0
23		\$ -	\$ 320,245	\$320,245
24		\$ -		\$0
25		\$ -		\$0
26		\$ -		\$0
27		\$ -		\$0
28		\$ -		\$0
29		\$ -		\$0
30		\$ -		\$0

Present value of O&M

\$154,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ -	\$ -	\$ 36,599,424	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$0	\$0	\$23,713,000	\$23,713,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

29,749,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2C	DESCRIPTION Level of Treatment - R1	QUAN	UN			TOTAL DIRECT COST
					UNIT COST	
Includes three COH Plant, Urban Sewering w/ Private and County Plants. All Gravity Sewers. Cross country sewers with new easements are used to reduce the number of pump stations. All current and future flow from Makai areas conveyed to existing private WWTPs. IWS for all low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to existing private WWPS or WWTP in Makai areas. COH sewers/WWPS from high density (commercial or <1 acre lots) from Mauka (Waimea) area to new COH WWTP.	Gravity Sewer 8 inch	248,186	LF		\$ 1,600	\$ 397,097,840
	Gravity Sewer 12 inch	2,113	LF		\$ 3,070	\$ 6,486,726
	Gravity Sewer 16 inch	6,544	LF		\$ 5,800	\$ 37,954,272
	Gravity Sewer 18 inch	34,879	LF		\$ 6,525	\$ 227,583,518
	Gravity Sewer 24 inch	-	LF		\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF		\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF		\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF		\$ 15,200	\$ -
	Force main 4 inch	-	LF		\$ 600	\$ -
	Force main 6 inch	40,414	LF		\$ 900	\$ 36,373,032
	Force main 8 inch	-	LF		\$ 1,600	\$ -
	Force main 10 inch	9,435	LF		\$ 1,700	\$ 16,039,500
	Force main 12 inch	-	LF		\$ 3,070	\$ -
	Force main 14 inch	-	LF		\$ 4,430	\$ -
	Force main 16 inch	-	LF		\$ 5,800	\$ -
	Force main 18 inch	-	LF		\$ 6,525	\$ -
	Force main 24 inch	-	LF		\$ 8,700	\$ -
	Force main 30 inch	-	LF		\$ 10,875	\$ -
	Force main 36 inch	-	LF		\$ 13,050	\$ -
	Force main 42 inch	-	LF		\$ 15,200	\$ -
	Regional PS	14	EA		\$ 7,000,000	\$ 98,000,000
	Neighborhood PS	8	EA		\$ 1,200,000	\$ 9,600,000
	COH WWTPs (3 total), level of treatment - R1		LS		\$ 39,189,540	\$ 39,189,540
	Subtotal of Estimated Construction Cost					\$ 868,324,427
	Right of Way	339	Ac		\$ 20,000	\$ 6,780,388
	Contingency	20%				\$ 175,020,963
	Total Estimated Project Cost					\$ 1,050,125,778
	Project services		20%			\$ 210,025,156
	TOTAL CAPITAL COST					\$ 1,260,151,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$240,760
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$127,410
Annual O&M					\$368,170

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 380,593		\$380,593
2		\$ 393,436		\$393,436
3		\$ 406,711		\$406,711
4		\$ 420,435		\$420,435
5		\$ 434,622		\$434,622
6		\$ 449,287		\$449,287
7		\$ 464,447		\$464,447
8		\$ 480,119		\$480,119
9		\$ 496,320		\$496,320
10		\$ 513,067		\$513,067
11		\$ 530,380		\$530,380
12		\$ 548,276		\$548,276
13		\$ 566,777		\$566,777
14		\$ 585,902		\$585,902
15		\$ 605,672		\$605,672
16		\$ 626,109		\$626,109
17		\$ 647,236		\$647,236
18		\$ 669,075		\$669,075
19		\$ 691,652		\$691,652
20		\$ 714,990		\$714,990
21		\$ 739,116	\$ 88,405,819	\$89,144,936
22		\$ 764,056		\$764,056
23		\$ 789,838	\$ 4,084,103	\$4,873,941
24		\$ 816,490		\$816,490
25		\$ 844,040		\$844,040
26		\$ 872,521		\$872,521
27		\$ 901,962		\$901,962
28		\$ 932,397		\$932,397
29		\$ 963,859		\$963,859
30		\$ 996,383		\$996,383

Present value of O&M \$58,174,000

replace elec./ motorized equipment

sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 44,036,862	\$ 102,752,678	\$ 721,534,887	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$23,776,000	\$44,382,000	\$467,480,000	\$535,638,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

782,687,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2C	DESCRIPTION Level of Treatment - R1	QUAN	UN			TOTAL DIRECT COST
					UNIT COST	
Waimea Area						
- 3 COH WWTPs	Gravity Sewer 8 inch	181,535	LF		\$ 1,600	\$ 290,456,448
- East Waimea WWTP	Gravity Sewer 12 inch	2,113	LF		\$ 3,070	\$ 6,486,726
- Waimea Town WWTP	Gravity Sewer 16 inch	6,544	LF		\$ 5,800	\$ 37,954,272
- West Waimea WWTP	Gravity Sewer 18 inch	29,833	LF		\$ 6,525	\$ 194,663,327
	Gravity Sewer 24 inch		LF		\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF		\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF		\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF		\$ 15,200	\$ -
	Force main 4 inch	-	LF		\$ 600	\$ -
	Force main 6 inch	9,159	LF		\$ 900	\$ 8,243,496
	Force main 8 inch		LF		\$ 1,600	\$ -
	Force main 10 inch	9,435	LF		\$ 1,700	\$ 16,039,500
	Force main 12 inch		LF		\$ 3,070	\$ -
	Force main 14 inch	-	LF		\$ 4,430	\$ -
	Force main 16 inch	-	LF		\$ 5,800	\$ -
	Force main 18 inch	-	LF		\$ 6,525	\$ -
	Force main 24 inch	-	LF		\$ 8,700	\$ -
	Force main 30 inch	-	LF		\$ 10,875	\$ -
	Force main 36 inch	-	LF		\$ 13,050	\$ -
	Force main 42 inch	-	LF		\$ 15,200	\$ -
	Regional PS	4	EA		\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	2	EA		\$ 1,200,000	\$ 2,400,000
	COH WWTPs (3 total), level of treatment - R1		LS		\$ 39,189,540	\$ 39,189,540
	Subtotal of Estimated Construction Cost					\$ 623,433,308
	Right of Way	236	Ac		\$ 20,000	\$ 4,724,352
	Contingency	20%				\$ 125,631,532
	Total Estimated Project Cost					\$ 753,789,192
	Project services		20%			\$ 150,757,838
	TOTAL CAPITAL COST					\$ 904,547,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$190,179
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$127,410

Annual O&M

\$317,589

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 328,306		\$328,306
2		\$ 339,384		\$339,384
3		\$ 350,836		\$350,836
4		\$ 362,674		\$362,674
5		\$ 374,912		\$374,912
6		\$ 387,562		\$387,562
7		\$ 400,640		\$400,640
8		\$ 414,159		\$414,159
9		\$ 428,134		\$428,134
10		\$ 442,580		\$442,580
11		\$ 457,514		\$457,514
12		\$ 472,952		\$472,952
13		\$ 488,911		\$488,911
14		\$ 505,408		\$505,408
15		\$ 522,462		\$522,462
16		\$ 540,092		\$540,092
17		\$ 558,316		\$558,316
18		\$ 577,155		\$577,155
19		\$ 596,630		\$596,630
20		\$ 616,762		\$616,762
21		\$ 637,574	\$ 41,911,163	\$42,548,736
22		\$ 659,087		\$659,087
23		\$ 681,327	\$ 3,080,357	\$3,761,684
24		\$ 704,317		\$704,317
25		\$ 728,083		\$728,083
26		\$ 752,650		\$752,650
27		\$ 778,047		\$778,047
28		\$ 804,301		\$804,301
29		\$ 831,440		\$831,440
30		\$ 859,496		\$859,496

Present value of O&M

\$32,459,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 20,876,862	\$ 48,712,678	\$ 553,843,768	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$11,272,000	\$21,041,000	\$358,833,000	\$391,146,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

545,860,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2C	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area							
- To exist. S. Kohala							
WRF	Gravity Sewer 8 inch	25,985	LF			\$ 1,600	\$ 41,576,448
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	5,045	LF			\$ 6,525	\$ 32,920,191
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	18,989	LF			\$ 900	\$ 17,090,532
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	3	EA			\$ 1,200,000	\$ 3,600,000
			LS			\$	-
	Subtotal of Estimated Construction Cost						\$ 144,187,171
	Right of Way	51	Ac			\$ 20,000	\$ 1,021,947
	Contingency	20%					\$ 29,041,824
	Total Estimated Project Cost						\$ 174,250,941
	Project services		20%				\$ 34,850,188
	TOTAL CAPITAL COST						\$ 209,101,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$36,371
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$0

Annual O&M

\$36,371

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 37,598		\$37,598
2		\$ 38,867		\$38,867
3		\$ 40,179		\$40,179
4		\$ 41,534		\$41,534
5		\$ 42,936		\$42,936
6		\$ 44,385		\$44,385
7		\$ 45,882		\$45,882
8		\$ 47,431		\$47,431
9		\$ 49,031		\$49,031
10		\$ 50,685		\$50,685
11		\$ 52,396		\$52,396
12		\$ 54,164		\$54,164
13		\$ 55,991		\$55,991
14		\$ 57,881		\$57,881
15		\$ 59,834		\$59,834
16		\$ 61,853		\$61,853
17		\$ 63,940		\$63,940
18		\$ 66,097		\$66,097
19		\$ 68,328		\$68,328
20		\$ 70,633		\$70,633
21		\$ 73,017	\$ 31,679,002	\$31,752,018
22		\$ 75,480		\$75,480
23		\$ 78,027	\$ 434,427	\$512,455
24		\$ 80,660		\$80,660
25		\$ 83,382		\$83,382
26		\$ 86,196		\$86,196
27		\$ 89,104		\$89,104
28		\$ 92,111		\$92,111
29		\$ 95,219		\$95,219
30		\$ 98,432		\$98,432

Present value of O&M

\$17,459,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 15,780,000	\$ 36,820,000	\$ 91,587,171	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$8,520,000	\$15,904,000	\$59,339,000	\$83,763,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

142,797,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2C	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area							
- To exist. Mauna Lani							
WWTP	Gravity Sewer 8 inch	17,791	LF			\$ 1,600	\$ 28,465,520
	Gravity Sewer 12 inch	-	LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch	-	LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	-	LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch	-	LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	12,266	LF			\$ 900	\$ 11,039,004
	Force main 8 inch	-	LF			\$ 1,600	\$ -
	Force main 10 inch	-	LF			\$ 1,700	\$ -
	Force main 12 inch	-	LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
Regional PS		3	EA			\$ 7,000,000	\$ 21,000,000
Neighborhood PS		3	EA			\$ 1,200,000	\$ 3,600,000
			LS			\$ -	\$ -
	Subtotal of Estimated Construction Cost					\$ 64,104,524	
	Right of Way	31	Ac			\$ 20,000	\$ 613,985
	Contingency	20%				\$ -	\$ 12,943,702
	Total Estimated Project Cost					\$ -	\$ 77,662,211
Project services		20%				\$ -	\$ 15,532,442
	TOTAL CAPITAL COST						\$ 93,195,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$14,209
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$0

Annual O&M \$14,209

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 14,689		\$14,689
2		\$ 15,185		\$15,185
3		\$ 15,697		\$15,697
4		\$ 16,227		\$16,227
5		\$ 16,774		\$16,774
6		\$ 17,340		\$17,340
7		\$ 17,925		\$17,925
8		\$ 18,530		\$18,530
9		\$ 19,155		\$19,155
10		\$ 19,802		\$19,802
11		\$ 20,470		\$20,470
12		\$ 21,161		\$21,161
13		\$ 21,875		\$21,875
14		\$ 22,613		\$22,613
15		\$ 23,376		\$23,376
16		\$ 24,165		\$24,165
17		\$ 24,980		\$24,980
18		\$ 25,823		\$25,823
19		\$ 26,694		\$26,694
20		\$ 27,595		\$27,595
21		\$ 28,526	\$ 14,815,655	\$14,844,181
22		\$ 29,489		\$29,489
23		\$ 30,484	\$ 249,073	\$279,557
24		\$ 31,512		\$31,512
25		\$ 32,576		\$32,576
26		\$ 33,675		\$33,675
27		\$ 34,811		\$34,811
28		\$ 35,986		\$35,986
29		\$ 37,200		\$37,200
30		\$ 38,455		\$38,455

Present value of O&M \$8,102,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 7,380,000	\$ 17,220,000	\$ 39,504,524	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,985,000	\$7,438,000	\$25,595,000	\$37,018,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

64,279,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 7, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 2C	DESCRIPTION Level of Treatment - R1	QUAN	UN			TOTAL DIRECT COST
					UNIT COST	
Waikoloa Area	Gravity Sewer 8 inch	22,875	LF		\$ 1,600	\$ 36,599,424
- To exist. Waikoloa Village WWTP	Gravity Sewer 12 inch		LF		\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF		\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF		\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF		\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF		\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF		\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF		\$ 15,200	\$ -
	Force main 4 inch	-	LF		\$ 600	\$ -
	Force main 6 inch	-	LF		\$ 900	\$ -
	Force main 8 inch		LF		\$ 1,600	\$ -
	Force main 10 inch		LF		\$ 1,700	\$ -
	Force main 12 inch		LF		\$ 3,070	\$ -
	Force main 14 inch	-	LF		\$ 4,430	\$ -
	Force main 16 inch	-	LF		\$ 5,800	\$ -
	Force main 18 inch	-	LF		\$ 6,525	\$ -
	Force main 24 inch	-	LF		\$ 8,700	\$ -
	Force main 30 inch	-	LF		\$ 10,875	\$ -
	Force main 36 inch	-	LF		\$ 13,050	\$ -
	Force main 42 inch	-	LF		\$ 15,200	\$ -
Regional PS		-	EA		\$ 7,000,000	\$ -
Neighborhood PS		-	EA		\$ 1,200,000	\$ -
			LS			\$ -
	Subtotal of Estimated Construction Cost					\$ 36,599,424
	Right of Way	21	Ac		\$ 20,000	\$ 420,104
	Contingency	20%				\$ 7,403,906
	Total Estimated Project Cost					\$ 44,423,433
Project services		20%				\$ 8,884,687
	TOTAL CAPITAL COST					\$ 53,308,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$0
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$0
Annual O&M					\$0

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ -		\$0
2		\$ -		\$0
3		\$ -		\$0
4		\$ -		\$0
5		\$ -		\$0
6		\$ -		\$0
7		\$ -		\$0
8		\$ -		\$0
9		\$ -		\$0
10		\$ -		\$0
11		\$ -		\$0
12		\$ -		\$0
13		\$ -		\$0
14		\$ -		\$0
15		\$ -		\$0
16		\$ -		\$0
17		\$ -		\$0
18		\$ -		\$0
19		\$ -		\$0
20		\$ -		\$0
21		\$ -	\$ -	\$0
22		\$ -		\$0
23		\$ -	\$ 320,245	\$320,245
24		\$ -		\$0
25		\$ -		\$0
26		\$ -		\$0
27		\$ -		\$0
28		\$ -		\$0
29		\$ -		\$0
30		\$ -		\$0

Present value of O&M \$154,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ -	\$ -	\$ 36,599,424	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$0	\$0	\$23,713,000	\$23,713,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value) 29,749,000

G-8: Alternative 3A Construction Cost and LCC Analysis

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3A	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Same as 2A, but sewer sizing is bigger to accomodate redevelopment of existing parcels. Includes one Mauka COH Plant, Urban Sewering w/ Private and County Plants, All Gravity Sewers. All current and future flow from Makai areas conveyed to existing private WWTPs. No IWS for low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to existing private WWPS or WWTP in Makai areas. COH sewers/WWPS from high density (commercial or <1 acre lots) from Mauka (Waimea) area to new COH WWTP.	Gravity Sewer 8 inch	411,847	LF			\$ 1,600	\$ 658,954,640
	Gravity Sewer 12 inch	16,949	LF			\$ 3,070	\$ 52,032,386
	Gravity Sewer 16 inch	10,249	LF			\$ 5,800	\$ 59,446,178
	Gravity Sewer 18 inch	27,419	LF			\$ 6,525	\$ 178,911,389
	Gravity Sewer 24 inch	19,265	LF			\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	84,170	LF			\$ 900	\$ 75,753,090
	Force main 8 inch	2,645	LF			\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF			\$ 1,700	\$ 7,512,300
	Force main 12 inch	6,989	LF			\$ 3,070	\$ 21,456,875
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	15	EA			\$ 7,000,000	\$ 105,000,000
	Neighborhood PS	52	EA			\$ 1,200,000	\$ 62,400,000
	COH WWTPs (2 total), level of treatment - R3		LS			\$ 27,900,000	\$ 27,900,000
	Subtotal of Estimated Construction Cost						\$ 1,421,204,358
	Right of Way	585	Ac			\$ 20,000	\$ 11,696,709
	Contingency	20%					\$ 286,580,213
	Total Estimated Project Cost						\$ 1,719,481,281
	Project services		20%				\$ 343,896,256
	TOTAL CAPITAL COST						\$ 2,063,378,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	699146	kWH	\$ 0.44	\$307,624
	Labor and Materials	\$ 78,143	LS	-	\$78,143
Annual O&M					\$385,767

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 398,784		\$398,784
2		\$ 412,240		\$412,240
3		\$ 426,150		\$426,150
4		\$ 440,530		\$440,530
5		\$ 455,395		\$455,395
6		\$ 470,761		\$470,761
7		\$ 486,646		\$486,646
8		\$ 503,067		\$503,067
9		\$ 520,042		\$520,042
10		\$ 537,590		\$537,590
11		\$ 555,730		\$555,730
12		\$ 574,482		\$574,482
13		\$ 593,867		\$593,867
14		\$ 613,905		\$613,905
15		\$ 634,620		\$634,620
16		\$ 656,034		\$656,034
17		\$ 678,171		\$678,171
18		\$ 701,055		\$701,055
19		\$ 724,710		\$724,710
20		\$ 749,164		\$749,164
21		\$ 774,443	\$ 117,621,845	\$118,396,288
22		\$ 800,575		\$800,575
23		\$ 827,589	\$ 6,800,206	\$7,627,795
24		\$ 855,515		\$855,515
25		\$ 884,382		\$884,382
26		\$ 914,224		\$914,224
27		\$ 945,073		\$945,073
28		\$ 976,962		\$976,962
29		\$ 1,009,928		\$1,009,928
30		\$ 1,044,006		\$1,044,006
Present value of O&M				\$74,903,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 58,590,000	\$ 136,710,000	\$ 1,225,904,358	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$31,634,000	\$59,049,000	\$794,259,000	\$884,942,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**1,253,339,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3A	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waimea Area							
- 1 COH WWTP	Gravity Sewer 8 inch	169,204	LF			\$ 1,600	\$ 270,726,400
- West Waimea WWTP	Gravity Sewer 12 inch	2,118	LF			\$ 3,070	\$ 6,500,909
	Gravity Sewer 16 inch	10,249	LF			\$ 5,800	\$ 59,446,178
	Gravity Sewer 18 inch	22,374	LF			\$ 6,525	\$ 145,991,329
	Gravity Sewer 24 inch	19,265	LF			\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	35,240	LF			\$ 900	\$ 31,716,378
	Force main 8 inch	2,645	LF			\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF			\$ 1,700	\$ 7,512,300
	Force main 12 inch	5,016	LF			\$ 3,070	\$ 15,399,120
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	33	EA			\$ 1,200,000	\$ 39,600,000
	COH West Waimea WWTP, level of treatment - R3		LS			\$ 22,000,000	\$ 22,000,000
	Subtotal of Estimated Construction Cost						\$ 798,730,114
	Right of Way	278	Ac			\$ 20,000	\$ 5,550,651
	Contingency	20%					\$ 160,856,153
	Total Estimated Project Cost						\$ 965,136,918
	Project services		20%				\$ 193,027,384
	TOTAL CAPITAL COST						\$ 1,158,164,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	531775	kWH	\$ 0.44	\$233,981
	Labor and Materials	\$ 50,867	LS	-	\$50,867
Annual O&M					\$284,849

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 294,460		\$294,460
2		\$ 304,396		\$304,396
3		\$ 314,667		\$314,667
4		\$ 325,285		\$325,285
5		\$ 336,261		\$336,261
6		\$ 347,608		\$347,608
7		\$ 359,337		\$359,337
8		\$ 371,462		\$371,462
9		\$ 383,997		\$383,997
10		\$ 396,954		\$396,954
11		\$ 410,348		\$410,348
12		\$ 424,195		\$424,195
13		\$ 438,508		\$438,508
14		\$ 453,305		\$453,305
15		\$ 468,601		\$468,601
16		\$ 484,413		\$484,413
17		\$ 500,758		\$500,758
18		\$ 517,655		\$517,655
19		\$ 535,123		\$535,123
20		\$ 553,179		\$553,179
21		\$ 571,845	\$ 53,962,710	\$54,534,555
				replace elec./motorized equipment
22		\$ 591,141		\$591,141
23		\$ 611,088	\$ 3,124,941	\$3,736,029
24		\$ 631,708		\$631,708
25		\$ 653,024		\$653,024
26		\$ 675,059		\$675,059
27		\$ 697,837		\$697,837
28		\$ 721,384		\$721,384
29		\$ 745,726		\$745,726
30		\$ 770,889		\$770,889

Present value of O&M \$37,633,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 26,880,000	\$ 62,720,000	\$ 709,130,114	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$14,513,000	\$27,091,000	\$459,443,000	\$501,047,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**694,750,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3A Kawaihae Area - To exist. S. Kohala WRF	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Gravity Sewer 8 inch		26,278	LF			\$ 1,600	\$ 42,044,960
Gravity Sewer 12 inch			LF			\$ 3,070	\$ -
Gravity Sewer 16 inch			LF			\$ 5,800	\$ -
Gravity Sewer 18 inch		5,045	LF			\$ 6,525	\$ 32,920,061
Gravity Sewer 24 inch			LF			\$ 8,700	\$ -
Gravity Sewer 30 inch		-	LF			\$ 10,875	\$ -
Gravity Sewer 36 inch		-	LF			\$ 13,050	\$ -
Gravity Sewer 42 inch		-	LF			\$ 15,200	\$ -
Force main 4 inch		-	LF			\$ 600	\$ -
Force main 6 inch		28,407	LF			\$ 900	\$ 25,565,850
Force main 8 inch			LF			\$ 1,600	\$ -
Force main 10 inch			LF			\$ 1,700	\$ -
Force main 12 inch			LF			\$ 3,070	\$ -
Force main 14 inch			LF			\$ 4,430	\$ -
Force main 16 inch		-	LF			\$ 5,800	\$ -
Force main 18 inch		-	LF			\$ 6,525	\$ -
Force main 24 inch		-	LF			\$ 8,700	\$ -
Force main 30 inch		-	LF			\$ 10,875	\$ -
Force main 36 inch		-	LF			\$ 13,050	\$ -
Force main 42 inch		-	LF			\$ 15,200	\$ -
Regional PS		7	EA			\$ 7,000,000	\$ 49,000,000
Neighborhood PS		8	EA			\$ 1,200,000	\$ 9,600,000
			LS			\$ -	\$ -
Subtotal of Estimated Construction Cost						\$ 159,130,871	
Right of Way		63	Ac			\$ 20,000	\$ 1,251,925
Contingency		20%				\$ -	\$ 32,076,559
Total Estimated Project Cost						\$ -	\$ 192,459,355
Project services			20%			\$ -	\$ 38,491,871
TOTAL CAPITAL COST							\$ 230,951,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	80402	kVH	\$ 0.44	\$35,377
	Labor and Materials	\$ 13,788	LS	-	\$13,788

Annual O&M

\$49,165

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 50,824		\$50,824
2		\$ 52,539		\$52,539
3		\$ 54,312		\$54,312
4		\$ 56,144		\$56,144
5		\$ 58,039		\$58,039
6		\$ 59,997		\$59,997
7		\$ 62,022		\$62,022
8		\$ 64,115		\$64,115
9		\$ 66,278		\$66,278
10		\$ 68,514		\$68,514
11		\$ 70,826		\$70,826
12		\$ 73,216		\$73,216
13		\$ 75,687		\$75,687
14		\$ 78,241		\$78,241
15		\$ 80,881		\$80,881
16		\$ 83,610		\$83,610
17		\$ 86,431		\$86,431
18		\$ 89,348		\$89,348
19		\$ 92,362		\$92,362
20		\$ 95,479		\$95,479
21		\$ 98,701	\$ 35,292,576	\$35,391,277
22		\$ 102,031		\$102,031
23		\$ 105,474	\$ 438,526	\$544,001
24		\$ 109,033		\$109,033
25		\$ 112,712		\$112,712
26		\$ 116,516		\$116,516
27		\$ 120,447		\$120,447
28		\$ 124,511		\$124,511
29		\$ 128,713		\$128,713
30		\$ 133,056		\$133,056

Present value of O&M

\$19,690,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 17,580,000	\$ 41,020,000	\$ 100,530,871	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$9,492,000	\$17,718,000	\$65,134,000	\$92,344,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

158,297,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3A	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area							
- To exist. Mauna Lani							
WWTP	Gravity Sewer 8 inch	17,791	LF			\$ 1,600	\$ 28,465,520
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	12,266	LF			\$ 900	\$ 11,039,004
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	3	EA			\$ 7,000,000	\$ 21,000,000
	Neighborhood PS	3	EA			\$ 1,200,000	\$ 3,600,000
			LS			\$ -	
	Subtotal of Estimated Construction Cost						\$ 64,104,524
	Right of Way	31	Ac			\$ 20,000	\$ 613,985
	Contingency	20%					\$ 12,943,702
	Total Estimated Project Cost						\$ 77,662,211
	Project services		20%				\$ 15,532,442
	TOTAL CAPITAL COST						\$ 93,195,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	24133	kWH	\$ 0.44	\$10,618
	Labor and Materials	\$ 4,167	LS	-	\$4,167

Annual O&M

\$14,785

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 15,284		\$15,284
2		\$ 15,800		\$15,800
3		\$ 16,333		\$16,333
4		\$ 16,884		\$16,884
5		\$ 17,454		\$17,454
6		\$ 18,043		\$18,043
7		\$ 18,652		\$18,652
8		\$ 19,281		\$19,281
9		\$ 19,932		\$19,932
10		\$ 20,604		\$20,604
11		\$ 21,299		\$21,299
12		\$ 22,018		\$22,018
13		\$ 22,761		\$22,761
14		\$ 23,529		\$23,529
15		\$ 24,323		\$24,323
16		\$ 25,144		\$25,144
17		\$ 25,992		\$25,992
18		\$ 26,869		\$26,869
19		\$ 27,776		\$27,776
20		\$ 28,713		\$28,713
21		\$ 29,682	\$ 14,815,655	\$14,845,337
22		\$ 30,684		\$30,684
23		\$ 31,719	\$ 249,073	\$280,792
24		\$ 32,789		\$32,789
25		\$ 33,896		\$33,896
26		\$ 35,040		\$35,040
27		\$ 36,222		\$36,222
28		\$ 37,444		\$37,444
29		\$ 38,708		\$38,708
30		\$ 40,014		\$40,014

Present value of O&M

\$8,120,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 7,380,000	\$ 17,220,000	\$ 39,504,524	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,985,000	\$7,438,000	\$25,595,000	\$37,018,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

64,297,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3A	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikoloa Area							
- To exist. Waikoloa							
Village WWTP	Gravity Sewer 8 inch	154,166	LF			\$ 1,600	\$ 246,666,176
	Gravity Sewer 12 inch	14,831	LF			\$ 3,070	\$ 45,531,477
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	6,855	LF			\$ 900	\$ 6,169,500
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch	1,973	LF			\$ 3,070	\$ 6,057,755
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	1	EA			\$ 7,000,000	\$ 7,000,000
	Neighborhood PS	7	EA			\$ 1,200,000	\$ 8,400,000
			LS			\$	-
	Subtotal of Estimated Construction Cost						\$ 319,824,908
	Right of Way	167	Ac			\$ 20,000	\$ 3,348,497
	Contingency	20%					\$ 64,634,681
	Total Estimated Project Cost						\$ 387,808,086
	Project services		20%				\$ 77,561,617
	TOTAL CAPITAL COST						\$ 465,370,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	51015	kWH	\$ 0.44	\$22,446
	Labor and Materials	\$ 8,542	LS	-	\$8,542

Annual O&M

\$30,989

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 32,035		\$32,035
2		\$ 33,116		\$33,116
3		\$ 34,233		\$34,233
4		\$ 35,388		\$35,388
5		\$ 36,582		\$36,582
6		\$ 37,817		\$37,817
7		\$ 39,093		\$39,093
8		\$ 40,412		\$40,412
9		\$ 41,775		\$41,775
10		\$ 43,185		\$43,185
11		\$ 44,642		\$44,642
12		\$ 46,149		\$46,149
13		\$ 47,706		\$47,706
14		\$ 49,315		\$49,315
15		\$ 50,980		\$50,980
16		\$ 52,700		\$52,700
17		\$ 54,478		\$54,478
18		\$ 56,316		\$56,316
19		\$ 58,217		\$58,217
20		\$ 60,181		\$60,181
21		\$ 62,212	\$ 9,274,841	\$9,337,052
22		\$ 64,311		\$64,311
23		\$ 66,481	\$ 2,365,964	\$2,432,445
24		\$ 68,724		\$68,724
25		\$ 71,043		\$71,043
26		\$ 73,440		\$73,440
27		\$ 75,918		\$75,918
28		\$ 78,480		\$78,480
29		\$ 81,128		\$81,128
30		\$ 83,866		\$83,866

Present value of O&M

\$6,801,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 4,620,000	\$ 10,780,000	\$ 304,424,908	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$2,494,000	\$4,656,000	\$197,236,000	\$204,386,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

267,785,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3A	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikii Area							
- 1 COH WWTP	Gravity Sewer 8 inch	44,407	LF			\$ 1,600	\$ 71,051,584
- Waikii WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	1,403	LF			\$ 900	\$ 1,262,358
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
	COH Waikii WWTPs, level of treatment - R3		LS			\$ 5,900,000	\$ 5,900,000
	Subtotal of Estimated Construction Cost						\$ 79,413,942
	Right of Way	47	Ac			\$ 20,000	\$ 931,650
	Contingency	20%					\$ 16,069,118
	Total Estimated Project Cost						\$ 96,414,711
	Project services		20%				\$ 19,282,942
	TOTAL CAPITAL COST						\$ 115,698,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	11822	kWH	\$ 0.44	\$5,202
	Labor and Materials	\$ 778	LS	-	\$778

Annual O&M

\$5,979

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 6,181		\$6,181
2		\$ 6,390		\$6,390
3		\$ 6,605		\$6,605
4		\$ 6,828		\$6,828
5		\$ 7,058		\$7,058
6		\$ 7,297		\$7,297
7		\$ 7,543		\$7,543
8		\$ 7,797		\$7,797
9		\$ 8,060		\$8,060
10		\$ 8,332		\$8,332
11		\$ 8,614		\$8,614
12		\$ 8,904		\$8,904
13		\$ 9,205		\$9,205
14		\$ 9,515		\$9,515
15		\$ 9,836		\$9,836
16		\$ 10,168		\$10,168
17		\$ 10,511		\$10,511
18		\$ 10,866		\$10,866
19		\$ 11,233		\$11,233
20		\$ 11,612		\$11,612
21		\$ 12,004	\$ 4,276,063	\$4,288,066
22		\$ 12,409		\$12,409
23		\$ 12,827	\$ 621,701	\$634,529
24		\$ 13,260		\$13,260
25		\$ 13,708		\$13,708
26		\$ 14,170		\$14,170
27		\$ 14,648		\$14,648
28		\$ 15,142		\$15,142
29		\$ 15,653		\$15,653
30		\$ 16,182		\$16,182

Present value of O&M

\$2,659,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 2,130,000	\$ 4,970,000	\$ 72,313,942	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$1,150,000	\$2,147,000	\$46,852,000	\$50,149,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

68,208,000

Alternative 3A	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Same as 2A, but sewer sizing is bigger to accomodate redevelopment of existing parcels. Includes one Mauka COH Plant, Urban Sewering w/ Private and County Plants, All Gravity Sewers. All current and future flow from Makai areas conveyed to existing private WWTPs. No IWS for low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to existing private WWPS or WWTP in Makai areas. COH sewers/WWPS from high density (commercial or <1 acre lots) from Mauka (Waimea) area to new COH WWTP.	Gravity Sewer 8 inch Gravity Sewer 12 inch Gravity Sewer 16 inch Gravity Sewer 18 inch Gravity Sewer 24 inch Gravity Sewer 30 inch Gravity Sewer 36 inch Gravity Sewer 42 inch Force main 4 inch Force main 6 inch Force main 8 inch Force main 10 inch Force main 12 inch Force main 14 inch Force main 16 inch Force main 18 inch Force main 24 inch Force main 30 inch Force main 36 inch Force main 42 inch Regional PS Neighborhood PS COH WWTPs (2 total), level of treatment - R2	411,847 16,949 10,249 27,419 19,265 - - - - 84,170 2,645 4,419 6,999 - - - - - - 15 52 	LF LF LF LF LF LF LF LF LF LF LF LF LF LF LF LF EA EA LS			\$ 1,600 \$ 3,070 \$ 5,800 \$ 6,525 \$ 8,700 \$ 10,875 \$ 13,050 \$ 15,200 \$ 600 \$ 900 \$ 1,600 \$ 1,700 \$ 3,070 \$ 4,430 \$ 5,800 \$ 6,525 \$ 8,700 \$ 10,875 \$ 13,050 \$ 15,200 \$ 7,000,000 \$ 1,200,000 \$ 29,875,000	\$ 658,954,640 \$ 52,032,386 \$ 59,446,178 \$ 178,911,389 \$ 167,605,500 - - - - \$ 75,753,090 \$ 4,232,000 \$ 7,512,300 \$ 21,456,875 - - - - \$ 105,000,000 \$ 62,400,000 \$ 29,875,000
	Subtotal of Estimated Construction Cost Right of Way Contingency Total Estimated Project Cost Project services	585 20% 20%	Ac			\$ 20,000	\$ 1,423,179,358 \$ 11,696,709 \$ 286,975,213 \$ 1,721,851,281 \$ 344,370,256
	TOTAL CAPITAL COST						2,066,222,000

O&M

Item	QUAN	UN	Unit cost	Total Annual
R3 level of treatment annual O&M				\$385,767
R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$146,674
Annual O&M				\$532,441

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 550,407		\$550,407
2		\$ 568,980		\$568,980
3		\$ 588,179		\$588,179
4		\$ 608,026		\$608,026
5		\$ 628,542		\$628,542
6		\$ 649,751		\$649,751
7		\$ 671,676		\$671,676
8		\$ 694,340		\$694,340
9		\$ 717,769		\$717,769
10		\$ 741,989		\$741,989
11		\$ 767,026		\$767,026
12		\$ 792,908		\$792,908
13		\$ 819,663		\$819,663
14		\$ 847,321		\$847,321
15		\$ 875,912		\$875,912
16		\$ 905,468		\$905,468
17		\$ 936,021		\$936,021
18		\$ 967,605		\$967,605
19		\$ 1,000,255		\$1,000,255
20		\$ 1,034,007		\$1,034,007
21		\$ 1,068,897	\$ 118,811,313	\$119,880,210 replace elec./ motorized equipment
22		\$ 1,104,965		\$1,104,965
23		\$ 1,142,250	\$ 6,800,206	\$7,942,456 sewer inspection at yr 10 of service
24		\$ 1,180,793		\$1,180,793
25		\$ 1,220,637		\$1,220,637
26		\$ 1,261,825		\$1,261,825
27		\$ 1,304,402		\$1,304,402
28		\$ 1,348,417		\$1,348,417
29		\$ 1,393,917		\$1,393,917
30		\$ 1,440,952		\$1,440,952

Present value of O&M \$79,951,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 59,182,500	\$ 138,092,500	\$ 1,225,904,358	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$31,953,000	\$59,646,000	\$794,259,000	\$885,858,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

1,260,315,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3A Waimea Area - 1 COH WWTP - West Waimea WWTP	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
	Gravity Sewer 8 inch	169,204	LF			\$ 1,600	\$ 270,726,400
	Gravity Sewer 12 inch	2,118	LF			\$ 3,070	\$ 6,500,909
	Gravity Sewer 16 inch	10,249	LF			\$ 5,800	\$ 59,446,178
	Gravity Sewer 18 inch	22,374	LF			\$ 6,525	\$ 145,991,329
	Gravity Sewer 24 inch	19,265	LF			\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	35,240	LF			\$ 900	\$ 31,716,378
	Force main 8 inch	2,645	LF			\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF			\$ 1,700	\$ 7,512,300
	Force main 12 inch	5,016	LF			\$ 3,070	\$ 15,399,120
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	33	EA			\$ 1,200,000	\$ 39,600,000
	COH West Waimea WWTP, level of treatment - R2	-	LS			\$ 23,562,000	\$ 23,562,000
	Subtotal of Estimated Construction Cost	-	-			\$ 800,292,114	
	Right of Way	278	Ac			\$ 20,000	\$ 5,550,651
	Contingency	20%	-				\$ 161,168,553
	Total Estimated Project Cost	-	-			\$ 967,011,318	
	Project services	-	20%				\$ 193,402,264
	TOTAL CAPITAL COST						\$ 1,160,414,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$284,849
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$142,780
Annual O&M					\$427,629

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 442,058		\$442,058
2		\$ 456,974		\$456,974
3		\$ 472,394		\$472,394
4		\$ 488,334		\$488,334
5		\$ 504,812		\$504,812
6		\$ 521,846		\$521,846
7		\$ 539,455		\$539,455
8		\$ 557,657		\$557,657
9		\$ 576,474		\$576,474
10		\$ 595,926		\$595,926
11		\$ 616,035		\$616,035
12		\$ 636,822		\$636,822
13		\$ 658,310		\$658,310
14		\$ 680,523		\$680,523
15		\$ 703,486		\$703,486
16		\$ 727,224		\$727,224
17		\$ 751,763		\$751,763
18		\$ 777,129		\$777,129
19		\$ 803,352		\$803,352
20		\$ 830,460		\$830,460
21		\$ 858,482	\$ 54,903,444	\$55,761,926
22		\$ 887,450		\$887,450
23		\$ 917,395	\$ 3,124,941	\$4,042,336
24		\$ 948,351		\$948,351
25		\$ 980,351		\$980,351
26		\$ 1,013,431		\$1,013,431
27		\$ 1,047,627		\$1,047,627
28		\$ 1,082,977		\$1,082,977
29		\$ 1,119,520		\$1,119,520
30		\$ 1,157,296		\$1,157,296

Present value of O&M

\$42,436,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 27,348,600	\$ 63,813,400	\$ 709,130,114	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$14,766,000	\$27,563,000	\$459,443,000	\$501,772,000

Alternative 3A	DESCRIPTION	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area	Level of Treatment - R2						
- To exist. S. Kohala	Gravity Sewer 8 inch	26,278	LF			\$ 1,600	\$ 42,044,960
WRF	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	5,045	LF			\$ 6,525	\$ 32,920,061
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	28,407	LF			\$ 900	\$ 25,565,850
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	8	EA			\$ 1,200,000	\$ 9,600,000
			LS			\$	\$ -
	Subtotal of Estimated Construction Cost						\$ 159,130,871
	Right of Way	63	Ac			\$ 20,000	\$ 1,251,925
	Contingency	20%					\$ 32,076,559
	Total Estimated Project Cost						\$ 192,459,355
	Project services	20%					\$ 38,491,871
	TOTAL CAPITAL COST						\$ 230,951,000

O&M

Item	QUAN	UN	Unit cost	Total Annual
R3 level of treatment annual O&M				\$49,165
R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$0

Annual O&M

\$49,165

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 50,824		\$50,824
2		\$ 52,539		\$52,539
3		\$ 54,312		\$54,312
4		\$ 56,144		\$56,144
5		\$ 58,039		\$58,039
6		\$ 59,997		\$59,997
7		\$ 62,022		\$62,022
8		\$ 64,115		\$64,115
9		\$ 66,278		\$66,278
10		\$ 68,514		\$68,514
11		\$ 70,826		\$70,826
12		\$ 73,216		\$73,216
13		\$ 75,687		\$75,687
14		\$ 78,241		\$78,241
15		\$ 80,881		\$80,881
16		\$ 83,610		\$83,610
17		\$ 86,431		\$86,431
18		\$ 89,348		\$89,348
19		\$ 92,362		\$92,362
20		\$ 95,479		\$95,479
21		\$ 98,701	\$ 35,292,576	\$35,391,277 replace elec./ motorized equipment
22		\$ 102,031		\$102,031
23		\$ 105,474	\$ 438,526	\$544,001 sewer inspection at yr 10 of service
24		\$ 109,033		\$109,033
25		\$ 112,712		\$112,712
26		\$ 116,516		\$116,516
27		\$ 120,447		\$120,447
28		\$ 124,511		\$124,511
29		\$ 128,713		\$128,713
30		\$ 133,056		\$133,056

Present value of O&M \$19,690,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 17,580,000	\$ 41,020,000	\$ 100,530,871	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$9,492,000	\$17,718,000	\$65,134,000	\$92,344,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

158,297,000

Alternative 3A	DESCRIPTION	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area	Gravity Sewer 8 inch	17,791	LF			\$ 1,600	\$ 28,465,520
- To exist. Mauna Lani	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
WWTP	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	12,266	LF			\$ 900	\$ 11,039,004
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	3	EA			\$ 7,000,000	\$ 21,000,000
	Neighborhood PS	3	EA			\$ 1,200,000	\$ 3,600,000
			LS			\$	\$ -
	Subtotal of Estimated Construction Cost						\$ 64,104,524
	Right of Way	31	Ac			\$ 20,000	\$ 613,985
	Contingency	20%					\$ 12,943,702
	Total Estimated Project Cost						\$ 77,662,211
	Project services	20%					\$ 15,532,442
	TOTAL CAPITAL COST						\$ 93,195,000

O&M

Item	QUAN	UN	Unit cost	Total Annual
R3 level of treatment annual O&M				\$14,785
R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$0

Annual O&M

\$14,785

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 15,284		\$15,284
2		\$ 15,800		\$15,800
3		\$ 16,333		\$16,333
4		\$ 16,884		\$16,884
5		\$ 17,454		\$17,454
6		\$ 18,043		\$18,043
7		\$ 18,652		\$18,652
8		\$ 19,281		\$19,281
9		\$ 19,932		\$19,932
10		\$ 20,604		\$20,604
11		\$ 21,299		\$21,299
12		\$ 22,018		\$22,018
13		\$ 22,761		\$22,761
14		\$ 23,529		\$23,529
15		\$ 24,323		\$24,323
16		\$ 25,144		\$25,144
17		\$ 25,992		\$25,992
18		\$ 26,869		\$26,869
19		\$ 27,776		\$27,776
20		\$ 28,713		\$28,713
21		\$ 29,682	\$ 14,815,655	\$14,845,337 replace elec./ motorized equipment
22		\$ 30,684		\$30,684
23		\$ 31,719	\$ 249,073	\$280,792 sewer inspection at yr 10 of service
24		\$ 32,789		\$32,789
25		\$ 33,896		\$33,896
26		\$ 35,040		\$35,040
27		\$ 36,222		\$36,222
28		\$ 37,444		\$37,444
29		\$ 38,708		\$38,708
30		\$ 40,014		\$40,014

Present value of O&M \$8,120,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 7,380,000	\$ 17,220,000	\$ 39,504,524	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,985,000	\$7,438,000	\$25,595,000	\$37,018,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

64,297,000

Alternative 3A Waikoloa Area - To exist. Waikoloa Village WWTP	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Gravity Sewer 8 inch	154,166	LF				\$ 1,600	\$ 246,666,176
Gravity Sewer 12 inch	14,831	LF				\$ 3,070	\$ 45,531,477
Gravity Sewer 16 inch		LF				\$ 5,800	\$ -
Gravity Sewer 18 inch		LF				\$ 6,525	\$ -
Gravity Sewer 24 inch		LF				\$ 8,700	\$ -
Gravity Sewer 30 inch	-	LF				\$ 10,875	\$ -
Gravity Sewer 36 inch	-	LF				\$ 13,050	\$ -
Gravity Sewer 42 inch	-	LF				\$ 15,200	\$ -
Force main 4 inch	-	LF				\$ 600	\$ -
Force main 6 inch	6,855	LF				\$ 900	\$ 6,169,500
Force main 8 inch		LF				\$ 1,600	\$ -
Force main 10 inch		LF				\$ 1,700	\$ -
Force main 12 inch	1,973	LF				\$ 3,070	\$ 6,057,755
Force main 14 inch		LF				\$ 4,430	\$ -
Force main 16 inch	-	LF				\$ 5,800	\$ -
Force main 18 inch	-	LF				\$ 6,525	\$ -
Force main 24 inch	-	LF				\$ 8,700	\$ -
Force main 30 inch	-	LF				\$ 10,875	\$ -
Force main 36 inch	-	LF				\$ 13,050	\$ -
Force main 42 inch	-	LF				\$ 15,200	\$ -
Regional PS	1	EA				\$ 7,000,000	\$ 7,000,000
Neighborhood PS	7	EA				\$ 1,200,000	\$ 8,400,000
		LS				\$ -	\$ -
Subtotal of Estimated Construction Cost						\$ 319,824,908	
Right of Way	167	Ac				\$ 20,000	\$ 3,348,497
Contingency	20%					\$ -	\$ 64,634,681
Total Estimated Project Cost						\$ -	\$ 387,808,086
Project services		20%				\$ -	\$ 77,561,617
TOTAL CAPITAL COST							\$ 465,370,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$30,989
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$0

Annual O&M

\$30,989

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 32,035		\$32,035
2		\$ 33,116		\$33,116
3		\$ 34,233		\$34,233
4		\$ 35,388		\$35,388
5		\$ 36,582		\$36,582
6		\$ 37,817		\$37,817
7		\$ 39,093		\$39,093
8		\$ 40,412		\$40,412
9		\$ 41,775		\$41,775
10		\$ 43,185		\$43,185
11		\$ 44,642		\$44,642
12		\$ 46,149		\$46,149
13		\$ 47,706		\$47,706
14		\$ 49,315		\$49,315
15		\$ 50,980		\$50,980
16		\$ 52,700		\$52,700
17		\$ 54,478		\$54,478
18		\$ 56,316		\$56,316
19		\$ 58,217		\$58,217
20		\$ 60,181		\$60,181
21		\$ 62,212	\$ 9,274,841	\$9,337,052
22		\$ 64,311		\$64,311
23		\$ 66,481	\$ 2,365,964	\$2,432,445
24		\$ 68,724		\$68,724
25		\$ 71,043		\$71,043
26		\$ 73,440		\$73,440
27		\$ 75,918		\$75,918
28		\$ 78,480		\$78,480
29		\$ 81,128		\$81,128
30		\$ 83,866		\$83,866

Present value of O&M

\$6,801,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 4,620,000	\$ 10,780,000	\$ 304,424,908	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$2,494,000	\$4,656,000	\$197,236,000	\$204,386,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

267,785,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3A Waikii Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
- 1 COH WWTP	Gravity Sewer 8 inch	44,407	LF			\$ 1,600	\$ 71,051,584
- Waikii WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	1,403	LF			\$ 900	\$ 1,262,358
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
	COH Waikii WWTPs, level of treatment - R2		LS			\$ 6,313,000	\$ 6,313,000
	Subtotal of Estimated Construction Cost					\$ 79,826,942	
	Right of Way	47	Ac			\$ 20,000	\$ 931,650
	Contingency	20%					\$ 16,151,718
	Total Estimated Project Cost						\$ 96,910,311
	Project services		20%				\$ 19,382,062
	TOTAL CAPITAL COST						\$ 116,292,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$5,979
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$3,894

Annual O&M

\$9,873

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 10,206		\$10,206
2		\$ 10,551		\$10,551
3		\$ 10,907		\$10,907
4		\$ 11,275		\$11,275
5		\$ 11,655		\$11,655
6		\$ 12,049		\$12,049
7		\$ 12,455		\$12,455
8		\$ 12,875		\$12,875
9		\$ 13,310		\$13,310
10		\$ 13,759		\$13,759
11		\$ 14,223		\$14,223
12		\$ 14,703		\$14,703
13		\$ 15,199		\$15,199
14		\$ 15,712		\$15,712
15		\$ 16,242		\$16,242
16		\$ 16,790		\$16,790
17		\$ 17,357		\$17,357
18		\$ 17,943		\$17,943
19		\$ 18,548		\$18,548
20		\$ 19,174		\$19,174
21		\$ 19,821	\$ 4,524,797	\$4,544,618
22		\$ 20,490		\$20,490
23		\$ 21,181	\$ 621,701	\$642,882
24		\$ 21,896		\$21,896
25		\$ 22,635		\$22,635
26		\$ 23,398		\$23,398
27		\$ 24,188		\$24,188
28		\$ 25,004		\$25,004
29		\$ 25,848		\$25,848
30		\$ 26,720		\$26,720

Present value of O&M

\$2,904,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 2,253,900	\$ 5,259,100	\$ 72,313,942	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$1,217,000	\$2,272,000	\$46,852,000	\$50,341,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

68,855,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3A	DESCRIPTION Level of Treatment - R1	QUAN	UN			TOTAL DIRECT COST
					UNIT COST	
Same as 2A, but sewer sizing is bigger to accommodate redevelopment of existing parcels. Includes one Mauka COH Plant, Urban Sewering w/ Private and County Plants, All Gravity Sewers. All current and future flow from Makai areas conveyed to existing private WWTPs. No IWS for low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to existing private WWPS or WWTP in Makai areas. COH sewers/WWPS from high density (commercial or <1 acre lots) from Mauka (Waimea) area to new COH WWTP.	Gravity Sewer 8 inch	411,847	LF		\$ 1,600	\$ 658,954,640
	Gravity Sewer 12 inch	16,949	LF		\$ 3,070	\$ 52,032,386
	Gravity Sewer 16 inch	10,249	LF		\$ 5,800	\$ 59,446,178
	Gravity Sewer 18 inch	27,419	LF		\$ 6,525	\$ 178,911,389
	Gravity Sewer 24 inch	19,265	LF		\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF		\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF		\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF		\$ 15,200	\$ -
	Force main 4 inch	-	LF		\$ 600	\$ -
	Force main 6 inch	84,170	LF		\$ 900	\$ 75,753,090
	Force main 8 inch	2,645	LF		\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF		\$ 1,700	\$ 7,512,300
	Force main 12 inch	6,989	LF		\$ 3,070	\$ 21,456,875
	Force main 14 inch	-	LF		\$ 4,430	\$ -
	Force main 16 inch	-	LF		\$ 5,800	\$ -
	Force main 18 inch	-	LF		\$ 6,525	\$ -
	Force main 24 inch	-	LF		\$ 8,700	\$ -
	Force main 30 inch	-	LF		\$ 10,875	\$ -
	Force main 36 inch	-	LF		\$ 13,050	\$ -
	Force main 42 inch	-	LF		\$ 15,200	\$ -
	Regional PS	15	EA		\$ 7,000,000	\$ 105,000,000
	Neighborhood PS	52	EA		\$ 1,200,000	\$ 62,400,000
	COH WWTPs (2 total), level of treatment - R1		LS		\$ 38,837,500	\$ 38,837,500
	Subtotal of Estimated Construction Cost					\$ 1,432,141,858
	Right of Way	585	Ac		\$ 20,000	\$ 11,696,709
	Contingency	20%				\$ 288,767,713
	Total Estimated Project Cost					\$ 1,732,606,281
	Project services		20%			\$ 346,521,256
	TOTAL CAPITAL COST					\$ 2,079,128,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$385,767
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$170,291

Annual O&M

\$556,058

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 574,821		\$574,821
2		\$ 594,217		\$594,217
3		\$ 614,268		\$614,268
4		\$ 634,995		\$634,995
5		\$ 656,422		\$656,422
6		\$ 678,572		\$678,572
7		\$ 701,469		\$701,469
8		\$ 725,138		\$725,138
9		\$ 749,607		\$749,607
10		\$ 774,901		\$774,901
11		\$ 801,048		\$801,048
12		\$ 828,078		\$828,078
13		\$ 856,020		\$856,020
14		\$ 884,905		\$884,905
15		\$ 914,764		\$914,764
16		\$ 945,631		\$945,631
17		\$ 977,539		\$977,539
18		\$ 1,010,524		\$1,010,524
19		\$ 1,044,623		\$1,044,623
20		\$ 1,079,871		\$1,079,871
21		\$ 1,116,309	\$ 124,209,090	\$125,325,399
22		\$ 1,153,977		\$1,153,977
23		\$ 1,192,916	\$ 6,800,206	\$7,993,122
24		\$ 1,233,168		\$1,233,168
25		\$ 1,274,779		\$1,274,779
26		\$ 1,317,794		\$1,317,794
27		\$ 1,362,261		\$1,362,261
28		\$ 1,408,227		\$1,408,227
29		\$ 1,455,745		\$1,455,745
30		\$ 1,504,866		\$1,504,866

Present value of O&M

\$83,418,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 61,871,250	\$ 144,366,250	\$ 1,225,904,358	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$33,405,000	\$62,356,000	\$794,259,000	\$890,020,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

1,272,526,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3A	DESCRIPTION Level of Treatment - R1	QUAN	UN			TOTAL DIRECT COST
					UNIT COST	
Waimea Area						
- 1 COH WWTP	Gravity Sewer 8 inch	169,204	LF		\$ 1,600	\$ 270,726,400
- West Waimea WWTP	Gravity Sewer 12 inch	2,118	LF		\$ 3,070	\$ 6,500,909
	Gravity Sewer 16 inch	10,249	LF		\$ 5,800	\$ 59,446,178
	Gravity Sewer 18 inch	22,374	LF		\$ 6,525	\$ 145,991,329
	Gravity Sewer 24 inch	19,265	LF		\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF		\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF		\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF		\$ 15,200	\$ -
	Force main 4 inch	-	LF		\$ 600	\$ -
	Force main 6 inch	35,240	LF		\$ 900	\$ 31,716,378
	Force main 8 inch	2,645	LF		\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF		\$ 1,700	\$ 7,512,300
	Force main 12 inch	5,016	LF		\$ 3,070	\$ 15,399,120
	Force main 14 inch		LF		\$ 4,430	\$ -
	Force main 16 inch	-	LF		\$ 5,800	\$ -
	Force main 18 inch	-	LF		\$ 6,525	\$ -
	Force main 24 inch	-	LF		\$ 8,700	\$ -
	Force main 30 inch	-	LF		\$ 10,875	\$ -
	Force main 36 inch	-	LF		\$ 13,050	\$ -
	Force main 42 inch	-	LF		\$ 15,200	\$ -
	Regional PS	4	EA		\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	33	EA		\$ 1,200,000	\$ 39,600,000
	COH West Waimea WWTP, level of treatment - R1		LS		\$ 30,630,600	\$ 30,630,600
	Subtotal of Estimated Construction Cost					\$ 807,360,714
	Right of Way	278	Ac		\$ 20,000	\$ 5,550,651
	Contingency	20%				\$ 162,582,273
	Total Estimated Project Cost					\$ 975,493,638
	Project services		20%			\$ 195,098,728
	TOTAL CAPITAL COST					\$ 1,170,592,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$284,849
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$165,770

Annual O&M

\$450,619

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 465,824		\$465,824
2		\$ 481,542		\$481,542
3		\$ 497,791		\$497,791
4		\$ 514,588		\$514,588
5		\$ 531,951		\$531,951
6		\$ 549,901		\$549,901
7		\$ 568,456		\$568,456
8		\$ 587,638		\$587,638
9		\$ 607,467		\$607,467
10		\$ 627,964		\$627,964
11		\$ 649,154		\$649,154
12		\$ 671,058		\$671,058
13		\$ 693,702		\$693,702
14		\$ 717,109		\$717,109
15		\$ 741,307		\$741,307
16		\$ 766,321		\$766,321
17		\$ 792,179		\$792,179
18		\$ 818,909		\$818,909
19		\$ 846,542		\$846,542
20		\$ 875,107		\$875,107
21		\$ 904,635	\$ 59,160,596	\$60,065,231
22		\$ 935,160		\$935,160
23		\$ 966,716	\$ 3,124,941	\$4,091,656
24		\$ 999,335		\$999,335
25		\$ 1,033,056		\$1,033,056
26		\$ 1,067,915		\$1,067,915
27		\$ 1,103,949		\$1,103,949
28		\$ 1,141,200		\$1,141,200
29		\$ 1,179,707		\$1,179,707
30		\$ 1,219,514		\$1,219,514

Present value of O&M

\$45,302,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 29,469,180	\$ 68,761,420	\$ 709,130,114	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$15,911,000	\$29,700,000	\$459,443,000	\$505,054,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

710,840,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3A	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area	Gravity Sewer 8 inch	26,278	LF			\$ 1,600	\$ 42,044,960
- To exist. S. Kohala	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
WRF	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	5,045	LF			\$ 6,525	\$ 32,920,061
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	28,407	LF			\$ 900	\$ 25,565,850
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	8	EA			\$ 1,200,000	\$ 9,600,000
			LS			\$	\$ -
	Subtotal of Estimated Construction Cost					\$	\$ 159,130,871
	Right of Way	63	Ac			\$ 20,000	\$ 1,251,925
	Contingency	20%				\$	\$ 32,076,559
	Total Estimated Project Cost					\$	\$ 192,459,355
	Project services		20%			\$	\$ 38,491,871
	TOTAL CAPITAL COST						\$ 230,951,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$49,165
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$0

Annual O&M \$49,165

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 50,824		\$50,824
2		\$ 52,539		\$52,539
3		\$ 54,312		\$54,312
4		\$ 56,144		\$56,144
5		\$ 58,039		\$58,039
6		\$ 59,997		\$59,997
7		\$ 62,022		\$62,022
8		\$ 64,115		\$64,115
9		\$ 66,278		\$66,278
10		\$ 68,514		\$68,514
11		\$ 70,826		\$70,826
12		\$ 73,216		\$73,216
13		\$ 75,687		\$75,687
14		\$ 78,241		\$78,241
15		\$ 80,881		\$80,881
16		\$ 83,610		\$83,610
17		\$ 86,431		\$86,431
18		\$ 89,348		\$89,348
19		\$ 92,362		\$92,362
20		\$ 95,479		\$95,479
21		\$ 98,701	\$ 35,292,576	\$35,391,277
22		\$ 102,031		\$102,031
23		\$ 105,474	\$ 438,526	\$544,001
24		\$ 109,033		\$109,033
25		\$ 112,712		\$112,712
26		\$ 116,516		\$116,516
27		\$ 120,447		\$120,447
28		\$ 124,511		\$124,511
29		\$ 128,713		\$128,713
30		\$ 133,056		\$133,056

Present value of O&M \$19,690,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 17,580,000	\$ 41,020,000	\$ 100,530,871	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$9,492,000	\$17,718,000	\$65,134,000	\$92,344,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

158,297,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3A	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area							
- To exist. Mauna Lani							
WWTP	Gravity Sewer 8 inch	17,791	LF			\$ 1,600	\$ 28,465,520
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	12,266	LF			\$ 900	\$ 11,039,004
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	3	EA			\$ 7,000,000	\$ 21,000,000
	Neighborhood PS	3	EA			\$ 1,200,000	\$ 3,600,000
			LS			\$ -	\$ -
	Subtotal of Estimated Construction Cost					\$ 64,104,524	
	Right of Way	31	Ac			\$ 20,000	\$ 613,985
	Contingency	20%				\$ -	\$ 12,943,702
	Total Estimated Project Cost					\$ -	\$ 77,662,211
	Project services		20%			\$ -	\$ 15,532,442
	TOTAL CAPITAL COST						\$ 93,195,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$14,785
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$0

Annual O&M

\$14,785

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 15,284		\$15,284
2		\$ 15,800		\$15,800
3		\$ 16,333		\$16,333
4		\$ 16,884		\$16,884
5		\$ 17,454		\$17,454
6		\$ 18,043		\$18,043
7		\$ 18,652		\$18,652
8		\$ 19,281		\$19,281
9		\$ 19,932		\$19,932
10		\$ 20,604		\$20,604
11		\$ 21,299		\$21,299
12		\$ 22,018		\$22,018
13		\$ 22,761		\$22,761
14		\$ 23,529		\$23,529
15		\$ 24,323		\$24,323
16		\$ 25,144		\$25,144
17		\$ 25,992		\$25,992
18		\$ 26,869		\$26,869
19		\$ 27,776		\$27,776
20		\$ 28,713		\$28,713
21		\$ 29,682	\$ 14,815,655	\$14,845,337
22		\$ 30,684		\$30,684
23		\$ 31,719	\$ 249,073	\$280,792
24		\$ 32,789		\$32,789
25		\$ 33,896		\$33,896
26		\$ 35,040		\$35,040
27		\$ 36,222		\$36,222
28		\$ 37,444		\$37,444
29		\$ 38,708		\$38,708
30		\$ 40,014		\$40,014

Present value of O&M \$8,120,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 7,380,000	\$ 17,220,000	\$ 39,504,524	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,985,000	\$7,438,000	\$25,595,000	\$37,018,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

64,297,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3A	DESCRIPTION Level of Treatment - R1	QUAN	UN			TOTAL DIRECT COST
					UNIT COST	
Waikoloa Area	Gravity Sewer 8 inch	154,166	LF		\$ 1,600	\$ 246,666,176
- To exist. Waikoloa Village WWTP	Gravity Sewer 12 inch	14,831	LF		\$ 3,070	\$ 45,531,477
	Gravity Sewer 16 inch		LF		\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF		\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF		\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF		\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF		\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF		\$ 15,200	\$ -
	Force main 4 inch	-	LF		\$ 600	\$ -
	Force main 6 inch	6,855	LF		\$ 900	\$ 6,169,500
	Force main 8 inch		LF		\$ 1,600	\$ -
	Force main 10 inch		LF		\$ 1,700	\$ -
	Force main 12 inch	1,973	LF		\$ 3,070	\$ 6,057,755
	Force main 14 inch		LF		\$ 4,430	\$ -
	Force main 16 inch	-	LF		\$ 5,800	\$ -
	Force main 18 inch	-	LF		\$ 6,525	\$ -
	Force main 24 inch	-	LF		\$ 8,700	\$ -
	Force main 30 inch	-	LF		\$ 10,875	\$ -
	Force main 36 inch	-	LF		\$ 13,050	\$ -
	Force main 42 inch	-	LF		\$ 15,200	\$ -
	Regional PS	1	EA		\$ 7,000,000	\$ 7,000,000
	Neighborhood PS	7	EA		\$ 1,200,000	\$ 8,400,000
			LS		\$	-
	Subtotal of Estimated Construction Cost				\$	319,824,908
	Right of Way	167	Ac		\$ 20,000	\$ 3,348,497
	Contingency	20%			\$	64,634,681
	Total Estimated Project Cost				\$	387,808,086
	Project services		20%		\$	77,561,617
	TOTAL CAPITAL COST					\$ 465,370,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$30,989
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$0

Annual O&M

\$30,989

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 32,035		\$32,035
2		\$ 33,116		\$33,116
3		\$ 34,233		\$34,233
4		\$ 35,388		\$35,388
5		\$ 36,582		\$36,582
6		\$ 37,817		\$37,817
7		\$ 39,093		\$39,093
8		\$ 40,412		\$40,412
9		\$ 41,775		\$41,775
10		\$ 43,185		\$43,185
11		\$ 44,642		\$44,642
12		\$ 46,149		\$46,149
13		\$ 47,706		\$47,706
14		\$ 49,315		\$49,315
15		\$ 50,980		\$50,980
16		\$ 52,700		\$52,700
17		\$ 54,478		\$54,478
18		\$ 56,316		\$56,316
19		\$ 58,217		\$58,217
20		\$ 60,181		\$60,181
21		\$ 62,212	\$ 9,274,841	\$9,337,052
22		\$ 64,311		\$64,311
23		\$ 66,481	\$ 2,365,964	\$2,432,445
24		\$ 68,724		\$68,724
25		\$ 71,043		\$71,043
26		\$ 73,440		\$73,440
27		\$ 75,918		\$75,918
28		\$ 78,480		\$78,480
29		\$ 81,128		\$81,128
30		\$ 83,866		\$83,866

Present value of O&M \$6,801,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 4,620,000	\$ 10,780,000	\$ 304,424,908	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$2,494,000	\$4,656,000	\$197,236,000	\$204,386,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

267,785,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
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Alternative 3A	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikii Area							
- 1 COH WWTP	Gravity Sewer 8 inch	44,407	LF			\$ 1,600	\$ 71,051,584
- Waikii WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	1,403	LF			\$ 900	\$ 1,262,358
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
	COH Waikii WWTPs, level of treatment - R1		LS			\$ 8,206,900	\$ 8,206,900
	Subtotal of Estimated Construction Cost						\$ 81,720,842
	Right of Way	47	Ac			\$ 20,000	\$ 931,650
	Contingency	20%					\$ 16,530,498
	Total Estimated Project Cost						\$ 99,182,991
	Project services		20%				\$ 19,836,598
	TOTAL CAPITAL COST						\$ 119,020,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$5,979
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$4,521

Annual O&M

\$10,500

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 10,855		\$10,855
2		\$ 11,221		\$11,221
3		\$ 11,599		\$11,599
4		\$ 11,991		\$11,991
5		\$ 12,395		\$12,395
6		\$ 12,814		\$12,814
7		\$ 13,246		\$13,246
8		\$ 13,693		\$13,693
9		\$ 14,155		\$14,155
10		\$ 14,633		\$14,633
11		\$ 15,126		\$15,126
12		\$ 15,637		\$15,637
13		\$ 16,164		\$16,164
14		\$ 16,710		\$16,710
15		\$ 17,274		\$17,274
16		\$ 17,857		\$17,857
17		\$ 18,459		\$18,459
18		\$ 19,082		\$19,082
19		\$ 19,726		\$19,726
20		\$ 20,392		\$20,392
21		\$ 21,080	\$ 5,665,422	\$5,686,502
22		\$ 21,791		\$21,791
23		\$ 22,526	\$ 621,701	\$644,228
24		\$ 23,286		\$23,286
25		\$ 24,072		\$24,072
26		\$ 24,884		\$24,884
27		\$ 25,724		\$25,724
28		\$ 26,592		\$26,592
29		\$ 27,489		\$27,489
30		\$ 28,417		\$28,417

Present value of O&M \$3,504,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 2,822,070	\$ 6,584,830	\$ 72,313,942	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$1,524,000	\$2,844,000	\$46,852,000	\$51,220,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

71,304,000

G-9: Alternative 3B Construction Cost and LCC Analysis

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3B	DESCRIPTION Level of Treatment - R3	QUAN	UN			TOTAL DIRECT COST
					UNIT COST	
Same as 2B, but sewer sizing is bigger to accommodate redevelopment of existing parcels. Includes one Mauka COH Plant, Urban Sewering w/ Private and County Plants, both gravity sewers and LPS to reduce the number of neighborhood pump stations. All current and future flow from Makai areas conveyed to existing private WWTPs. No IWS for low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to existing private WWPS or WWTP in Makai areas. COH sewers/WWPS from high density (commercial or <1 acre lots) from Mauka (Waimea) area to new COH WWTP.	Gravity Sewer 8 inch	271,236	LF		\$ 1,600	\$ 433,977,552
	Gravity Sewer 12 inch	16,949	LF		\$ 3,070	\$ 52,032,386
	Gravity Sewer 16 inch	10,249	LF		\$ 5,800	\$ 59,446,178
	Gravity Sewer 18 inch	27,429	LF		\$ 6,525	\$ 178,976,639
	Gravity Sewer 24 inch	19,265	LF		\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF		\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF		\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF		\$ 15,200	\$ -
	Force main 4 inch	-	LF		\$ 600	\$ -
	Force main 6 inch	40,644	LF		\$ 900	\$ 36,579,510
	Force main 8 inch	2,645	LF		\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF		\$ 1,700	\$ 7,512,300
	Force main 12 inch	6,989	LF		\$ 3,070	\$ 21,456,875
	Force main 14 inch	-	LF		\$ 4,430	\$ -
	Force main 16 inch	-	LF		\$ 5,800	\$ -
	Force main 18 inch	-	LF		\$ 6,525	\$ -
	Force main 24 inch	-	LF		\$ 8,700	\$ -
	Force main 30 inch	-	LF		\$ 10,875	\$ -
	Force main 36 inch	-	LF		\$ 13,050	\$ -
	Force main 42 inch	-	LF		\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	146,047	LF		\$ 450	\$ 65,720,970
	Low pressure sewer (On-Lot)	2,701	EA		\$ 26,000	\$ 70,226,000
	Regional PS (including exist. PS that receives additional flow)	15	EA		\$ 7,000,000	\$ 105,000,000
	Neighborhood PS	1	EA		\$ 1,200,000	\$ 1,200,000
	COH WWTPs (2 total), level of treatment - R3		LS		\$ 27,900,000	\$ 27,900,000
	Subtotal of Estimated Construction Cost					\$ 1,231,865,910
	Right of Way	524	Ac		\$ 20,000	\$ 10,470,488
	Contingency	20%				\$ 248,467,280
	Total Estimated Project Cost					\$ 1,490,803,677
	Project services	20%				\$ 298,160,735
	TOTAL CAPITAL COST					\$ 1,788,964,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	558932	kWH	\$ 0.44	\$245,930
	Labor and Materials	\$ 1,561,754	LS	-	\$1,561,754

Annual O&M

\$1,807,684

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 1,868,681		\$1,868,681
2		\$ 1,931,736		\$1,931,736
3		\$ 1,996,918		\$1,996,918
4		\$ 2,064,301		\$2,064,301
5		\$ 2,133,956		\$2,133,956
6		\$ 2,205,962		\$2,205,962
7		\$ 2,280,398		\$2,280,398
8		\$ 2,357,346		\$2,357,346
9		\$ 2,436,890		\$2,436,890
10		\$ 2,519,118		\$2,519,118
11		\$ 2,604,121		\$2,604,121
12		\$ 2,691,991		\$2,691,991
13		\$ 2,782,827		\$2,782,827
14		\$ 2,876,728		\$2,876,728
15		\$ 2,973,798		\$2,973,798
16		\$ 3,074,143		\$3,074,143
17		\$ 3,177,874		\$3,177,874
18		\$ 3,285,105		\$3,285,105
19		\$ 3,395,954		\$3,395,954
20		\$ 3,510,544		\$3,510,544
21		\$ 3,629,001	\$ 123,057,865	\$126,686,866
22		\$ 3,751,454		\$3,751,454
23		\$ 3,878,039	\$ 4,831,797	\$8,709,836
24		\$ 4,008,896		\$4,008,896
25		\$ 4,144,169		\$4,144,169
26		\$ 4,284,005		\$4,284,005
27		\$ 4,428,561		\$4,428,561
28		\$ 4,577,994		\$4,577,994
29		\$ 4,732,469		\$4,732,469
30		\$ 4,892,157		\$4,892,157

Present value of O&M \$119,786,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 61,297,800	\$ 143,028,200	\$ 1,027,539,910	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$33,096,000	\$61,778,000	\$665,739,000	\$760,613,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

1,148,137,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3B	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waimea Area							
- 1 COH WWTP	Gravity Sewer 8 inch	121,916	LF			\$ 1,600	\$ 195,066,384
- West Waimea WWTP	Gravity Sewer 12 inch	2,118	LF			\$ 3,070	\$ 6,500,909
	Gravity Sewer 16 inch	10,249	LF			\$ 5,800	\$ 59,446,178
	Gravity Sewer 18 inch	22,384	LF			\$ 6,525	\$ 146,056,579
	Gravity Sewer 24 inch	19,265	LF			\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	3,572	LF			\$ 900	\$ 3,214,548
	Force main 8 inch	2,645	LF			\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF			\$ 1,700	\$ 7,512,300
	Force main 12 inch	5,016	LF			\$ 3,070	\$ 15,399,120
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	47,288	LF			\$ 450	\$ 21,279,380
	Low pressure sewer (On-Lot)	1,336	EA			\$ 26,000	\$ 34,736,000
	Regional PS (including exist. PS that receives additional flow)	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	-	EA			\$ 1,200,000	\$ -
	COH West Waimea WWTP, level of treatment - R3		LS			\$ 22,000,000	\$ 22,000,000
	Subtotal of Estimated Construction Cost						\$ 711,048,897
	Right of Way	231	Ac			\$ 20,000	\$ 4,628,315
	Contingency	20%					\$ 143,135,443
	Total Estimated Project Cost						\$ 858,812,655
	Project services		20%				\$ 171,762,531
	TOTAL CAPITAL COST						\$ 1,030,575,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	441048	kWH	\$ 0.44	\$194,061
	Labor and Materials	\$ 763,401	LS	-	\$763,401
Annual O&M					\$957,463

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 989,770		\$989,770
2		\$ 1,023,168		\$1,023,168
3		\$ 1,057,693		\$1,057,693
4		\$ 1,093,383		\$1,093,383
5		\$ 1,130,277		\$1,130,277
6		\$ 1,168,416		\$1,168,416
7		\$ 1,207,842		\$1,207,842
8		\$ 1,248,598		\$1,248,598
9		\$ 1,290,730		\$1,290,730
10		\$ 1,334,283		\$1,334,283
11		\$ 1,379,305		\$1,379,305
12		\$ 1,425,847		\$1,425,847
13		\$ 1,473,960		\$1,473,960
14		\$ 1,523,696		\$1,523,696
15		\$ 1,575,110		\$1,575,110
16		\$ 1,628,259		\$1,628,259
17		\$ 1,683,201		\$1,683,201
18		\$ 1,739,997		\$1,739,997
19		\$ 1,798,710		\$1,798,710
20		\$ 1,859,404		\$1,859,404
21		\$ 1,922,146	\$ 51,033,306	\$52,955,452
22		\$ 1,987,005		\$1,987,005
23		\$ 2,054,053	\$ 2,463,056	\$4,517,108
24		\$ 2,123,363		\$2,123,363
25		\$ 2,195,011		\$2,195,011
26		\$ 2,269,078		\$2,269,078
27		\$ 2,345,643		\$2,345,643
28		\$ 2,424,792		\$2,424,792
29		\$ 2,506,612		\$2,506,612
30		\$ 2,591,193		\$2,591,193

Present value of O&M \$56,189,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 25,420,800	\$ 59,315,200	\$ 626,312,897	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$13,725,000	\$25,620,000	\$405,786,000	\$445,131,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**641,633,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3B	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area							
- To exist. S. Kohala							
WRF	Gravity Sewer 8 inch	18,788	LF			\$ 1,600	\$ 30,060,752
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	5,045	LF			\$ 6,525	\$ 32,920,061
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	19,564	LF			\$ 900	\$ 17,607,339
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	12,357	LF			\$ 450	\$ 5,560,655
	Low pressure sewer (On-Lot)	349	EA			\$ 26,000	\$ 9,074,000
	Regional PS (including exist. PS that receives additional flow)	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	-	EA LS			\$ 1,200,000	\$ -
						\$	\$ -
	Subtotal of Estimated Construction Cost						\$ 144,222,806
	Right of Way	55	Ac			\$ 20,000	\$ 1,096,261
	Contingency	20%					\$ 29,063,813
	Total Estimated Project Cost						\$ 174,382,880
	Project services		20%				\$ 34,876,576
	TOTAL CAPITAL COST						\$ 209,259,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	58407	kWH	\$ 0.44	\$25,699
	Labor and Materials	\$ 199,993	LS	-	\$199,993

Annual O&M

\$225,692

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 233,308		\$233,308
2		\$ 241,180		\$241,180
3		\$ 249,318		\$249,318
4		\$ 257,731		\$257,731
5		\$ 266,428		\$266,428
6		\$ 275,418		\$275,418
7		\$ 284,711		\$284,711
8		\$ 294,318		\$294,318
9		\$ 304,249		\$304,249
10		\$ 314,516		\$314,516
11		\$ 325,128		\$325,128
12		\$ 336,099		\$336,099
13		\$ 347,440		\$347,440
14		\$ 359,164		\$359,164
15		\$ 371,283		\$371,283
16		\$ 383,811		\$383,811
17		\$ 396,762		\$396,762
18		\$ 410,150		\$410,150
19		\$ 423,990		\$423,990
20		\$ 438,297		\$438,297
21		\$ 453,086	\$ 34,975,786	\$35,428,872
22		\$ 468,375		\$468,375
23		\$ 484,179	\$ 333,665	\$817,844
24		\$ 500,517		\$500,517
25		\$ 517,406		\$517,406
26		\$ 534,864		\$534,864
27		\$ 552,912		\$552,912
28		\$ 571,569		\$571,569
29		\$ 590,856		\$590,856
30		\$ 610,793		\$610,793

Present value of O&M

\$24,824,000

replace elec./motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 17,422,200	\$ 40,651,800	\$ 86,148,806	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$9,406,000	\$17,559,000	\$55,815,000	\$82,780,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**151,303,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3B	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area							
- To exist. Mauna Lani							
WWTP	Gravity Sewer 8 inch	0	LF			\$ 1,600	\$ -
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch		LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch		LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch		LF			\$ 15,200	\$ -
	Force main 4 inch		LF			\$ 600	\$ -
	Force main 6 inch	17,508	LF			\$ 900	\$ 15,757,623
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	18,360	LF			\$ 450	\$ 8,261,996
	Low pressure sewer (On-Lot)	268	EA			\$ 26,000	\$ 6,968,000
	Regional PS (including exist. PS that receives additional flow)	3	EA			\$ 7,000,000	\$ 21,000,000
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
			LS				\$ -
	Subtotal of Estimated Construction Cost						\$ 53,187,619
	Right of Way	35	Ac			\$ 20,000	\$ 700,064
	Contingency	20%					\$ 10,777,536
	Total Estimated Project Cost						\$ 64,665,218
	Project services		20%				\$ 12,933,044
	TOTAL CAPITAL COST						\$ 77,598,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	18634	kWH	\$ 0.44	\$8,199
	Labor and Materials	\$ 154,880	LS	-	\$154,880

Annual O&M

\$163,079

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 168,582		\$168,582
2		\$ 174,271		\$174,271
3		\$ 180,151		\$180,151
4		\$ 186,230		\$186,230
5		\$ 192,514		\$192,514
6		\$ 199,010		\$199,010
7		\$ 205,725		\$205,725
8		\$ 212,667		\$212,667
9		\$ 219,843		\$219,843
10		\$ 227,261		\$227,261
11		\$ 234,929		\$234,929
12		\$ 242,857		\$242,857
13		\$ 251,051		\$251,051
14		\$ 259,523		\$259,523
15		\$ 268,280		\$268,280
16		\$ 277,332		\$277,332
17		\$ 286,690		\$286,690
18		\$ 296,364		\$296,364
19		\$ 306,364		\$306,364
20		\$ 316,702		\$316,702
21		\$ 327,388	\$ 17,566,789	\$17,894,178
22		\$ 338,436		\$338,436
23		\$ 349,855	\$ -	\$349,855
24		\$ 361,661		\$361,661
25		\$ 373,864		\$373,864
26		\$ 386,479		\$386,479
27		\$ 399,520		\$399,520
28		\$ 413,001		\$413,001
29		\$ 426,937		\$426,937
30		\$ 441,344		\$441,344

Present value of O&M

\$13,893,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 8,750,400	\$ 20,417,600	\$ 24,019,619	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$4,724,000	\$8,819,000	\$15,562,000	\$29,105,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

62,386,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3B	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikoloa Area	Gravity Sewer 8 inch	130,532	LF			\$ 1,600	\$ 208,850,416
- To exist. Waikoloa Village WWTP	Gravity Sewer 12 inch	14,831	LF			\$ 3,070	\$ 45,531,477
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	-	LF			\$ 900	\$ -
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch	1,973	LF			\$ 3,070	\$ 6,057,755
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	23,635	LF			\$ 450	\$ 10,635,683
	Low pressure sewer (On-Lot)	668	EA			\$ 26,000	\$ 17,368,000
	Regional PS (including exist. PS that receives additional flow)	1	EA			\$ 7,000,000	\$ 7,000,000
	Neighborhood PS		EA			\$ 1,200,000	\$ -
			LS			\$	\$ -
	Subtotal of Estimated Construction Cost						\$ 295,443,330
	Right of Way	158	Ac			\$ 20,000	\$ 3,150,288
	Contingency	20%					\$ 59,718,724
	Total Estimated Project Cost						\$ 358,312,342
	Project services		20%				\$ 71,662,468
	TOTAL CAPITAL COST						\$ 429,975,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	31770	kWH	\$ 0.44	\$13,979
	Labor and Materials	\$ 365,837	LS	-	\$365,837

Annual O&M

\$379,815

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 392,632		\$392,632
2		\$ 405,880		\$405,880
3		\$ 419,576		\$419,576
4		\$ 433,733		\$433,733
5		\$ 448,369		\$448,369
6		\$ 463,498		\$463,498
7		\$ 479,138		\$479,138
8		\$ 495,306		\$495,306
9		\$ 512,019		\$512,019
10		\$ 529,296		\$529,296
11		\$ 547,156		\$547,156
12		\$ 565,619		\$565,619
13		\$ 584,704		\$584,704
14		\$ 604,434		\$604,434
15		\$ 624,829		\$624,829
16		\$ 645,913		\$645,913
17		\$ 667,708		\$667,708
18		\$ 690,239		\$690,239
19		\$ 713,529		\$713,529
20		\$ 737,606		\$737,606
21		\$ 762,495	\$ 14,675,930	\$15,438,425
22		\$ 788,224		\$788,224
23		\$ 814,821	\$ 2,035,077	\$2,849,898
24		\$ 842,316		\$842,316
25		\$ 870,738		\$870,738
26		\$ 900,119		\$900,119
27		\$ 930,492		\$930,492
28		\$ 961,890		\$961,890
29		\$ 994,347		\$994,347
30		\$ 1,027,899		\$1,027,899

Present value of O&M \$19,958,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 7,310,400	\$ 17,057,600	\$ 271,075,330	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,947,000	\$7,368,000	\$175,629,000	\$186,944,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

262,989,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3B	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikii Area							
- 1 COH WWTP	Gravity Sewer 8 inch	0	LF			\$ 1,600	\$ -
- Waikii WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch		LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	-	LF			\$ 900	\$ -
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	44,407	LF			\$ 450	\$ 19,983,258
	Low pressure sewer (On-Lot)	80	EA			\$ 26,000	\$ 2,080,000
	Regional PS (including exist. PS that receives additional flow)	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH Waikii WWTPs, level of treatment - R3		LS			\$ 5,900,000	\$ 5,900,000
	Subtotal of Estimated Construction Cost						\$ 27,963,258
	Right of Way	45	Ac			\$ 20,000	\$ 895,560
	Contingency	20%					\$ 5,771,764
	Total Estimated Project Cost						\$ 34,630,582
	Project services		20%				\$ 6,926,116
	TOTAL CAPITAL COST						\$ 41,557,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	9073	kWH	\$ 0.44	\$3,992
	Labor and Materials	\$ 77,643	LS	-	\$77,643

Annual O&M

\$81,635

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 84,389		\$84,389
2		\$ 87,237		\$87,237
3		\$ 90,180		\$90,180
4		\$ 93,223		\$93,223
5		\$ 96,369		\$96,369
6		\$ 99,621		\$99,621
7		\$ 102,982		\$102,982
8		\$ 106,457		\$106,457
9		\$ 110,049		\$110,049
10		\$ 113,763		\$113,763
11		\$ 117,601		\$117,601
12		\$ 121,570		\$121,570
13		\$ 125,672		\$125,672
14		\$ 129,912		\$129,912
15		\$ 134,296		\$134,296
16		\$ 138,828		\$138,828
17		\$ 143,512		\$143,512
18		\$ 148,355		\$148,355
19		\$ 153,360		\$153,360
20		\$ 158,535		\$158,535
21		\$ 163,885	\$ 4,806,054	\$4,969,939
22		\$ 169,415		\$169,415
23		\$ 175,131	\$ -	\$175,131
24		\$ 181,041		\$181,041
25		\$ 187,150		\$187,150
26		\$ 193,465		\$193,465
27		\$ 199,993		\$199,993
28		\$ 206,741		\$206,741
29		\$ 213,717		\$213,717
30		\$ 220,929		\$220,929

Present value of O&M

\$4,922,000

replace elec./motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 2,394,000	\$ 5,586,000	\$ 19,983,258	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$1,293,000	\$2,413,000	\$12,947,000	\$16,653,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**29,826,000**

Alternative 3B Same as 2B, but sewer sizing is bigger to accomodate redevelopment of existing parcels. Includes one Mauka COH Plant, Urban Sewering w/ Private and County Plants, both gravity sewers and LPS to reduce the number of neighborhood pump stations. All current and future flow from Makai areas conveyed to existing private WWTPs. No IWS for low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or >1 acre lots) to existing private WWPS or WWTP in Makai areas. COH sewers/WWPS from high density (commercial or <1 acre lots) from Mauka (Waimea) area to new COH WWTP.	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Gravity Sewer 8 inch	271,236	LF			\$ 1,600	\$ 433,977,552	
Gravity Sewer 12 inch	16,949	LF			\$ 3,070	\$ 52,032,386	
Gravity Sewer 16 inch	10,249	LF			\$ 5,800	\$ 59,446,178	
Gravity Sewer 18 inch	27,429	LF			\$ 6,525	\$ 178,976,639	
Gravity Sewer 24 inch	19,265	LF			\$ 8,700	\$ 167,605,500	
Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -	
Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -	
Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -	
Force main 4 inch	-	LF			\$ 600	\$ -	
Force main 6 inch	40,644	LF			\$ 900	\$ 36,579,510	
Force main 8 inch	2,645	LF			\$ 1,600	\$ 4,232,000	
Force main 10 inch	4,419	LF			\$ 1,700	\$ 7,512,300	
Force main 12 inch	6,999	LF			\$ 3,070	\$ 21,456,875	
Force main 14 inch	-	LF			\$ 4,430	\$ -	
Force main 16 inch	-	LF			\$ 5,800	\$ -	
Force main 18 inch	-	LF			\$ 6,525	\$ -	
Force main 24 inch	-	LF			\$ 8,700	\$ -	
Force main 30 inch	-	LF			\$ 10,875	\$ -	
Force main 36 inch	-	LF			\$ 13,050	\$ -	
Force main 42 inch	-	LF			\$ 15,200	\$ -	
Low Pressure Sewer In-Street (3 inch average)	146,047	LF			\$ 450	\$ 65,720,970	
Low pressure sewer (On-Lot)	2,701	EA			\$ 26,000	\$ 70,226,000	
Regional PS (including exist. PS that receives additional flow)	15	EA			\$ 7,000,000	\$ 105,000,000	
Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000	
COH WWTPs (2 total), level of treatment - R2		LS			\$ 29,875,000	\$ 29,875,000	
Subtotal of Estimated Construction Cost						\$ 1,233,840,910	
Right of Way	524	Ac			\$ 20,000	\$ 10,470,488	
Contingency	20%					\$ 248,862,280	
Total Estimated Project Cost						\$ 1,493,173,677	
Project services		20%				\$ 298,634,735	
TOTAL CAPITAL COST						\$ 1,791,808,000	

O&M

Item	QUAN	UN	Unit Cost	Total Annual
R3 level of treatment annual O&M				\$1,807,684
R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$146,674

Annual O&M

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 2,020,304		\$2,020,304
2		\$ 2,088,475		\$2,088,475
3		\$ 2,158,947		\$2,158,947
4		\$ 2,231,796		\$2,231,796
5		\$ 2,307,104		\$2,307,104
6		\$ 2,384,952		\$2,384,952
7		\$ 2,465,428		\$2,465,428
8		\$ 2,548,619		\$2,548,619
9		\$ 2,634,617		\$2,634,617
10		\$ 2,723,517		\$2,723,517
11		\$ 2,815,417		\$2,815,417
12		\$ 2,910,417		\$2,910,417
13		\$ 3,008,624		\$3,008,624
14		\$ 3,110,144		\$3,110,144
15		\$ 3,215,089		\$3,215,089
16		\$ 3,323,576		\$3,323,576
17		\$ 3,435,724		\$3,435,724
18		\$ 3,551,656		\$3,551,656
19		\$ 3,671,499		\$3,671,499
20		\$ 3,795,387		\$3,795,387
21		\$ 3,923,455	\$ 124,247,333	\$128,170,788 replace elec./ motorized equipment
22		\$ 4,065,844		\$4,065,844
23		\$ 4,192,700	\$ 4,831,797	\$9,024,497 sewer inspection at yr 10 of service
24		\$ 4,334,175		\$4,334,175
25		\$ 4,480,423		\$4,480,423
26		\$ 4,631,606		\$4,631,606
27		\$ 4,787,890		\$4,787,890
28		\$ 4,949,448		\$4,949,448
29		\$ 5,116,458		\$5,116,458
30		\$ 5,289,103		\$5,289,103

Present value of O&M \$124,834,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 61,890,300	\$ 144,410,700	\$ 1,027,539,910	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$33,415,000	\$62,375,000	\$665,739,000	\$761,529,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

1,155,113,000

Alternative 3B	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waimea Area							
- 1 COH WWTP	Gravity Sewer 8 inch	121,916	LF			\$ 1,600	\$ 195,066,384
- West Waimea WWTP	Gravity Sewer 12 inch	2,118	LF			\$ 3,070	\$ 6,500,909
	Gravity Sewer 16 inch	10,249	LF			\$ 5,800	\$ 59,446,178
	Gravity Sewer 18 inch	22,384	LF			\$ 6,525	\$ 146,056,579
	Gravity Sewer 24 inch	19,265	LF			\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	3,572	LF			\$ 900	\$ 3,214,548
	Force main 8 inch	2,645	LF			\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF			\$ 1,700	\$ 7,512,300
	Force main 12 inch	5,016	LF			\$ 3,070	\$ 15,399,120
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	47,288	LF			\$ 450	\$ 21,279,380
	Low pressure sewer (On-Lot)	1,336	EA			\$ 26,000	\$ 34,736,000
	Regional PS (including exist. PS that receives additional flow)	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	-	EA			\$ 1,200,000	\$ -
	COH West Waimea WWTP, level of treatment - R2		LS			\$ 23,562,000	\$ 23,562,000
	Subtotal of Estimated Construction Cost						\$ 712,610,897
	Right of Way	231	Ac			\$ 20,000	\$ 4,628,315
	Contingency	20%					\$ 143,447,843
	Total Estimated Project Cost						\$ 860,687,055
	Project services		20%				\$ 172,137,411
	TOTAL CAPITAL COST						\$ 1,032,824,000

O&M

Item	QUAN	UN	Unit cost	Total Annual
R3 level of treatment annual O&M				\$957,463
R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$142,780

Annual O&M

\$1,100,243

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 1,137,368		\$1,137,368
2		\$ 1,175,747		\$1,175,747
3		\$ 1,215,420		\$1,215,420
4		\$ 1,256,432		\$1,256,432
5		\$ 1,298,828		\$1,298,828
6		\$ 1,342,654		\$1,342,654
7		\$ 1,387,959		\$1,387,959
8		\$ 1,434,793		\$1,434,793
9		\$ 1,483,207		\$1,483,207
10		\$ 1,533,255		\$1,533,255
11		\$ 1,584,992		\$1,584,992
12		\$ 1,638,474		\$1,638,474
13		\$ 1,693,761		\$1,693,761
14		\$ 1,750,914		\$1,750,914
15		\$ 1,809,995		\$1,809,995
16		\$ 1,871,070		\$1,871,070
17		\$ 1,934,206		\$1,934,206
18		\$ 1,999,472		\$1,999,472
19		\$ 2,066,940		\$2,066,940
20		\$ 2,136,685		\$2,136,685
21		\$ 2,208,783	\$ 51,974,040	\$4,182,823 replace elec./ motorized equipment
22		\$ 2,283,314		\$2,283,314
23		\$ 2,360,360	\$ 2,463,056	\$4,823,415 sewer inspection at yr 10 of service
24		\$ 2,440,005		\$2,440,005
25		\$ 2,522,339		\$2,522,339
26		\$ 2,607,450		\$2,607,450
27		\$ 2,695,433		\$2,695,433
28		\$ 2,786,385		\$2,786,385
29		\$ 2,880,406		\$2,880,406
30		\$ 2,977,600		\$2,977,600

Present value of O&M \$60,992,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 25,889,400	\$ 60,408,600	\$ 626,312,897	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$13,978,000	\$26,092,000	\$405,786,000	\$445,856,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

647,960,000

Alternative 3B	DESCRIPTION	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area	Level of Treatment - R2						
- To exist. S. Kohala							
WRF	Gravity Sewer 8 inch	18,788	LF			\$ 1,600	\$ 30,060,752
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	5,045	LF			\$ 6,525	\$ 32,920,061
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	19,564	LF			\$ 900	\$ 17,607,339
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	12,357	LF			\$ 450	\$ 5,560,655
	Low pressure sewer (On-Lot)	349	EA			\$ 26,000	\$ 9,074,000
	Regional PS (inclding exist. PS that receives additional flow)	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	-	EA			\$ 1,200,000	\$ -
			LS				
	Subtotal of Estimated Construction Cost						\$ 144,222,806
	Right of Way	55	Ac			\$ 20,000	\$ 1,096,261
	Contingency	20%					\$ 29,063,813
	Total Estimated Project Cost						\$ 174,382,880
	Project services	20%					\$ 34,876,576
	TOTAL CAPITAL COST						\$ 209,259,000

O&M

Item	QUAN	UN	Unit cost	Total Annual
R3 level of treatment annual O&M				\$225,692
R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$0

Annual O&M

\$225,692

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 233,308		\$233,308
2		\$ 241,180		\$241,180
3		\$ 249,318		\$249,318
4		\$ 257,731		\$257,731
5		\$ 266,428		\$266,428
6		\$ 275,418		\$275,418
7		\$ 284,711		\$284,711
8		\$ 294,318		\$294,318
9		\$ 304,249		\$304,249
10		\$ 314,516		\$314,516
11		\$ 325,128		\$325,128
12		\$ 336,099		\$336,099
13		\$ 347,440		\$347,440
14		\$ 359,164		\$359,164
15		\$ 371,283		\$371,283
16		\$ 383,811		\$383,811
17		\$ 396,762		\$396,762
18		\$ 410,150		\$410,150
19		\$ 423,990		\$423,990
20		\$ 438,297		\$438,297
21		\$ 453,086	\$ 34,975,786	\$35,428,872
22		\$ 468,375		\$468,375
23		\$ 484,179	\$ 333,665	\$817,844
24		\$ 500,517		\$500,517
25		\$ 517,406		\$517,406
26		\$ 534,864		\$534,864
27		\$ 552,912		\$552,912
28		\$ 571,569		\$571,569
29		\$ 590,856		\$590,856
30		\$ 610,793		\$610,793

Present value of O&M \$24,824,000

replace elec./ motorized equipment

sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 17,422,200	\$ 40,651,800	\$ 86,148,806	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$9,406,000	\$17,559,000	\$55,815,000	\$82,780,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

151,303,000

Alternative 3B	DESCRIPTION	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area	Level of Treatment - R2						
- To exist. Mauna Lani							
WWTP	Gravity Sewer 8 inch	0	LF			\$ 1,600	\$ -
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	17,508	LF			\$ 900	\$ 15,757,623
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	18,360	LF			\$ 450	\$ 8,261,996
	Low pressure sewer (On-Lot)	208	EA			\$ 26,000	\$ 6,968,000
	Regional PS (inclding exist. PS that receives additional flow)	3	EA			\$ 7,000,000	\$ 21,000,000
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
			LS			\$ -	
	Subtotal of Estimated Construction Cost						\$ 53,187,619
	Right of Way	35	Ac			\$ 20,000	\$ 700,064
	Contingency	20%					\$ 10,777,536
	Total Estimated Project Cost						\$ 64,665,218
	Project services	20%					\$ 12,933,044
	TOTAL CAPITAL COST						\$ 77,598,000

O&M

Item	QUAN	UN	Unit Cost	Total Annual
R3 level of treatment annual O&M				\$163,079
R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$0

Annual O&M

\$163,079

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 168,582		\$168,582
2		\$ 174,271		\$174,271
3		\$ 180,151		\$180,151
4		\$ 186,230		\$186,230
5		\$ 192,514		\$192,514
6		\$ 199,010		\$199,010
7		\$ 205,725		\$205,725
8		\$ 212,667		\$212,667
9		\$ 219,843		\$219,843
10		\$ 227,261		\$227,261
11		\$ 234,929		\$234,929
12		\$ 242,857		\$242,857
13		\$ 251,051		\$251,051
14		\$ 259,523		\$259,523
15		\$ 268,280		\$268,280
16		\$ 277,332		\$277,332
17		\$ 286,690		\$286,690
18		\$ 296,364		\$296,364
19		\$ 306,364		\$306,364
20		\$ 316,702		\$316,702
21		\$ 327,388	\$ 17,566,789	\$17,894,178 replace elec./ motorized equipment
22		\$ 338,436		\$338,436
23		\$ 349,855	\$ -	\$349,855 sewer inspection at yr 10 of service
24		\$ 361,661		\$361,661
25		\$ 373,864		\$373,864
26		\$ 386,479		\$386,479
27		\$ 399,520		\$399,520
28		\$ 413,001		\$413,001
29		\$ 426,937		\$426,937
30		\$ 441,344		\$441,344

Present value of O&M \$13,893,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 8,750,400	\$ 20,417,600	\$ 24,019,619	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$4,724,000	\$8,819,000	\$15,562,000	\$29,105,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

62,386,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3B Waikoloa Area - To exist. Waikoloa Village WWTP	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Gravity Sewer 8 inch		130,532	LF			\$ 1,600	\$ 208,850,416
Gravity Sewer 12 inch		14,831	LF			\$ 3,070	\$ 45,531,477
Gravity Sewer 16 inch			LF			\$ 5,800	\$ -
Gravity Sewer 18 inch			LF			\$ 6,525	\$ -
Gravity Sewer 24 inch			LF			\$ 8,700	\$ -
Gravity Sewer 30 inch		-	LF			\$ 10,875	\$ -
Gravity Sewer 36 inch		-	LF			\$ 13,050	\$ -
Gravity Sewer 42 inch		-	LF			\$ 15,200	\$ -
Force main 4 inch		-	LF			\$ 600	\$ -
Force main 6 inch		-	LF			\$ 900	\$ -
Force main 8 inch			LF			\$ 1,600	\$ -
Force main 10 inch			LF			\$ 1,700	\$ -
Force main 12 inch		1,973	LF			\$ 3,070	\$ 6,057,755
Force main 14 inch			LF			\$ 4,430	\$ -
Force main 16 inch		-	LF			\$ 5,800	\$ -
Force main 18 inch		-	LF			\$ 6,525	\$ -
Force main 24 inch		-	LF			\$ 8,700	\$ -
Force main 30 inch		-	LF			\$ 10,875	\$ -
Force main 36 inch		-	LF			\$ 13,050	\$ -
Force main 42 inch		-	LF			\$ 15,200	\$ -
Low Pressure Sewer In-Street (3 inch average)		23,635	LF			\$ 450	\$ 10,635,683
Low pressure sewer (On-Lot)		668	EA			\$ 26,000	\$ 17,368,000
Regional PS (including exist. PS that receives additional flow)		1	EA			\$ 7,000,000	\$ 7,000,000
Neighborhood PS			EA			\$ 1,200,000	\$ -
			LS			\$ -	\$ -
Subtotal of Estimated Construction Cost							\$ 295,443,330
Right of Way	158	Ac				\$ 20,000	\$ 3,150,288
Contingency	20%						\$ 59,718,724
Total Estimated Project Cost							\$ 358,312,342
Project services		20%					\$ 71,662,468
TOTAL CAPITAL COST							\$ 429,975,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$379,815
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$0

Annual O&M

\$379,815

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 392,632		\$392,632
2		\$ 405,880		\$405,880
3		\$ 419,576		\$419,576
4		\$ 433,733		\$433,733
5		\$ 448,369		\$448,369
6		\$ 463,498		\$463,498
7		\$ 479,138		\$479,138
8		\$ 495,306		\$495,306
9		\$ 512,019		\$512,019
10		\$ 529,296		\$529,296
11		\$ 547,156		\$547,156
12		\$ 565,619		\$565,619
13		\$ 584,704		\$584,704
14		\$ 604,434		\$604,434
15		\$ 624,829		\$624,829
16		\$ 645,913		\$645,913
17		\$ 667,708		\$667,708
18		\$ 690,239		\$690,239
19		\$ 713,529		\$713,529
20		\$ 737,606		\$737,606
21		\$ 762,495	\$ 14,675,930	\$15,438,425
22		\$ 788,224		\$788,224
23		\$ 814,821	\$ 2,035,077	\$2,849,898
24		\$ 842,316		\$842,316
25		\$ 870,738		\$870,738
26		\$ 900,119		\$900,119
27		\$ 930,492		\$930,492
28		\$ 961,890		\$961,890
29		\$ 994,347		\$994,347
30		\$ 1,027,899		\$1,027,899

Present value of O&M

\$19,958,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 7,310,400	\$ 17,057,600	\$ 271,075,330	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,947,000	\$7,368,000	\$175,629,000	\$186,944,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

262,989,000

Alternative 3B	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikii Area	Gravity Sewer 8 inch	0	LF			\$ 1,600	\$ -
- 1 COH WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
- Waikii WWTP	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	-	LF			\$ 900	\$ -
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	44,407	LF			\$ 450	\$ 19,983,258
	Low pressure sewer (On-Lot)	80	EA			\$ 26,000	\$ 2,080,000
	Regional PS (including exist. PS that receives additional flow)	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH Waikii WWTPs, level of treatment - R2		LS			\$ 6,313,000	\$ 6,313,000
	Subtotal of Estimated Construction Cost						\$ 28,376,258
	Right of Way	45	Ac			\$ 20,000	\$ 895,560
	Contingency	20%					\$ 5,854,364
	Total Estimated Project Cost						\$ 35,126,182
	Project services		20%				\$ 7,025,236
	TOTAL CAPITAL COST						\$ 42,151,000

O&M

Item	QUAN	UN	Unit cost	Total Annual
R3 level of treatment annual O&M				\$81,635
R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$3,694

Annual O&M

\$85,529

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 88,415		\$88,415
2		\$ 91,398		\$91,398
3		\$ 94,482		\$94,482
4		\$ 97,670		\$97,670
5		\$ 100,966		\$100,966
6		\$ 104,373		\$104,373
7		\$ 107,894		\$107,894
8		\$ 111,535		\$111,535
9		\$ 115,299		\$115,299
10		\$ 119,189		\$119,189
11		\$ 123,211		\$123,211
12		\$ 127,369		\$127,369
13		\$ 131,666		\$131,666
14		\$ 136,109		\$136,109
15		\$ 140,702		\$140,702
16		\$ 145,450		\$145,450
17		\$ 150,358		\$150,358
18		\$ 155,431		\$155,431
19		\$ 160,676		\$160,676
20		\$ 166,097		\$166,097
21		\$ 171,702	\$ 5,054,788	\$5,226,490 replace elec./ motorized equipment
22		\$ 177,496		\$177,496
23		\$ 183,485	\$ -	\$183,485 sewer inspection at yr 10 of service
24		\$ 189,676		\$189,676
25		\$ 196,077		\$196,077
26		\$ 202,693		\$202,693
27		\$ 209,532		\$209,532
28		\$ 216,603		\$216,603
29		\$ 223,911		\$223,911
30		\$ 231,467		\$231,467

Present value of O&M \$5,167,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 2,517,900	\$ 5,875,100	\$ 19,983,258	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$1,359,000	\$2,538,000	\$12,947,000	\$16,844,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

30,474,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3B	DESCRIPTION Level of Treatment - R1	QUAN	UN			TOTAL DIRECT COST
					UNIT COST	
Same as 2B, but sewer sizing is bigger to accommodate redevelopment of existing parcels. Includes one Mauka COH Plant, Urban Sewering w/ Private and County Plants, both gravity sewers and LPS to reduce the number of neighborhood pump stations. All current and future flow from Makai areas conveyed to existing private WWTPs. No IWS for low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to existing private WWPS or WWTP in Makai areas. COH sewers/WWPS from high density (commercial or <1 acre lots) from Mauka (Waimea) area to new COH WWTP.	Gravity Sewer 8 inch	271,236	LF		\$ 1,600	\$ 433,977,552
	Gravity Sewer 12 inch	16,949	LF		\$ 3,070	\$ 52,032,386
	Gravity Sewer 16 inch	10,249	LF		\$ 5,800	\$ 59,446,178
	Gravity Sewer 18 inch	27,429	LF		\$ 6,525	\$ 178,976,639
	Gravity Sewer 24 inch	19,265	LF		\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF		\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF		\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF		\$ 15,200	\$ -
	Force main 4 inch	-	LF		\$ 600	\$ -
	Force main 6 inch	40,644	LF		\$ 900	\$ 36,579,510
	Force main 8 inch	2,645	LF		\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF		\$ 1,700	\$ 7,512,300
	Force main 12 inch	6,989	LF		\$ 3,070	\$ 21,456,875
	Force main 14 inch	-	LF		\$ 4,430	\$ -
	Force main 16 inch	-	LF		\$ 5,800	\$ -
	Force main 18 inch	-	LF		\$ 6,525	\$ -
	Force main 24 inch	-	LF		\$ 8,700	\$ -
	Force main 30 inch	-	LF		\$ 10,875	\$ -
	Force main 36 inch	-	LF		\$ 13,050	\$ -
	Force main 42 inch	-	LF		\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	146,047	LF		\$ 450	\$ 65,720,970
	Low pressure sewer (On-Lot)	2,701	EA		\$ 26,000	\$ 70,226,000
	Regional PS (including exist. PS that receives additional flow)	15	EA		\$ 7,000,000	\$ 105,000,000
	Neighborhood PS	1	EA		\$ 1,200,000	\$ 1,200,000
	COH WWTPs (2 total), level of treatment - R1		LS		\$ 38,837,500	\$ 38,837,500
	Subtotal of Estimated Construction Cost					\$ 1,242,803,410
	Right of Way	524	Ac		\$ 20,000	\$ 10,470,488
	Contingency	20%				\$ 250,654,780
	Total Estimated Project Cost					\$ 1,503,928,677
	Project services	20%				\$ 300,785,735
	TOTAL CAPITAL COST					\$ 1,804,714,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$1,807,684
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$170,291

Annual O&M

\$1,977,975

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 2,044,718		\$2,044,718
2		\$ 2,113,713		\$2,113,713
3		\$ 2,185,036		\$2,185,036
4		\$ 2,258,766		\$2,258,766
5		\$ 2,334,983		\$2,334,983
6		\$ 2,413,773		\$2,413,773
7		\$ 2,495,221		\$2,495,221
8		\$ 2,579,417		\$2,579,417
9		\$ 2,666,454		\$2,666,454
10		\$ 2,756,429		\$2,756,429
11		\$ 2,849,439		\$2,849,439
12		\$ 2,945,588		\$2,945,588
13		\$ 3,044,981		\$3,044,981
14		\$ 3,147,728		\$3,147,728
15		\$ 3,253,942		\$3,253,942
16		\$ 3,363,739		\$3,363,739
17		\$ 3,477,242		\$3,477,242
18		\$ 3,594,575		\$3,594,575
19		\$ 3,715,867		\$3,715,867
20		\$ 3,841,251		\$3,841,251
21		\$ 3,970,867	\$ 129,645,110	\$133,615,977
22		\$ 4,104,856		\$4,104,856
23		\$ 4,243,366	\$ 4,831,797	\$9,075,163
24		\$ 4,386,550		\$4,386,550
25		\$ 4,534,566		\$4,534,566
26		\$ 4,687,576		\$4,687,576
27		\$ 4,845,749		\$4,845,749
28		\$ 5,009,259		\$5,009,259
29		\$ 5,178,286		\$5,178,286
30		\$ 5,353,017		\$5,353,017

Present value of O&M

\$128,301,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 64,579,050	\$ 150,684,450	\$ 1,027,539,910	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$34,867,000	\$65,085,000	\$665,739,000	\$765,691,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3B	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waimea Area							
- 1 COH WWTP	Gravity Sewer 8 inch	121,916	LF			\$ 1,600	\$ 195,066,384
- West Waimea WWTP	Gravity Sewer 12 inch	2,118	LF			\$ 3,070	\$ 6,500,909
	Gravity Sewer 16 inch	10,249	LF			\$ 5,800	\$ 59,446,178
	Gravity Sewer 18 inch	22,384	LF			\$ 6,525	\$ 146,056,579
	Gravity Sewer 24 inch	19,265	LF			\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	3,572	LF			\$ 900	\$ 3,214,548
	Force main 8 inch	2,645	LF			\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF			\$ 1,700	\$ 7,512,300
	Force main 12 inch	5,016	LF			\$ 3,070	\$ 15,399,120
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	47,288	LF			\$ 450	\$ 21,279,380
	Low pressure sewer (On-Lot)	1,336	EA			\$ 26,000	\$ 34,736,000
	Regional PS (including exist. PS that receives additional flow)	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	-	EA			\$ 1,200,000	\$ -
	COH West Waimea WWTP, level of treatment - R1		LS			\$ 30,630,600	\$ 30,630,600
	Subtotal of Estimated Construction Cost						\$ 719,679,497
	Right of Way	231	Ac			\$ 20,000	\$ 4,628,315
	Contingency	20%					\$ 144,861,563
	Total Estimated Project Cost						\$ 869,169,375
	Project services		20%				\$ 173,833,875
	TOTAL CAPITAL COST						\$ 1,043,003,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$957,463
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$165,770
Annual O&M					\$1,123,233

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 1,161,134		\$1,161,134
2		\$ 1,200,314		\$1,200,314
3		\$ 1,240,816		\$1,240,816
4		\$ 1,282,685		\$1,282,685
5		\$ 1,325,967		\$1,325,967
6		\$ 1,370,709		\$1,370,709
7		\$ 1,416,961		\$1,416,961
8		\$ 1,464,774		\$1,464,774
9		\$ 1,514,200		\$1,514,200
10		\$ 1,565,293		\$1,565,293
11		\$ 1,618,111		\$1,618,111
12		\$ 1,672,711		\$1,672,711
13		\$ 1,729,153		\$1,729,153
14		\$ 1,787,500		\$1,787,500
15		\$ 1,847,816		\$1,847,816
16		\$ 1,910,167		\$1,910,167
17		\$ 1,974,622		\$1,974,622
18		\$ 2,041,251		\$2,041,251
19		\$ 2,110,129		\$2,110,129
20		\$ 2,181,331		\$2,181,331
21		\$ 2,254,936	\$ 56,231,192	\$58,486,128
22		\$ 2,331,025		\$2,331,025
23		\$ 2,409,680	\$ 2,463,056	\$4,872,736
24		\$ 2,490,990		\$2,490,990
25		\$ 2,575,044		\$2,575,044
26		\$ 2,661,934		\$2,661,934
27		\$ 2,751,755		\$2,751,755
28		\$ 2,844,608		\$2,844,608
29		\$ 2,940,594		\$2,940,594
30		\$ 3,039,818		\$3,039,818

Present value of O&M

\$63,858,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 28,009,980	\$ 65,356,620	\$ 626,312,897	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$15,123,000	\$28,230,000	\$405,786,000	\$449,139,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

657,722,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3B	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area							
- To exist. S. Kohala							
WRF	Gravity Sewer 8 inch	18,788	LF			\$ 1,600	\$ 30,060,752
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	5,045	LF			\$ 6,525	\$ 32,920,061
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	19,564	LF			\$ 900	\$ 17,607,339
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	12,357	LF			\$ 450	\$ 5,560,655
	Low pressure sewer (On-Lot)	349	EA			\$ 26,000	\$ 9,074,000
	Regional PS (including exist. PS that receives additional flow)	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	-	EA LS			\$ 1,200,000	\$ -
						\$	\$ -
	Subtotal of Estimated Construction Cost						\$ 144,222,806
	Right of Way	55	Ac			\$ 20,000	\$ 1,096,261
	Contingency	20%					\$ 29,063,813
	Total Estimated Project Cost						\$ 174,382,880
	Project services		20%				\$ 34,876,576
	TOTAL CAPITAL COST						\$ 209,259,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$225,692
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$0
Annual O&M					\$225,692

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 233,308		\$233,308
2		\$ 241,180		\$241,180
3		\$ 249,318		\$249,318
4		\$ 257,731		\$257,731
5		\$ 266,428		\$266,428
6		\$ 275,418		\$275,418
7		\$ 284,711		\$284,711
8		\$ 294,318		\$294,318
9		\$ 304,249		\$304,249
10		\$ 314,516		\$314,516
11		\$ 325,128		\$325,128
12		\$ 336,099		\$336,099
13		\$ 347,440		\$347,440
14		\$ 359,164		\$359,164
15		\$ 371,283		\$371,283
16		\$ 383,811		\$383,811
17		\$ 396,762		\$396,762
18		\$ 410,150		\$410,150
19		\$ 423,990		\$423,990
20		\$ 438,297		\$438,297
21		\$ 453,086	\$ 34,975,786	\$35,428,872
22		\$ 468,375		\$468,375
23		\$ 484,179	\$ 333,665	\$817,844
24		\$ 500,517		\$500,517
25		\$ 517,406		\$517,406
26		\$ 534,864		\$534,864
27		\$ 552,912		\$552,912
28		\$ 571,569		\$571,569
29		\$ 590,856		\$590,856
30		\$ 610,793		\$610,793

Present value of O&M \$24,824,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 17,422,200	\$ 40,651,800	\$ 86,148,806	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$9,406,000	\$17,559,000	\$55,815,000	\$82,780,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**151,303,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3B	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area							
- To exist. Mauna Lani							
WWTP	Gravity Sewer 8 inch	0	LF			\$ 1,600	\$ -
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch		LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch		LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch		LF			\$ 15,200	\$ -
	Force main 4 inch		LF			\$ 600	\$ -
	Force main 6 inch	17,508	LF			\$ 900	\$ 15,757,623
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	18,360	LF			\$ 450	\$ 8,261,996
	Low pressure sewer (On-Lot)	268	EA			\$ 26,000	\$ 6,968,000
	Regional PS (including exist. PS that receives additional flow)	3	EA			\$ 7,000,000	\$ 21,000,000
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
			LS				\$ -
	Subtotal of Estimated Construction Cost						\$ 53,187,619
	Right of Way	35	Ac			\$ 20,000	\$ 700,064
	Contingency	20%					\$ 10,777,536
	Total Estimated Project Cost						\$ 64,665,218
	Project services		20%				\$ 12,933,044
	TOTAL CAPITAL COST						\$ 77,598,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$163,079
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$0

Annual O&M

\$163,079

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 168,582		\$168,582
2		\$ 174,271		\$174,271
3		\$ 180,151		\$180,151
4		\$ 186,230		\$186,230
5		\$ 192,514		\$192,514
6		\$ 199,010		\$199,010
7		\$ 205,725		\$205,725
8		\$ 212,667		\$212,667
9		\$ 219,843		\$219,843
10		\$ 227,261		\$227,261
11		\$ 234,929		\$234,929
12		\$ 242,857		\$242,857
13		\$ 251,051		\$251,051
14		\$ 259,523		\$259,523
15		\$ 268,280		\$268,280
16		\$ 277,332		\$277,332
17		\$ 286,690		\$286,690
18		\$ 296,364		\$296,364
19		\$ 306,364		\$306,364
20		\$ 316,702		\$316,702
21		\$ 327,388	\$ 17,566,789	\$17,894,178
22		\$ 338,436		\$338,436
23		\$ 349,855	\$ -	\$349,855
24		\$ 361,661		\$361,661
25		\$ 373,864		\$373,864
26		\$ 386,479		\$386,479
27		\$ 399,520		\$399,520
28		\$ 413,001		\$413,001
29		\$ 426,937		\$426,937
30		\$ 441,344		\$441,344

Present value of O&M

\$13,893,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 8,750,400	\$ 20,417,600	\$ 24,019,619	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$4,724,000	\$8,819,000	\$15,562,000	\$29,105,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

62,386,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3B	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikoloa Area	Gravity Sewer 8 inch	130,532	LF			\$ 1,600	\$ 208,850,416
- To exist. Waikoloa Village WWTP	Gravity Sewer 12 inch	14,831	LF			\$ 3,070	\$ 45,531,477
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	-	LF			\$ 900	\$ -
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch	1,973	LF			\$ 3,070	\$ 6,057,755
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	23,635	LF			\$ 450	\$ 10,635,683
	Low pressure sewer (On-Lot)	668	EA			\$ 26,000	\$ 17,368,000
	Regional PS (including exist. PS that receives additional flow)	1	EA			\$ 7,000,000	\$ 7,000,000
	Neighborhood PS		EA			\$ 1,200,000	\$ -
			LS			\$	\$ -
	Subtotal of Estimated Construction Cost						\$ 295,443,330
	Right of Way	158	Ac			\$ 20,000	\$ 3,150,288
	Contingency	20%					\$ 59,718,724
	Total Estimated Project Cost						\$ 358,312,342
	Project services		20%				\$ 71,662,468
	TOTAL CAPITAL COST						\$ 429,975,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$379,815
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$0

Annual O&M

\$379,815

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 392,632		\$392,632
2		\$ 405,880		\$405,880
3		\$ 419,576		\$419,576
4		\$ 433,733		\$433,733
5		\$ 448,369		\$448,369
6		\$ 463,498		\$463,498
7		\$ 479,138		\$479,138
8		\$ 495,306		\$495,306
9		\$ 512,019		\$512,019
10		\$ 529,296		\$529,296
11		\$ 547,156		\$547,156
12		\$ 565,619		\$565,619
13		\$ 584,704		\$584,704
14		\$ 604,434		\$604,434
15		\$ 624,829		\$624,829
16		\$ 645,913		\$645,913
17		\$ 667,708		\$667,708
18		\$ 690,239		\$690,239
19		\$ 713,529		\$713,529
20		\$ 737,606		\$737,606
21		\$ 762,495	\$ 14,675,930	\$15,438,425
22		\$ 788,224		\$788,224
23		\$ 814,821	\$ 2,035,077	\$2,849,898
24		\$ 842,316		\$842,316
25		\$ 870,738		\$870,738
26		\$ 900,119		\$900,119
27		\$ 930,492		\$930,492
28		\$ 961,890		\$961,890
29		\$ 994,347		\$994,347
30		\$ 1,027,899		\$1,027,899

Present value of O&M \$19,958,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 7,310,400	\$ 17,057,600	\$ 271,075,330	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,947,000	\$7,368,000	\$175,629,000	\$186,944,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

262,989,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3B	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikii Area							
- 1 COH WWTP	Gravity Sewer 8 inch	0	LF			\$ 1,600	\$ -
- Waikii WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	-	LF			\$ 900	\$ -
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	44,407	LF			\$ 450	\$ 19,983,258
	Low pressure sewer (On-Lot)	80	EA			\$ 26,000	\$ 2,080,000
	Regional PS (including exist. PS that receives additional flow)	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH Waikii WWTPs, level of treatment - R1		LS			\$ 8,206,900	\$ 8,206,900
	Subtotal of Estimated Construction Cost						\$ 30,270,158
	Right of Way	45	Ac			\$ 20,000	\$ 895,560
	Contingency	20%					\$ 6,233,144
	Total Estimated Project Cost						\$ 37,398,862
	Project services		20%				\$ 7,479,772
	TOTAL CAPITAL COST						\$ 44,879,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$81,635
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$4,521
Annual O&M					\$86,156

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 89,063		\$89,063
2		\$ 92,068		\$92,068
3		\$ 95,175		\$95,175
4		\$ 98,386		\$98,386
5		\$ 101,706		\$101,706
6		\$ 105,138		\$105,138
7		\$ 108,685		\$108,685
8		\$ 112,353		\$112,353
9		\$ 116,144		\$116,144
10		\$ 120,063		\$120,063
11		\$ 124,114		\$124,114
12		\$ 128,302		\$128,302
13		\$ 132,632		\$132,632
14		\$ 137,107		\$137,107
15		\$ 141,733		\$141,733
16		\$ 146,516		\$146,516
17		\$ 151,460		\$151,460
18		\$ 156,571		\$156,571
19		\$ 161,854		\$161,854
20		\$ 167,315		\$167,315
21		\$ 172,961	\$ 6,195,413	\$6,368,374
22		\$ 178,797		\$178,797
23		\$ 184,830	\$ -	\$184,830
24		\$ 191,067		\$191,067
25		\$ 197,514		\$197,514
26		\$ 204,179		\$204,179
27		\$ 211,068		\$211,068
28		\$ 218,191		\$218,191
29		\$ 225,553		\$225,553
30		\$ 233,164		\$233,164

Present value of O&M \$5,767,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 3,086,070	\$ 7,200,830	\$ 19,983,258	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$1,666,000	\$3,110,000	\$12,947,000	\$17,723,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

32,923,000

G-10: Alternative 3C Construction Cost and LCC Analysis

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3C	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Same as 2C, but sewer sizing is bigger to accomodate redevelopment of existing parcels with IWS. Includes one Mauka COH Plant, Urban Sewering w/ Private and County Plants, All Gravity Sewers. Cross country sewers with new easements are used to reduce the number of pump stations. All current and future flow from Makai areas conveyed to existing private WWTPs. IWS for all low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to existing private WWPS or WWTP in Makai areas. COH sewers/WWPS from high density (commercial or <1 acre lots) from Mauka (Waimea) area to new COH WWTP.	Gravity Sewer 8 inch	429,197	LF			\$ 1,600	\$ 686,715,040
	Gravity Sewer 12 inch	16,949	LF			\$ 3,070	\$ 52,032,386
	Gravity Sewer 16 inch	10,249	LF			\$ 5,800	\$ 59,446,178
	Gravity Sewer 18 inch	27,429	LF			\$ 6,525	\$ 178,976,639
	Gravity Sewer 24 inch	19,265	LF			\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	39,213	LF			\$ 900	\$ 35,292,105
	Force main 8 inch	2,645	LF			\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF			\$ 1,700	\$ 7,512,300
	Force main 12 inch	6,989	LF			\$ 3,070	\$ 21,456,875
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	15	EA			\$ 7,000,000	\$ 105,000,000
	Neighborhood PS	9	EA			\$ 1,200,000	\$ 10,800,000
	COH WWTPs (2 total), level of treatment - R3		LS			\$ 27,900,000	\$ 27,900,000
	Subtotal of Estimated Construction Cost						\$ 1,356,969,023
	Right of Way	537	Ac			\$ 20,000	\$ 10,745,674
	Contingency	20%					\$ 273,542,939
	Total Estimated Project Cost						\$ 1,641,257,636
	Project services		20%				\$ 328,251,527
	TOTAL CAPITAL COST						\$ 1,969,509,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	590458	kWH	\$ 0.44	\$259,801
	Labor and Materials	\$ 75,505	LS	-	\$75,505

Annual O&M

\$335,306

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 346,620		\$346,620
2		\$ 358,316		\$358,316
3		\$ 370,407		\$370,407
4		\$ 382,906		\$382,906
5		\$ 395,826		\$395,826
6		\$ 409,182		\$409,182
7		\$ 422,989		\$422,989
8		\$ 437,262		\$437,262
9		\$ 452,017		\$452,017
10		\$ 467,269		\$467,269
11		\$ 483,036		\$483,036
12		\$ 499,336		\$499,336
13		\$ 516,185		\$516,185
14		\$ 533,602		\$533,602
15		\$ 551,608		\$551,608
16		\$ 570,221		\$570,221
17		\$ 589,462		\$589,462
18		\$ 609,352		\$609,352
19		\$ 629,913		\$629,913
20		\$ 651,168		\$651,168
21		\$ 673,141	\$ 86,545,105	\$87,218,246
22		\$ 695,854		\$695,854
23		\$ 719,335	\$ 7,043,250	\$7,762,585
24		\$ 743,607		\$743,607
25		\$ 768,699		\$768,699
26		\$ 794,637		\$794,637
27		\$ 821,450		\$821,450
28		\$ 849,169		\$849,169
29		\$ 877,822		\$877,822
30		\$ 907,443		\$907,443

Present value of O&M

\$57,649,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 43,110,000	\$ 100,590,000	\$ 1,213,269,023	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$23,276,000	\$43,448,000	\$786,072,000	\$852,796,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

1,174,362,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3C	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waimea Area							
- 1 COH WWTP	Gravity Sewer 8 inch	181,535	LF			\$ 1,600	\$ 290,456,448
- West Waimea WWTP	Gravity Sewer 12 inch	2,118	LF			\$ 3,070	\$ 6,500,909
	Gravity Sewer 16 inch	10,249	LF			\$ 5,800	\$ 59,446,178
	Gravity Sewer 18 inch	22,384	LF			\$ 6,525	\$ 146,056,579
	Gravity Sewer 24 inch	19,265	LF			\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	6,514	LF			\$ 900	\$ 5,862,996
	Force main 8 inch	2,645	LF			\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF			\$ 1,700	\$ 7,512,300
	Force main 12 inch	5,016	LF			\$ 3,070	\$ 15,399,120
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	2	EA			\$ 1,200,000	\$ 2,400,000
	COH West Waimea WWTP, level of treatment - R3		LS			\$ 22,000,000	\$ 22,000,000
	Subtotal of Estimated Construction Cost						\$ 755,472,030
	Right of Way	246	Ac			\$ 20,000	\$ 4,929,491
	Contingency	20%					\$ 152,080,304
	Total Estimated Project Cost						\$ 912,481,825
	Project services		20%				\$ 182,496,365
	TOTAL CAPITAL COST						\$ 1,094,978,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	456078	kWH	\$ 0.44	\$200,674
	Labor and Materials	\$ 49,536	LS	-	\$49,536

Annual O&M

\$250,211

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 258,653		\$258,653
2		\$ 267,381		\$267,381
3		\$ 276,403		\$276,403
4		\$ 285,730		\$285,730
5		\$ 295,372		\$295,372
6		\$ 305,338		\$305,338
7		\$ 315,641		\$315,641
8		\$ 326,292		\$326,292
9		\$ 337,302		\$337,302
10		\$ 348,684		\$348,684
11		\$ 360,449		\$360,449
12		\$ 372,612		\$372,612
13		\$ 385,185		\$385,185
14		\$ 398,182		\$398,182
15		\$ 411,618		\$411,618
16		\$ 425,507		\$425,507
17		\$ 439,865		\$439,865
18		\$ 454,708		\$454,708
19		\$ 470,051		\$470,051
20		\$ 485,912		\$485,912
21		\$ 502,308	\$ 31,558,549	\$32,060,857
22		\$ 519,257		\$519,257
23		\$ 536,779	\$ 3,297,719	\$3,834,497
24		\$ 554,891		\$554,891
25		\$ 573,615		\$573,615
26		\$ 592,971		\$592,971
27		\$ 612,979		\$612,979
28		\$ 633,663		\$633,663
29		\$ 655,045		\$655,045
30		\$ 677,148		\$677,148

Present value of O&M

\$25,246,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 15,720,000	\$ 36,680,000	\$ 703,072,030	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$8,487,000	\$15,843,000	\$455,518,000	\$479,848,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**640,376,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3C	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area	Gravity Sewer 8 inch	25,985	LF			\$ 1,600	\$ 41,576,448
- To exist. S. Kohala	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
WRF	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	5,045	LF			\$ 6,525	\$ 32,920,061
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	18,989	LF			\$ 900	\$ 17,090,532
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	3	EA			\$ 1,200,000	\$ 3,600,000
			LS			\$	\$ -
	Subtotal of Estimated Construction Cost					\$	\$ 144,187,041
	Right of Way	51	Ac			\$ 20,000	\$ 1,021,946
	Contingency	20%				\$	\$ 29,041,797
	Total Estimated Project Cost					\$	\$ 174,250,784
	Project services		20%			\$	\$ 34,850,157
	TOTAL CAPITAL COST						\$ 209,101,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	66655	kwh	\$ 0.44	\$29,328
	Labor and Materials	13,244	LS	-	\$13,244

Annual O&M \$42,572

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 44,009		\$44,009
2		\$ 45,494		\$45,494
3		\$ 47,029		\$47,029
4		\$ 48,616		\$48,616
5		\$ 50,256		\$50,256
6		\$ 51,952		\$51,952
7		\$ 53,705		\$53,705
8		\$ 55,517		\$55,517
9		\$ 57,390		\$57,390
10		\$ 59,327		\$59,327
11		\$ 61,329		\$61,329
12		\$ 63,398		\$63,398
13		\$ 65,537		\$65,537
14		\$ 67,749		\$67,749
15		\$ 70,035		\$70,035
16		\$ 72,398		\$72,398
17		\$ 74,841		\$74,841
18		\$ 77,366		\$77,366
19		\$ 79,977		\$79,977
20		\$ 82,675		\$82,675
21		\$ 85,465	\$ 31,679,002	\$31,764,467
22		\$ 88,349		\$88,349
23		\$ 91,330	\$ 434,427	\$525,757
24		\$ 94,412		\$94,412
25		\$ 97,598		\$97,598
26		\$ 100,891		\$100,891
27		\$ 104,295		\$104,295
28		\$ 107,815		\$107,815
29		\$ 111,453		\$111,453
30		\$ 115,213		\$115,213

Present value of O&M \$17,647,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 15,780,000	\$ 36,820,000	\$ 91,587,041	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$8,520,000	\$15,904,000	\$59,339,000	\$83,763,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

142,985,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3C	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area							
- To exist. Mauna Lani							
WWTP	Gravity Sewer 8 inch	17,791	LF			\$ 1,600	\$ 28,465,520
	Gravity Sewer 12 inch	-	LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch	-	LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	-	LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch	-	LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	12,266	LF			\$ 900	\$ 11,039,004
	Force main 8 inch	-	LF			\$ 1,600	\$ -
	Force main 10 inch	-	LF			\$ 1,700	\$ -
	Force main 12 inch	-	LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	3	EA			\$ 7,000,000	\$ 21,000,000
	Neighborhood PS	3	EA			\$ 1,200,000	\$ 3,600,000
			LS			\$ -	
	Subtotal of Estimated Construction Cost						\$ 64,104,524
	Right of Way	31	Ac			\$ 20,000	\$ 613,985
	Contingency	20%					\$ 12,943,702
	Total Estimated Project Cost						\$ 77,662,211
	Project services		20%				\$ 15,532,442
	TOTAL CAPITAL COST						\$ 93,195,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	24133	kWH	\$ 0.44	\$10,618
	Labor and Materials	\$ 4,167	LS	-	\$4,167

Annual O&M

\$14,785

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 15,284		\$15,284
2		\$ 15,800		\$15,800
3		\$ 16,333		\$16,333
4		\$ 16,884		\$16,884
5		\$ 17,454		\$17,454
6		\$ 18,043		\$18,043
7		\$ 18,652		\$18,652
8		\$ 19,281		\$19,281
9		\$ 19,932		\$19,932
10		\$ 20,604		\$20,604
11		\$ 21,299		\$21,299
12		\$ 22,018		\$22,018
13		\$ 22,761		\$22,761
14		\$ 23,529		\$23,529
15		\$ 24,323		\$24,323
16		\$ 25,144		\$25,144
17		\$ 25,992		\$25,992
18		\$ 26,869		\$26,869
19		\$ 27,776		\$27,776
20		\$ 28,713		\$28,713
21		\$ 29,682	\$ 14,815,655	\$14,845,337
22		\$ 30,684		\$30,684
23		\$ 31,719	\$ 249,073	\$280,792
24		\$ 32,789		\$32,789
25		\$ 33,896		\$33,896
26		\$ 35,040		\$35,040
27		\$ 36,222		\$36,222
28		\$ 37,444		\$37,444
29		\$ 38,708		\$38,708
30		\$ 40,014		\$40,014

Present value of O&M

\$8,120,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 7,380,000	\$ 17,220,000	\$ 39,504,524	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,985,000	\$7,438,000	\$25,595,000	\$37,018,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

64,297,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3C	DESCRIPTION Level of Treatment - R3	QUAN	UN			TOTAL DIRECT COST
					UNIT COST	
Waikoloa Area	Gravity Sewer 8 inch	157,524	LF		\$ 1,600	\$ 252,038,352
- To exist. Waikoloa Village WWTP	Gravity Sewer 12 inch	14,831	LF		\$ 3,070	\$ 45,531,477
	Gravity Sewer 16 inch		LF		\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF		\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF		\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF		\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF		\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF		\$ 15,200	\$ -
	Force main 4 inch	-	LF		\$ 600	\$ -
	Force main 6 inch	1,444	LF		\$ 900	\$ 1,299,573
	Force main 8 inch		LF		\$ 1,600	\$ -
	Force main 10 inch		LF		\$ 1,700	\$ -
	Force main 12 inch	1,973	LF		\$ 3,070	\$ 6,057,755
	Force main 14 inch		LF		\$ 4,430	\$ -
	Force main 16 inch	-	LF		\$ 5,800	\$ -
	Force main 18 inch	-	LF		\$ 6,525	\$ -
	Force main 24 inch	-	LF		\$ 8,700	\$ -
	Force main 30 inch	-	LF		\$ 10,875	\$ -
	Force main 36 inch	-	LF		\$ 13,050	\$ -
	Force main 42 inch	-	LF		\$ 15,200	\$ -
Regional PS		1	EA		\$ 7,000,000	\$ 7,000,000
Neighborhood PS		1	EA		\$ 1,200,000	\$ 1,200,000
			LS		\$	\$ -
	Subtotal of Estimated Construction Cost				\$	313,127,157
	Right of Way	162	Ac		\$ 20,000	\$ 3,248,802
	Contingency	20%			\$	63,275,192
	Total Estimated Project Cost				\$	379,651,150
Project services		20%			\$	75,930,230
	TOTAL CAPITAL COST					455,581,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	34519	kwh	\$ 0.44	\$15,188
	Labor and Materials	7,889	LS	-	\$7,889

Annual O&M \$23,077

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 23,856		\$23,856
2		\$ 24,661		\$24,661
3		\$ 25,493		\$25,493
4		\$ 26,353		\$26,353
5		\$ 27,243		\$27,243
6		\$ 28,162		\$28,162
7		\$ 29,112		\$29,112
8		\$ 30,095		\$30,095
9		\$ 31,110		\$31,110
10		\$ 32,160		\$32,160
11		\$ 33,245		\$33,245
12		\$ 34,367		\$34,367
13		\$ 35,526		\$35,526
14		\$ 36,725		\$36,725
15		\$ 37,964		\$37,964
16		\$ 39,245		\$39,245
17		\$ 40,570		\$40,570
18		\$ 41,939		\$41,939
19		\$ 43,354		\$43,354
20		\$ 44,817		\$44,817
21		\$ 46,329	\$ 4,938,552	\$4,984,880
22		\$ 47,892		\$47,892
23		\$ 49,508	\$ 2,412,971	\$2,462,479
24		\$ 51,179		\$51,179
25		\$ 52,906		\$52,906
26		\$ 54,691		\$54,691
27		\$ 56,536		\$56,536
28		\$ 58,444		\$58,444
29		\$ 60,416		\$60,416
30		\$ 62,455		\$62,455

Present value of O&M \$4,373,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 2,460,000	\$ 5,740,000	\$ 304,927,157	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$1,328,000	\$2,479,000	\$197,561,000	\$201,368,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

258,586,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3C	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikii Area							
- 1 COH WWTP	Gravity Sewer 8 inch	46,361	LF			\$ 1,600	\$ 74,178,272
- Waikii WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch		LF			\$ 900	\$ -
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS		EA			\$ 7,000,000	\$ -
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH Waikii WWTPs, level of treatment - R3		LS			\$ 5,900,000	\$ 5,900,000
	Subtotal of Estimated Construction Cost						\$ 80,078,272
	Right of Way	47	Ac			\$ 20,000	\$ 931,449
	Contingency	20%					\$ 16,201,944
	Total Estimated Project Cost						\$ 97,211,666
	Project services		20%				\$ 19,442,333
	TOTAL CAPITAL COST						\$ 116,654,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	9073	kWH	\$ 0.44	\$3,992
	Labor and Materials	\$ 669	LS	-	\$669

Annual O&M

\$4,661

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 4,818		\$4,818
2		\$ 4,980		\$4,980
3		\$ 5,149		\$5,149
4		\$ 5,322		\$5,322
5		\$ 5,502		\$5,502
6		\$ 5,687		\$5,687
7		\$ 5,879		\$5,879
8		\$ 6,078		\$6,078
9		\$ 6,283		\$6,283
10		\$ 6,495		\$6,495
11		\$ 6,714		\$6,714
12		\$ 6,941		\$6,941
13		\$ 7,175		\$7,175
14		\$ 7,417		\$7,417
15		\$ 7,667		\$7,667
16		\$ 7,926		\$7,926
17		\$ 8,193		\$8,193
18		\$ 8,470		\$8,470
19		\$ 8,756		\$8,756
20		\$ 9,051		\$9,051
21		\$ 9,356	\$ 3,553,348	\$3,562,704
22		\$ 9,672		\$9,672
23		\$ 9,998	\$ 649,060	\$659,058
24		\$ 10,336		\$10,336
25		\$ 10,685		\$10,685
26		\$ 11,045		\$11,045
27		\$ 11,418		\$11,418
28		\$ 11,803		\$11,803
29		\$ 12,201		\$12,201
30		\$ 12,613		\$12,613

Present value of O&M

\$2,264,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 1,770,000	\$ 4,130,000	\$ 74,178,272	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$956,000	\$1,784,000	\$48,060,000	\$50,800,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

68,118,000

Alternative 3C	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Same as 2C, but sewer sizing is bigger to accomodate redevelopment of existing parcels with IWS. Includes one Mauka COH Plant, Urban Sewering w/ Private and County Plants, All Gravity Sewers. Cross country sewers with new easements are used to reduce the number of pump stations. All current and future flow from Makai areas conveyed to existing private WWTPs. IWS for all low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to existing private WWPS or WWTP in Makai areas. COH sewers/WWPS from high density (commercial or <1 acre lots) from Mauka (Waimea) area to new COH WWTP.	Gravity Sewer 8 inch Gravity Sewer 12 inch Gravity Sewer 16 inch Gravity Sewer 18 inch Gravity Sewer 24 inch Gravity Sewer 30 inch Gravity Sewer 36 inch Gravity Sewer 42 inch Force main 4 inch Force main 6 inch Force main 8 inch Force main 10 inch Force main 12 inch Force main 14 inch Force main 16 inch Force main 18 inch Force main 24 inch Force main 30 inch Force main 36 inch Force main 42 inch Regional PS Neighborhood PS COH WWTPs (2 total), level of treatment - R2	429,197 16,949 10,249 27,429 19,265 - - - - 39,213 2,645 4,419 6,999 - - - - - - - 15 9 	LF LF LF LF LF LF LF LF LF EA EA LS			\$ 1,600 \$ 3,070 \$ 5,800 \$ 6,525 \$ 8,700 \$ 10,875 \$ 13,050 \$ 15,200 \$ 600 \$ 900 \$ 1,600 \$ 1,700 \$ 3,070 \$ 4,430 \$ 5,800 \$ 6,525 \$ 8,700 \$ 10,875 \$ 13,050 \$ 15,200 \$ 7,000,000 \$ 1,200,000 \$ 29,875,000	\$ 686,715,040 \$ 52,032,386 \$ 59,446,178 \$ 178,976,639 \$ 167,605,500 - - - - \$ 35,292,105 \$ 4,232,000 \$ 7,512,300 \$ 21,456,875 - - - - \$ 105,000,000 \$ 10,800,000 \$ 29,875,000
	Subtotal of Estimated Construction Cost Right of Way Contingency Total Estimated Project Cost Project services	537 20% 20%	Ac			\$ 20,000	\$ 1,358,944,023 \$ 10,745,674 \$ 273,937,939 \$ 1,643,627,636 \$ 328,725,527
	TOTAL CAPITAL COST						\$ 1,972,353,000

O&M

Item	QUAN	UN	Unit cost	Total Annual
R3 level of treatment annual O&M				\$335,306
R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$146,674
Annual O&M				\$481,980

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 498,243		\$498,243
2		\$ 515,056		\$515,056
3		\$ 532,435		\$532,435
4		\$ 550,401		\$550,401
5		\$ 568,973		\$568,973
6		\$ 588,172		\$588,172
7		\$ 608,019		\$608,019
8		\$ 628,535		\$628,535
9		\$ 649,744		\$649,744
10		\$ 671,668		\$671,668
11		\$ 694,333		\$694,333
12		\$ 717,762		\$717,762
13		\$ 741,981		\$741,981
14		\$ 767,018		\$767,018
15		\$ 792,899		\$792,899
16		\$ 819,654		\$819,654
17		\$ 847,312		\$847,312
18		\$ 875,902		\$875,902
19		\$ 905,458		\$905,458
20		\$ 936,011		\$936,011
21		\$ 967,595	\$ 87,734,574	\$88,702,168 replace elec./ motorized equipment
22		\$ 1,000,244		\$1,000,244
23		\$ 1,033,996	\$ 7,043,250	\$8,077,245 sewer inspection at yr 10 of service
24		\$ 1,068,886		\$1,068,886
25		\$ 1,104,953		\$1,104,953
26		\$ 1,142,238		\$1,142,238
27		\$ 1,180,780		\$1,180,780
28		\$ 1,220,623		\$1,220,623
29		\$ 1,261,811		\$1,261,811
30		\$ 1,304,388		\$1,304,388

Present value of O&M \$62,697,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 43,702,500	\$ 101,972,500	\$ 1,213,269,023	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$23,596,000	\$44,045,000	\$786,072,000	\$853,713,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

1,181,337,000

Alternative 3C	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waimea Area							
- 1 COH WWTP	Gravity Sewer 8 inch	181,535	LF			\$ 1,600	\$ 290,456,448
- West Waimea WWTP	Gravity Sewer 12 inch	2,118	LF			\$ 3,070	\$ 6,500,909
	Gravity Sewer 16 inch	10,249	LF			\$ 5,800	\$ 59,446,178
	Gravity Sewer 18 inch	22,384	LF			\$ 6,525	\$ 146,056,579
	Gravity Sewer 24 inch	19,265	LF			\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	6,514	LF			\$ 900	\$ 5,862,996
	Force main 8 inch	2,645	LF			\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF			\$ 1,700	\$ 7,512,300
	Force main 12 inch	5,016	LF			\$ 3,070	\$ 15,399,120
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	2	EA			\$ 1,200,000	\$ 2,400,000
	COH West Waimea WWTP, level of treatment - R2		LS			\$ 23,562,000	\$ 23,562,000
	Subtotal of Estimated Construction Cost						\$ 757,034,030
	Right of Way	246	Ac			\$ 20,000	\$ 4,929,491
	Contingency	20%					\$ 152,392,704
	Total Estimated Project Cost						\$ 914,356,225
	Project services		20%				\$ 182,871,245
	TOTAL CAPITAL COST						\$ 1,097,227,000

O&M

Item	QUAN	UN	Unit Cost	Total Annual
R3 level of treatment annual O&M				\$250,211
R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$142,780

Annual O&M

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 406,251		\$406,251
2		\$ 419,959		\$419,959
3		\$ 434,130		\$434,130
4		\$ 448,779		\$448,779
5		\$ 463,922		\$463,922
6		\$ 479,576		\$479,576
7		\$ 495,759		\$495,759
8		\$ 512,487		\$512,487
9		\$ 529,780		\$529,780
10		\$ 547,656		\$547,656
11		\$ 566,136		\$566,136
12		\$ 585,239		\$585,239
13		\$ 604,987		\$604,987
14		\$ 625,401		\$625,401
15		\$ 646,504		\$646,504
16		\$ 668,319		\$668,319
17		\$ 690,870		\$690,870
18		\$ 714,182		\$714,182
19		\$ 738,281		\$738,281
20		\$ 763,192		\$763,192
21		\$ 788,945	\$ 32,499,283	\$33,288,228 replace elec./ motorized equipment
22		\$ 815,566		\$815,566
23		\$ 843,086	\$ 3,297,719	\$4,140,805 sewer inspection at yr 10 of service
24		\$ 871,534		\$871,534
25		\$ 900,942		\$900,942
26		\$ 931,343		\$931,343
27		\$ 962,769		\$962,769
28		\$ 995,256		\$995,256
29		\$ 1,028,839		\$1,028,839
30		\$ 1,063,555		\$1,063,555

Present value of O&M \$30,049,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 16,188,600	\$ 37,773,400	\$ 703,072,030	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$8,740,000	\$16,315,000	\$455,518,000	\$480,573,000

Alternative 3C	DESCRIPTION	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area	Gravity Sewer 8 inch	25,985	LF			\$ 1,600	\$ 41,576,448
- To exist. S. Kohala	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
WRF	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	5,045	LF			\$ 6,525	\$ 32,920,061
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	18,989	LF			\$ 900	\$ 17,090,532
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	3	EA			\$ 1,200,000	\$ 3,600,000
			LS			\$	\$ -
	Subtotal of Estimated Construction Cost						\$ 144,187,041
	Right of Way	51	Ac			\$ 20,000	\$ 1,021,946
	Contingency	20%					\$ 29,041,797
	Total Estimated Project Cost						\$ 174,250,784
	Project services		20%				\$ 34,850,157
	TOTAL CAPITAL COST						\$ 209,101,000

O&M

Item	QUAN	UN	Unit cost	Total Annual
R3 level of treatment annual O&M				\$42,572
R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$0

Annual O&M

\$42,572

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 44,009		\$44,009
2		\$ 45,494		\$45,494
3		\$ 47,029		\$47,029
4		\$ 48,616		\$48,616
5		\$ 50,256		\$50,256
6		\$ 51,952		\$51,952
7		\$ 53,705		\$53,705
8		\$ 55,517		\$55,517
9		\$ 57,390		\$57,390
10		\$ 59,327		\$59,327
11		\$ 61,329		\$61,329
12		\$ 63,398		\$63,398
13		\$ 65,537		\$65,537
14		\$ 67,749		\$67,749
15		\$ 70,035		\$70,035
16		\$ 72,398		\$72,398
17		\$ 74,841		\$74,841
18		\$ 77,366		\$77,366
19		\$ 79,977		\$79,977
20		\$ 82,675		\$82,675
21		\$ 85,465	\$ 31,679,002	\$31,764,467 replace elec./ motorized equipment
22		\$ 88,349		\$88,349
23		\$ 91,330	\$ 434,427	\$525,757 sewer inspection at yr 10 of service
24		\$ 94,412		\$94,412
25		\$ 97,598		\$97,598
26		\$ 100,891		\$100,891
27		\$ 104,295		\$104,295
28		\$ 107,815		\$107,815
29		\$ 111,453		\$111,453
30		\$ 115,213		\$115,213

Present value of O&M \$17,647,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 15,780,000	\$ 36,820,000	\$ 91,587,041	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$8,520,000	\$15,904,000	\$59,339,000	\$83,763,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

142,985,000

Alternative 3C	DESCRIPTION	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area	Level of Treatment - R2						
- To exist. Mauna Lani							
WWTP	Gravity Sewer 8 inch	17,791	LF			\$ 1,600	\$ 28,465,520
	Gravity Sewer 12 inch	-	LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch	-	LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	-	LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch	-	LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	12,266	LF			\$ 900	\$ 11,039,004
	Force main 8 inch	-	LF			\$ 1,600	\$ -
	Force main 10 inch	-	LF			\$ 1,700	\$ -
	Force main 12 inch	-	LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	3	EA			\$ 7,000,000	\$ 21,000,000
	Neighborhood PS	3	EA			\$ 1,200,000	\$ 3,600,000
			LS			\$	\$ -
	Subtotal of Estimated Construction Cost						\$ 64,104,524
	Right of Way	31	Ac			\$ 20,000	\$ 613,985
	Contingency	20%					\$ 12,943,702
	Total Estimated Project Cost						\$ 77,662,211
	Project services		20%				\$ 15,532,442
	TOTAL CAPITAL COST						\$ 93,195,000

O&M

Item	QUAN	UN	Unit cost	Total Annual
R3 level of treatment annual O&M				\$14,785
R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$0

Annual O&M

\$14,785

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 15,284		\$15,284
2		\$ 15,800		\$15,800
3		\$ 16,333		\$16,333
4		\$ 16,884		\$16,884
5		\$ 17,454		\$17,454
6		\$ 18,043		\$18,043
7		\$ 18,652		\$18,652
8		\$ 19,281		\$19,281
9		\$ 19,932		\$19,932
10		\$ 20,604		\$20,604
11		\$ 21,299		\$21,299
12		\$ 22,018		\$22,018
13		\$ 22,761		\$22,761
14		\$ 23,529		\$23,529
15		\$ 24,323		\$24,323
16		\$ 25,144		\$25,144
17		\$ 25,992		\$25,992
18		\$ 26,869		\$26,869
19		\$ 27,776		\$27,776
20		\$ 28,713		\$28,713
21		\$ 29,682	\$ 14,815,655	\$14,845,337 replace elec./ motorized equipment
22		\$ 30,684		\$30,684
23		\$ 31,719	\$ 249,073	\$280,792 sewer inspection at yr 10 of service
24		\$ 32,789		\$32,789
25		\$ 33,896		\$33,896
26		\$ 35,040		\$35,040
27		\$ 36,222		\$36,222
28		\$ 37,444		\$37,444
29		\$ 38,708		\$38,708
30		\$ 40,014		\$40,014

Present value of O&M \$8,120,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 7,380,000	\$ 17,220,000	\$ 39,504,524	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,985,000	\$7,438,000	\$25,595,000	\$37,018,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

64,297,000

Alternative 3C	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikoloa Area	Gravity Sewer 8 inch	157,524	LF			\$ 1,600	\$ 252,038,352
- To exist. Waikoloa Village WWTP	Gravity Sewer 12 inch	14,831	LF			\$ 3,070	\$ 45,531,477
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	1,444	LF			\$ 900	\$ 1,299,573
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch	1,973	LF			\$ 3,070	\$ 6,057,756
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	1	EA			\$ 7,000,000	\$ 7,000,000
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
			LS			\$	\$ -
	Subtotal of Estimated Construction Cost						\$ 313,127,157
	Right of Way	162	Ac			\$ 20,000	\$ 3,248,802
	Contingency	20%					\$ 63,275,192
	Total Estimated Project Cost						\$ 379,651,150
	Project services		20%				\$ 75,930,230
	TOTAL CAPITAL COST						\$ 455,581,000

O&M

Item	QUAN	UN	Unit cost	Total Annual
R3 level of treatment annual O&M				\$23,077
R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$0

Annual O&M

\$23,077

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 23,856		\$23,856
2		\$ 24,661		\$24,661
3		\$ 25,493		\$25,493
4		\$ 26,353		\$26,353
5		\$ 27,243		\$27,243
6		\$ 28,162		\$28,162
7		\$ 29,112		\$29,112
8		\$ 30,095		\$30,095
9		\$ 31,110		\$31,110
10		\$ 32,160		\$32,160
11		\$ 33,245		\$33,245
12		\$ 34,367		\$34,367
13		\$ 35,526		\$35,526
14		\$ 36,725		\$36,725
15		\$ 37,964		\$37,964
16		\$ 39,245		\$39,245
17		\$ 40,570		\$40,570
18		\$ 41,939		\$41,939
19		\$ 43,354		\$43,354
20		\$ 44,817		\$44,817
21		\$ 46,329	\$ 4,938,552	\$4,984,880
22		\$ 47,892		\$47,892
23		\$ 49,508	\$ 2,412,971	\$2,462,479
24		\$ 51,179		\$51,179
25		\$ 52,906		\$52,906
26		\$ 54,691		\$54,691
27		\$ 56,536		\$56,536
28		\$ 58,444		\$58,444
29		\$ 60,416		\$60,416
30		\$ 62,455		\$62,455

Present value of O&M \$4,373,000

replace elec./ motorized equipment
sewer inspection at yr 10 of serviceResidual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 2,460,000	\$ 5,740,000	\$ 304,927,157	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$1,328,000	\$2,479,000	\$197,561,000	\$201,368,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

258,586,000

Alternative 3C	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikii Area	Gravity Sewer 8 inch	46,361	LF			\$ 1,600	\$ 74,178,272
- 1 COH WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
- Waikii WWTP	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	-	LF			\$ 900	\$ -
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH Waikii WWTPs, level of treatment - R2		LS			\$ 6,313,000	\$ 6,313,000
	Subtotal of Estimated Construction Cost						\$ 80,491,272
	Right of Way	47	Ac			\$ 20,000	\$ 931,449
	Contingency	20%					\$ 16,284,544
	Total Estimated Project Cost						\$ 97,707,266
	Project services		20%				\$ 19,541,453
	TOTAL CAPITAL COST						\$ 117,249,000

O&M

Item	QUAN	UN	Unit cost	Total Annual
R3 level of treatment annual O&M				\$4,661
R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$3,894
Annual O&M				\$8,555

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 8,843		\$8,843
2		\$ 9,142		\$9,142
3		\$ 9,450		\$9,450
4		\$ 9,769		\$9,769
5		\$ 10,099		\$10,099
6		\$ 10,439		\$10,439
7		\$ 10,792		\$10,792
8		\$ 11,156		\$11,156
9		\$ 11,532		\$11,532
10		\$ 11,921		\$11,921
11		\$ 12,324		\$12,324
12		\$ 12,739		\$12,739
13		\$ 13,169		\$13,169
14		\$ 13,614		\$13,614
15		\$ 14,073		\$14,073
16		\$ 14,548		\$14,548
17		\$ 15,039		\$15,039
18		\$ 15,546		\$15,546
19		\$ 16,071		\$16,071
20		\$ 16,613		\$16,613
21		\$ 17,174	\$ 3,802,082	\$3,819,256 replace elec./ motorized equipment
22		\$ 17,753		\$17,753
23		\$ 18,352	\$ 649,060	\$667,412 sewer inspection at yr 10 of service
24		\$ 18,972		\$18,972
25		\$ 19,612		\$19,612
26		\$ 20,273		\$20,273
27		\$ 20,958		\$20,958
28		\$ 21,665		\$21,665
29		\$ 22,396		\$22,396
30		\$ 23,151		\$23,151

Present value of O&M \$2,508,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 1,893,900	\$ 4,419,100	\$ 74,178,272	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$1,023,000	\$1,909,000	\$48,060,000	\$50,992,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

68,765,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3C	DESCRIPTION Level of Treatment - R1	QUAN	UN			TOTAL DIRECT COST
					UNIT COST	
Same as 2C, but sewer sizing is bigger to accommodate redevelopment of existing parcels with IWS. Includes one Mauka COH Plant, Urban Sewering w/ Private and County Plants, All Gravity Sewers. Cross country sewers with new easements are used to reduce the number of pump stations. All current and future flow from Makai areas conveyed to existing private WWTPs. IWS for all low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to existing private WWPS or WWTP in Makai areas. COH sewers/WWPS from high density (commercial or <1 acre lots) from Mauka (Waimea) area to new COH WWTP.	Gravity Sewer 8 inch	429,197	LF	\$ 1,600	\$ 686,715,040	
	Gravity Sewer 12 inch	16,949	LF	\$ 3,070	\$ 52,032,386	
	Gravity Sewer 16 inch	10,249	LF	\$ 5,800	\$ 59,446,178	
	Gravity Sewer 18 inch	27,429	LF	\$ 6,525	\$ 178,976,639	
	Gravity Sewer 24 inch	19,265	LF	\$ 8,700	\$ 167,605,500	
	Gravity Sewer 30 inch	-	LF	\$ 10,875	\$ -	
	Gravity Sewer 36 inch	-	LF	\$ 13,050	\$ -	
	Gravity Sewer 42 inch	-	LF	\$ 15,200	\$ -	
	Force main 4 inch	-	LF	\$ 600	\$ -	
	Force main 6 inch	39,213	LF	\$ 900	\$ 35,292,105	
	Force main 8 inch	2,645	LF	\$ 1,600	\$ 4,232,000	
	Force main 10 inch	4,419	LF	\$ 1,700	\$ 7,512,300	
	Force main 12 inch	6,989	LF	\$ 3,070	\$ 21,456,875	
	Force main 14 inch	-	LF	\$ 4,430	\$ -	
	Force main 16 inch	-	LF	\$ 5,800	\$ -	
	Force main 18 inch	-	LF	\$ 6,525	\$ -	
	Force main 24 inch	-	LF	\$ 8,700	\$ -	
	Force main 30 inch	-	LF	\$ 10,875	\$ -	
	Force main 36 inch	-	LF	\$ 13,050	\$ -	
	Force main 42 inch	-	LF	\$ 15,200	\$ -	
	Regional PS	15	EA	\$ 7,000,000	\$ 105,000,000	
	Neighborhood PS	9	EA	\$ 1,200,000	\$ 10,800,000	
	COH WWTPs (2 total), level of treatment - R1		LS	\$ 38,837,500	\$ 38,837,500	
	Subtotal of Estimated Construction Cost				\$ 1,367,906,523	
	Right of Way	537	Ac	\$ 20,000	\$ 10,745,674	
	Contingency	20%			\$ 275,730,439	
	Total Estimated Project Cost				\$ 1,654,382,636	
	Project services		20%		\$ 330,876,527	
	TOTAL CAPITAL COST				\$ 1,985,259,000	

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$335,306
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$170,291

Annual O&M

\$505,597

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 522,657		\$522,657
2		\$ 540,293		\$540,293
3		\$ 558,525		\$558,525
4		\$ 577,371		\$577,371
5		\$ 596,853		\$596,853
6		\$ 616,993		\$616,993
7		\$ 637,812		\$637,812
8		\$ 659,334		\$659,334
9		\$ 681,582		\$681,582
10		\$ 704,580		\$704,580
11		\$ 728,355		\$728,355
12		\$ 752,932		\$752,932
13		\$ 778,338		\$778,338
14		\$ 804,601		\$804,601
15		\$ 831,751		\$831,751
16		\$ 859,817		\$859,817
17		\$ 888,830		\$888,830
18		\$ 918,822		\$918,822
19		\$ 949,825		\$949,825
20		\$ 981,875		\$981,875
21		\$ 1,015,007	\$ 93,132,350	\$94,147,357
22		\$ 1,049,256		\$1,049,256
23		\$ 1,084,661	\$ 7,043,250	\$8,127,911
24		\$ 1,121,261		\$1,121,261
25		\$ 1,159,096		\$1,159,096
26		\$ 1,198,207		\$1,198,207
27		\$ 1,238,638		\$1,238,638
28		\$ 1,280,434		\$1,280,434
29		\$ 1,323,640		\$1,323,640
30		\$ 1,368,303		\$1,368,303

Present value of O&M

\$66,164,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 46,391,250	\$ 108,246,250	\$ 1,213,269,023	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$25,047,000	\$46,755,000	\$786,072,000	\$857,874,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

1,193,549,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3C	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waimea Area							
- 1 COH WWTP	Gravity Sewer 8 inch	181,535	LF			\$ 1,600	\$ 290,456,448
- West Waimea WWTP	Gravity Sewer 12 inch	2,118	LF			\$ 3,070	\$ 6,500,909
	Gravity Sewer 16 inch	10,249	LF			\$ 5,800	\$ 59,446,178
	Gravity Sewer 18 inch	22,384	LF			\$ 6,525	\$ 146,056,579
	Gravity Sewer 24 inch	19,265	LF			\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	6,514	LF			\$ 900	\$ 5,862,996
	Force main 8 inch	2,645	LF			\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF			\$ 1,700	\$ 7,512,300
	Force main 12 inch	5,016	LF			\$ 3,070	\$ 15,399,120
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	2	EA			\$ 1,200,000	\$ 2,400,000
	COH West Waimea WWTP, level of treatment - R1		LS			\$ 30,630,600	\$ 30,630,600
	Subtotal of Estimated Construction Cost						\$ 764,102,630
	Right of Way	246	Ac			\$ 20,000	\$ 4,929,491
	Contingency	20%					\$ 153,806,424
	Total Estimated Project Cost						\$ 922,838,545
	Project services		20%				\$ 184,567,709
	TOTAL CAPITAL COST						\$ 1,107,406,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$250,211
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$165,770
Annual O&M					\$415,981

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 430,017		\$430,017
2		\$ 444,527		\$444,527
3		\$ 459,527		\$459,527
4		\$ 475,033		\$475,033
5		\$ 491,062		\$491,062
6		\$ 507,632		\$507,632
7		\$ 524,761		\$524,761
8		\$ 542,468		\$542,468
9		\$ 560,772		\$560,772
10		\$ 579,694		\$579,694
11		\$ 599,255		\$599,255
12		\$ 619,476		\$619,476
13		\$ 640,379		\$640,379
14		\$ 661,987		\$661,987
15		\$ 684,324		\$684,324
16		\$ 707,415		\$707,415
17		\$ 731,286		\$731,286
18		\$ 755,962		\$755,962
19		\$ 781,470		\$781,470
20		\$ 807,839		\$807,839
21		\$ 835,098	\$ 36,756,435	\$37,591,533
22		\$ 863,277		\$863,277
23		\$ 892,407	\$ 3,297,719	\$4,190,125
24		\$ 922,519		\$922,519
25		\$ 953,648		\$953,648
26		\$ 985,827		\$985,827
27		\$ 1,019,091		\$1,019,091
28		\$ 1,053,479		\$1,053,479
29		\$ 1,089,026		\$1,089,026
30		\$ 1,125,773		\$1,125,773

Present value of O&M \$32,915,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 18,309,180	\$ 42,721,420	\$ 703,072,030	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$9,885,000	\$18,453,000	\$455,518,000	\$483,856,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

656,465,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3C	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area	Gravity Sewer 8 inch	25,985	LF			\$ 1,600	\$ 41,576,448
- To exist. S. Kohala	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
WRF	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	5,045	LF			\$ 6,525	\$ 32,920,061
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	18,989	LF			\$ 900	\$ 17,090,532
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	3	EA			\$ 1,200,000	\$ 3,600,000
			LS			\$	\$ -
	Subtotal of Estimated Construction Cost					\$	\$ 144,187,041
	Right of Way	51	Ac			\$ 20,000	\$ 1,021,946
	Contingency	20%				\$	\$ 29,041,797
	Total Estimated Project Cost					\$	\$ 174,250,784
	Project services		20%			\$	\$ 34,850,157
	TOTAL CAPITAL COST						\$ 209,101,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$42,572
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$0

Annual O&M

\$42,572

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 44,009		\$44,009
2		\$ 45,494		\$45,494
3		\$ 47,029		\$47,029
4		\$ 48,616		\$48,616
5		\$ 50,256		\$50,256
6		\$ 51,952		\$51,952
7		\$ 53,705		\$53,705
8		\$ 55,517		\$55,517
9		\$ 57,390		\$57,390
10		\$ 59,327		\$59,327
11		\$ 61,329		\$61,329
12		\$ 63,398		\$63,398
13		\$ 65,537		\$65,537
14		\$ 67,749		\$67,749
15		\$ 70,035		\$70,035
16		\$ 72,398		\$72,398
17		\$ 74,841		\$74,841
18		\$ 77,366		\$77,366
19		\$ 79,977		\$79,977
20		\$ 82,675		\$82,675
21		\$ 85,465	\$ 31,679,002	\$31,764,467
22		\$ 88,349		\$88,349
23		\$ 91,330	\$ 434,427	\$525,757
24		\$ 94,412		\$94,412
25		\$ 97,598		\$97,598
26		\$ 100,891		\$100,891
27		\$ 104,295		\$104,295
28		\$ 107,815		\$107,815
29		\$ 111,453		\$111,453
30		\$ 115,213		\$115,213

Present value of O&M

\$17,647,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 15,780,000	\$ 36,820,000	\$ 91,587,041	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$8,520,000	\$15,904,000	\$59,339,000	\$83,763,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

142,985,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3C	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area							
- To exist. Mauna Lani							
WWTP	Gravity Sewer 8 inch	17,791	LF			\$ 1,600	\$ 28,465,520
	Gravity Sewer 12 inch	-	LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch	-	LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	-	LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch	-	LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	12,266	LF			\$ 900	\$ 11,039,004
	Force main 8 inch	-	LF			\$ 1,600	\$ -
	Force main 10 inch	-	LF			\$ 1,700	\$ -
	Force main 12 inch	-	LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	3	EA			\$ 7,000,000	\$ 21,000,000
	Neighborhood PS	3	EA			\$ 1,200,000	\$ 3,600,000
			LS			\$ -	
	Subtotal of Estimated Construction Cost						\$ 64,104,524
	Right of Way	31	Ac			\$ 20,000	\$ 613,985
	Contingency	20%					\$ 12,943,702
	Total Estimated Project Cost						\$ 77,662,211
	Project services		20%				\$ 15,532,442
	TOTAL CAPITAL COST						\$ 93,195,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$14,785
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$0

Annual O&M

\$14,785

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 15,284		\$15,284
2		\$ 15,800		\$15,800
3		\$ 16,333		\$16,333
4		\$ 16,884		\$16,884
5		\$ 17,454		\$17,454
6		\$ 18,043		\$18,043
7		\$ 18,652		\$18,652
8		\$ 19,281		\$19,281
9		\$ 19,932		\$19,932
10		\$ 20,604		\$20,604
11		\$ 21,299		\$21,299
12		\$ 22,018		\$22,018
13		\$ 22,761		\$22,761
14		\$ 23,529		\$23,529
15		\$ 24,323		\$24,323
16		\$ 25,144		\$25,144
17		\$ 25,992		\$25,992
18		\$ 26,869		\$26,869
19		\$ 27,776		\$27,776
20		\$ 28,713		\$28,713
21		\$ 29,682	\$ 14,815,655	\$14,845,337
22		\$ 30,684		\$30,684
23		\$ 31,719	\$ 249,073	\$280,792
24		\$ 32,789		\$32,789
25		\$ 33,896		\$33,896
26		\$ 35,040		\$35,040
27		\$ 36,222		\$36,222
28		\$ 37,444		\$37,444
29		\$ 38,708		\$38,708
30		\$ 40,014		\$40,014

Present value of O&M

\$8,120,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 7,380,000	\$ 17,220,000	\$ 39,504,524	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,985,000	\$7,438,000	\$25,595,000	\$37,018,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

64,297,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3C	DESCRIPTION Level of Treatment - R1	QUAN	UN			TOTAL DIRECT COST
					UNIT COST	
Waikoloa Area	Gravity Sewer 8 inch	157,524	LF		\$ 1,600	\$ 252,038,352
- To exist. Waikoloa Village WWTP	Gravity Sewer 12 inch	14,831	LF		\$ 3,070	\$ 45,531,477
	Gravity Sewer 16 inch		LF		\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF		\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF		\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF		\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF		\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF		\$ 15,200	\$ -
	Force main 4 inch	-	LF		\$ 600	\$ -
	Force main 6 inch	1,444	LF		\$ 900	\$ 1,299,573
	Force main 8 inch		LF		\$ 1,600	\$ -
	Force main 10 inch		LF		\$ 1,700	\$ -
	Force main 12 inch	1,973	LF		\$ 3,070	\$ 6,057,755
	Force main 14 inch		LF		\$ 4,430	\$ -
	Force main 16 inch	-	LF		\$ 5,800	\$ -
	Force main 18 inch	-	LF		\$ 6,525	\$ -
	Force main 24 inch	-	LF		\$ 8,700	\$ -
	Force main 30 inch	-	LF		\$ 10,875	\$ -
	Force main 36 inch	-	LF		\$ 13,050	\$ -
	Force main 42 inch	-	LF		\$ 15,200	\$ -
Regional PS		1	EA		\$ 7,000,000	\$ 7,000,000
Neighborhood PS		1	EA		\$ 1,200,000	\$ 1,200,000
			LS		\$	\$ -
	Subtotal of Estimated Construction Cost				\$	313,127,157
	Right of Way	162	Ac		\$ 20,000	\$ 3,248,802
	Contingency	20%			\$	63,275,192
	Total Estimated Project Cost				\$	379,651,150
Project services		20%			\$	75,930,230
	TOTAL CAPITAL COST					455,581,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$23,077
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$0

Annual O&M

\$23,077

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 23,856		\$23,856
2		\$ 24,661		\$24,661
3		\$ 25,493		\$25,493
4		\$ 26,353		\$26,353
5		\$ 27,243		\$27,243
6		\$ 28,162		\$28,162
7		\$ 29,112		\$29,112
8		\$ 30,095		\$30,095
9		\$ 31,110		\$31,110
10		\$ 32,160		\$32,160
11		\$ 33,245		\$33,245
12		\$ 34,367		\$34,367
13		\$ 35,526		\$35,526
14		\$ 36,725		\$36,725
15		\$ 37,964		\$37,964
16		\$ 39,245		\$39,245
17		\$ 40,570		\$40,570
18		\$ 41,939		\$41,939
19		\$ 43,354		\$43,354
20		\$ 44,817		\$44,817
21		\$ 46,329	\$ 4,938,552	\$4,984,880
22		\$ 47,892		\$47,892
23		\$ 49,508	\$ 2,412,971	\$2,462,479
24		\$ 51,179		\$51,179
25		\$ 52,906		\$52,906
26		\$ 54,691		\$54,691
27		\$ 56,536		\$56,536
28		\$ 58,444		\$58,444
29		\$ 60,416		\$60,416
30		\$ 62,455		\$62,455

Present value of O&M \$4,373,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 2,460,000	\$ 5,740,000	\$ 304,927,157	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$1,328,000	\$2,479,000	\$197,561,000	\$201,368,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

258,586,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 3C	DESCRIPTION Level of Treatment - R1	QUAN	UN			TOTAL DIRECT COST
					UNIT COST	
Waikii Area						
- 1 COH WWTP	Gravity Sewer 8 inch	46,361	LF	\$ 1,600	\$ 74,178,272	
- Waikii WWTP	Gravity Sewer 12 inch		LF	\$ 3,070	\$ -	
	Gravity Sewer 16 inch		LF	\$ 5,800	\$ -	
	Gravity Sewer 18 inch		LF	\$ 6,525	\$ -	
	Gravity Sewer 24 inch		LF	\$ 8,700	\$ -	
	Gravity Sewer 30 inch	-	LF	\$ 10,875	\$ -	
	Gravity Sewer 36 inch	-	LF	\$ 13,050	\$ -	
	Gravity Sewer 42 inch	-	LF	\$ 15,200	\$ -	
	Force main 4 inch	-	LF	\$ 600	\$ -	
	Force main 6 inch	-	LF	\$ 900	\$ -	
	Force main 8 inch		LF	\$ 1,600	\$ -	
	Force main 10 inch		LF	\$ 1,700	\$ -	
	Force main 12 inch		LF	\$ 3,070	\$ -	
	Force main 14 inch		LF	\$ 4,430	\$ -	
	Force main 16 inch	-	LF	\$ 5,800	\$ -	
	Force main 18 inch	-	LF	\$ 6,525	\$ -	
	Force main 24 inch	-	LF	\$ 8,700	\$ -	
	Force main 30 inch	-	LF	\$ 10,875	\$ -	
	Force main 36 inch	-	LF	\$ 13,050	\$ -	
	Force main 42 inch	-	LF	\$ 15,200	\$ -	
	Regional PS	-	EA	\$ 7,000,000	\$ -	
	Neighborhood PS		EA	\$ 1,200,000	\$ -	
	COH Waikii WWTPs, level of treatment - R1		LS	\$ 8,206,900	\$ 8,206,900	
	Subtotal of Estimated Construction Cost				\$ 82,385,172	
	Right of Way	47	Ac	\$ 20,000	\$ 931,449	
	Contingency	20%			\$ 16,663,324	
	Total Estimated Project Cost				\$ 99,979,946	
	Project services		20%		\$ 19,995,989	
	TOTAL CAPITAL COST					119,976,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$4,661
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$4,521

Annual O&M \$9,182

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 9,491		\$9,491
2		\$ 9,812		\$9,812
3		\$ 10,143		\$10,143
4		\$ 10,485		\$10,485
5		\$ 10,839		\$10,839
6		\$ 11,205		\$11,205
7		\$ 11,583		\$11,583
8		\$ 11,973		\$11,973
9		\$ 12,377		\$12,377
10		\$ 12,795		\$12,795
11		\$ 13,227		\$13,227
12		\$ 13,673		\$13,673
13		\$ 14,135		\$14,135
14		\$ 14,612		\$14,612
15		\$ 15,105		\$15,105
16		\$ 15,614		\$15,614
17		\$ 16,141		\$16,141
18		\$ 16,686		\$16,686
19		\$ 17,249		\$17,249
20		\$ 17,831		\$17,831
21		\$ 18,432	\$ 4,942,707	\$4,961,140
22		\$ 19,054		\$19,054
23		\$ 19,697	\$ 649,060	\$668,757
24		\$ 20,362		\$20,362
25		\$ 21,049		\$21,049
26		\$ 21,759		\$21,759
27		\$ 22,494		\$22,494
28		\$ 23,253		\$23,253
29		\$ 24,037		\$24,037
30		\$ 24,848		\$24,848

Present value of O&M \$3,109,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 2,462,070	\$ 5,744,830	\$ 74,178,272	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$1,329,000	\$2,481,000	\$48,060,000	\$51,870,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

71,215,000

G-11: Alternative 4A Construction Cost and LCC Analysis

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4A	DESCRIPTION Level of Treatment - R3	QUAN	UN			TOTAL DIRECT COST
					UNIT COST	
Includes four Mauka COH Plant and one Makai COH Plant, Urban Sewering w/ Private and County Plants, All Gravity Sewers. Private plant service areas unchanged. IWS for all low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to new COH Mauka (Waimea and East Waikoloa) area or Makai (Puako) WWTP.	Gravity Sewer 8 inch	224,302	LF		\$ 1,600	\$ 358,882,496
	Gravity Sewer 12 inch	29,833	LF		\$ 3,070	\$ 91,587,801
	Gravity Sewer 16 inch	6,544	LF		\$ 5,800	\$ 37,957,984
	Gravity Sewer 18 inch	9,925	LF		\$ 6,525	\$ 64,760,168
	Gravity Sewer 24 inch	-	LF		\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF		\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF		\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF		\$ 15,200	\$ -
	Force main 4 inch	-	LF		\$ 600	\$ -
	Force main 6 inch	85,779	LF		\$ 900	\$ 77,201,037
	Force main 8 inch	-	LF		\$ 1,600	\$ -
	Force main 10 inch	9,435	LF		\$ 1,700	\$ 16,039,500
	Force main 12 inch	-	LF		\$ 3,070	\$ -
	Force main 14 inch	-	LF		\$ 4,430	\$ -
	Force main 16 inch	-	LF		\$ 5,800	\$ -
	Force main 18 inch	-	LF		\$ 6,525	\$ -
	Force main 24 inch	-	LF		\$ 8,700	\$ -
	Force main 30 inch	-	LF		\$ 10,875	\$ -
	Force main 36 inch	-	LF		\$ 13,050	\$ -
	Force main 42 inch	-	LF		\$ 15,200	\$ -
	Regional PS	13	EA		\$ 7,000,000	\$ 91,000,000
	Neighborhood PS	47	EA		\$ 1,200,000	\$ 56,400,000
	COH WWTPs (5 total), level of treatment - R3		LS		\$ 40,400,000	\$ 40,400,000
	Subtotal of Estimated Construction Cost					\$ 834,228,986
	Right of Way	389	Ac		\$ 20,000	\$ 7,778,256
	Contingency	20%				\$ 168,401,449
	Total Estimated Project Cost					\$ 1,010,408,691
	Project services		20%			\$ 202,081,738
	TOTAL CAPITAL COST					\$ 1,212,490,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	571885	kwh	\$ 0.44	\$251,629
	Labor and Materials	58,145	LS	-	\$58,145

Annual O&M

\$309,774

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 320,227		\$320,227
2		\$ 331,032		\$331,032
3		\$ 342,202		\$342,202
4		\$ 353,749		\$353,749
5		\$ 365,686		\$365,686
6		\$ 378,025		\$378,025
7		\$ 390,781		\$390,781
8		\$ 403,967		\$403,967
9		\$ 417,598		\$417,598
10		\$ 431,689		\$431,689
11		\$ 446,256		\$446,256
12		\$ 461,314		\$461,314
13		\$ 476,880		\$476,880
14		\$ 492,971		\$492,971
15		\$ 509,606		\$509,606
16		\$ 526,801		\$526,801
17		\$ 544,577		\$544,577
18		\$ 562,953		\$562,953
19		\$ 581,948		\$581,948
20		\$ 601,585		\$601,585
21		\$ 621,884	\$ 113,104,877	\$113,726,761
22		\$ 642,869		\$642,869
23		\$ 664,561	\$ 3,788,458	\$4,453,019
24		\$ 686,985		\$686,985
25		\$ 710,166		\$710,166
26		\$ 734,130		\$734,130
27		\$ 758,901		\$758,901
28		\$ 784,509		\$784,509
29		\$ 810,981		\$810,981
30		\$ 838,346		\$838,346

Present value of O&M

\$68,855,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 56,340,000	\$ 131,460,000	\$ 646,428,986	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$30,419,000	\$56,782,000	\$418,819,000	\$506,020,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

775,325,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4A	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waimea Area							
- 3 COH WWTPs							
- East Waimea WWTP	Gravity Sewer 8 inch	169,204	LF			\$ 1,600	\$ 270,726,400
- Waimea Town WWTP	Gravity Sewer 12 inch	29,833	LF			\$ 3,070	\$ 91,587,801
- West Waimea WWTP	Gravity Sewer 16 inch	6,544	LF			\$ 5,800	\$ 37,957,984
	Gravity Sewer 18 inch	2,113	LF			\$ 6,525	\$ 13,786,934
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	37,885	LF			\$ 900	\$ 34,096,878
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch	9,435	LF			\$ 1,700	\$ 16,039,500
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	33	EA			\$ 1,200,000	\$ 39,600,000
	COH WWTPs (3 total), level of treatment - R3		LS			\$ 28,200,000	\$ 28,200,000
	Subtotal of Estimated Construction Cost						\$ 559,995,497
	Right of Way	267	Ac			\$ 20,000	\$ 5,345,702
	Contingency	20%					\$ 113,068,240
	Total Estimated Project Cost						\$ 678,409,439
	Project services		20%				\$ 135,681,888
	TOTAL CAPITAL COST						\$ 814,091,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	435306	kWH	\$ 0.44	\$191,534
	Labor and Materials	\$ 38,674	LS	-	\$38,674

Annual O&M

\$230,208

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 237,976		\$237,976
2		\$ 246,006		\$246,006
3		\$ 254,307		\$254,307
4		\$ 262,888		\$262,888
5		\$ 271,759		\$271,759
6		\$ 280,929		\$280,929
7		\$ 290,408		\$290,408
8		\$ 300,208		\$300,208
9		\$ 310,337		\$310,337
10		\$ 320,809		\$320,809
11		\$ 331,634		\$331,634
12		\$ 342,825		\$342,825
13		\$ 354,393		\$354,393
14		\$ 366,351		\$366,351
15		\$ 378,713		\$378,713
16		\$ 391,492		\$391,492
17		\$ 404,702		\$404,702
18		\$ 418,358		\$418,358
19		\$ 432,474		\$432,474
20		\$ 447,067		\$447,067
21		\$ 462,153	\$ 57,696,737	\$58,158,890
22		\$ 477,747		\$477,747
23		\$ 493,868	\$ 2,907,724	\$3,401,592
24		\$ 510,532		\$510,532
25		\$ 527,759		\$527,759
26		\$ 545,567		\$545,567
27		\$ 563,976		\$563,976
28		\$ 583,007		\$583,007
29		\$ 602,679		\$602,679
30		\$ 623,015		\$623,015

Present value of O&M

\$37,778,000

replace elec./motorized equipment
sewer inspection at yr 10 of serviceResidual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 28,740,000	\$ 67,060,000	\$ 464,195,497	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$15,517,000	\$28,965,000	\$300,751,000	\$345,233,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**506,636,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4A	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area							
- 1 COH WWTP	Gravity Sewer 8 inch	26,278	LF			\$ 1,600	\$ 42,044,944
- Makai WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	7,812	LF			\$ 6,525	\$ 50,973,235
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch		LF			\$ 600	\$ -
	Force main 6 inch	29,380	LF			\$ 900	\$ 26,442,027
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Regional PS	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	8	EA			\$ 1,200,000	\$ 9,600,000
	COH Makai WWTPs, level of treatment - R3		LS			\$ 8,000,000	\$ 8,000,000
	Subtotal of Estimated Construction Cost						\$ 186,060,206
	Right of Way	70	Ac			\$ 20,000	\$ 1,400,617
	Contingency	20%					\$ 37,492,165
	Total Estimated Project Cost						\$ 224,952,988
	Project services		20%				\$ 44,990,598
	TOTAL CAPITAL COST						\$ 269,944,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	99158	kwh	\$ 0.44	\$43,630
	Labor and Materials	14,870	LS	-	\$14,870

Annual O&M \$58,500

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 60,473		\$60,473
2		\$ 62,514		\$62,514
3		\$ 64,623		\$64,623
4		\$ 66,804		\$66,804
5		\$ 69,058		\$69,058
6		\$ 71,388		\$71,388
7		\$ 73,797		\$73,797
8		\$ 76,287		\$76,287
9		\$ 78,862		\$78,862
10		\$ 81,523		\$81,523
11		\$ 84,273		\$84,273
12		\$ 87,117		\$87,117
13		\$ 90,057		\$90,057
14		\$ 93,095		\$93,095
15		\$ 96,237		\$96,237
16		\$ 99,484		\$99,484
17		\$ 102,841		\$102,841
18		\$ 106,311		\$106,311
19		\$ 109,898		\$109,898
20		\$ 113,607		\$113,607
21		\$ 117,440	\$ 40,110,675	\$40,228,115
22		\$ 121,403		\$121,403
23		\$ 125,500	\$ 477,261	\$602,761
24		\$ 129,734		\$129,734
25		\$ 134,112		\$134,112
26		\$ 138,637		\$138,637
27		\$ 143,315		\$143,315
28		\$ 148,151		\$148,151
29		\$ 153,150		\$153,150
30		\$ 158,318		\$158,318

Present value of O&M \$22,448,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 19,980,000	\$ 46,620,000	\$ 119,460,206	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$10,787,000	\$20,137,000	\$77,398,000	\$108,322,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

184,070,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4A	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area	Gravity Sewer 8 inch	12,852	LF			\$ 1,600	\$ 20,563,712
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	16,276	LF			\$ 900	\$ 14,648,769
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Regional PS	2	EA			\$ 7,000,000	\$ 14,000,000
	Neighborhood PS	5	EA			\$ 1,200,000	\$ 6,000,000
			LS			\$ -	
	Subtotal of Estimated Construction Cost						\$ 55,212,481
	Right of Way	30	Ac			\$ 20,000	\$ 607,277
	Contingency	20%					\$ 11,163,952
	Total Estimated Project Cost						\$ 66,983,710
	Project services		20%				\$ 13,396,742
	TOTAL CAPITAL COST						\$ 80,380,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	27798	kWH	\$ 0.44	\$12,231
	Labor and Materials	\$ 3,986	LS	-	\$3,986

Annual O&M

\$16,217

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 16,764		\$16,764
2		\$ 17,330		\$17,330
3		\$ 17,915		\$17,915
4		\$ 18,519		\$18,519
5		\$ 19,144		\$19,144
6		\$ 19,790		\$19,790
7		\$ 20,458		\$20,458
8		\$ 21,148		\$21,148
9		\$ 21,862		\$21,862
10		\$ 22,599		\$22,599
11		\$ 23,362		\$23,362
12		\$ 24,150		\$24,150
13		\$ 24,965		\$24,965
14		\$ 25,808		\$25,808
15		\$ 26,678		\$26,678
16		\$ 27,579		\$27,579
17		\$ 28,509		\$28,509
18		\$ 29,471		\$29,471
19		\$ 30,466		\$30,466
20		\$ 31,494		\$31,494
21		\$ 32,556	\$ 12,045,248	\$12,077,804
22		\$ 33,655		\$33,655
23		\$ 34,791	\$ 179,932	\$214,723
24		\$ 35,965		\$35,965
25		\$ 37,178		\$37,178
26		\$ 38,433		\$38,433
27		\$ 39,729		\$39,729
28		\$ 41,070		\$41,070
29		\$ 42,456		\$42,456
30		\$ 43,888		\$43,888

Present value of O&M

\$6,718,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 6,000,000	\$ 14,000,000	\$ 35,212,481	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,239,000	\$6,047,000	\$22,814,000	\$32,100,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

54,998,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
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Alternative 4A	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikoloa Area							
- 1 COH WWTP							
- East Waikoloa WWTP	Gravity Sewer 8 inch	15,967	LF			\$ 1,600	\$ 25,547,440
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	2,237	LF			\$ 900	\$ 2,013,363
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
	COH East Waikoloa WWTP), level of treatment - R3		LS			\$ 4,200,000	\$ 4,200,000
	Subtotal of Estimated Construction Cost						\$ 32,960,803
	Right of Way	21	Ac			\$ 20,000	\$ 424,660
	Contingency	20%					\$ 6,677,093
	Total Estimated Project Cost						\$ 40,062,555
	Project services		20%				\$ 8,012,511
	TOTAL CAPITAL COST						\$ 48,075,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	9623	kWH	\$ 0.44	\$4,234
	Labor and Materials	\$ 615	LS	-	\$615

Annual O&M

\$4,849

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 5,013		\$5,013
2		\$ 5,182		\$5,182
3		\$ 5,357		\$5,357
4		\$ 5,538		\$5,538
5		\$ 5,725		\$5,725
6		\$ 5,918		\$5,918
7		\$ 6,117		\$6,117
8		\$ 6,324		\$6,324
9		\$ 6,537		\$6,537
10		\$ 6,758		\$6,758
11		\$ 6,986		\$6,986
12		\$ 7,222		\$7,222
13		\$ 7,465		\$7,465
14		\$ 7,717		\$7,717
15		\$ 7,978		\$7,978
16		\$ 8,247		\$8,247
17		\$ 8,525		\$8,525
18		\$ 8,813		\$8,813
19		\$ 9,110		\$9,110
20		\$ 9,418		\$9,418
21		\$ 9,735	\$ 3,252,217	\$3,261,952
				replace elec./motorized equipment
22		\$ 10,064		\$10,064
23		\$ 10,403	\$ 223,540	\$233,943
				sewer inspection at yr 10 of service
24		\$ 10,754		\$10,754
25		\$ 11,117		\$11,117
26		\$ 11,492		\$11,492
27		\$ 11,880		\$11,880
28		\$ 12,281		\$12,281
29		\$ 12,695		\$12,695
30		\$ 13,124		\$13,124

Present value of O&M

\$1,912,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 1,620,000	\$ 3,780,000	\$ 27,560,803	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$875,000	\$1,633,000	\$17,857,000	\$20,365,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

29,622,000

Alternative 4A	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Includes four Mauka COH Plant and one Makai COH Plant, Urban Sewering w/ Private and County Plants, All Gravity Sewers. Private plant service areas unchanged. IWS for all low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to new COH Mauka (Waimea and East Waikoloa) area or Makai	Gravity Sewer 8 inch Gravity Sewer 12 inch Gravity Sewer 16 inch Gravity Sewer 18 inch Gravity Sewer 24 inch Gravity Sewer 30 inch Gravity Sewer 36 inch Gravity Sewer 42 inch Force main 4 inch Force main 6 inch Force main 8 inch Force main 10 inch Force main 12 inch Force main 14 inch Force main 16 inch Force main 18 inch Force main 24 inch Force main 30 inch Force main 36 inch Force main 42 inch Regional PS Neighborhood PS COH WWTPs (5 total), level of treatment - R2	224,302 29,833 6,544 9,925 - - - - - 85,779 - 9,435 - - - - - - - - - 13 47 	LF LF LF LF LF LF LF LF LF LF LF LF LF LF LF LF LF LF EA EA LS	\$ 1,600 \$ 3,070 \$ 5,800 \$ 6,525 \$ 8,700 \$ 10,875 \$ 13,050 \$ 15,200 \$ 600 \$ 900 \$ 1,600 \$ 1,700 \$ 3,070 \$ 4,430 \$ 5,800 \$ 6,525 \$ 8,700 \$ 10,875 \$ 13,050 \$ 15,200 \$ 7,000,000 \$ 1,200,000 \$ 43,147,200	\$ 358,882,496 \$ 91,587,801 \$ 37,957,984 \$ 64,760,168 - - - - - \$ 77,201,037 - \$ 16,039,500 - - - - - - - - - \$ 91,000,000 \$ 56,400,000 \$ 43,147,200		
	Subtotal of Estimated Construction Cost Right of Way Contingency Total Estimated Project Cost Project services	389 20% 20%	Ac	\$ 20,000	\$ 836,976,186 \$ 7,778,256 \$ 168,950,889 \$ 1,013,705,331 \$ 202,741,066		
	TOTAL CAPITAL COST						1,216,446,000

O&M

Item	QUAN	UN	Unit cost	Total Annual
R3 level of treatment annual O&M				\$309,774
R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$124,962
Annual O&M				\$434,736

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 449,406		\$449,406
2		\$ 464,570		\$464,570
3		\$ 480,246		\$480,246
4		\$ 496,451		\$496,451
5		\$ 513,203		\$513,203
6		\$ 530,520		\$530,520
7		\$ 548,421		\$548,421
8		\$ 566,926		\$566,926
9		\$ 586,056		\$586,056
10		\$ 605,831		\$605,831
11		\$ 626,274		\$626,274
12		\$ 647,406		\$647,406
13		\$ 669,252		\$669,252
14		\$ 691,834		\$691,834
15		\$ 715,179		\$715,179
16		\$ 739,311		\$739,311
17		\$ 764,258		\$764,258
18		\$ 790,046		\$790,046
19		\$ 816,705		\$816,705
20		\$ 844,263		\$844,263
21		\$ 872,751	\$ 114,759,412	\$115,632,163 replace elec./ motorized equipment
22		\$ 902,200		\$902,200
23		\$ 932,643	\$ 3,788,458	\$4,721,101 sewer inspection at yr 10 of service
24		\$ 964,113		\$964,113
25		\$ 996,645		\$996,645
26		\$ 1,030,275		\$1,030,275
27		\$ 1,065,040		\$1,065,040
28		\$ 1,100,978		\$1,100,978
29		\$ 1,138,128		\$1,138,128
30		\$ 1,176,532		\$1,176,532

Present value of O&M \$73,483,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 57,164,160	\$ 133,383,040	\$ 646,428,986	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$30,864,000	\$57,612,000	\$418,819,000	\$507,295,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value) 782,634,000

Alternative 4A Waimea Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
- 3 COH WWTPs							
- East Waimea WWTP	Gravity Sewer 8 inch	169,204	LF			\$ 1,600	\$ 270,726,400
- Waimea Town WWTP	Gravity Sewer 12 inch	29,833	LF			\$ 3,070	\$ 91,587,801
- West Waimea WWTP	Gravity Sewer 16 inch	6,544	LF			\$ 5,800	\$ 37,957,984
	Gravity Sewer 18 inch	2,113	LF			\$ 6,525	\$ 13,786,934
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch		LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch		LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch		LF			\$ 15,200	\$ -
	Force main 4 inch		LF			\$ 600	\$ -
	Force main 6 inch	37,885	LF			\$ 900	\$ 34,096,878
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch	9,435	LF			\$ 1,700	\$ 16,039,500
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Regional PS	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	33	EA			\$ 1,200,000	\$ 39,600,000
	COH WWTPs (3 total), level of treatment - R2		LS			\$ 30,117,600	\$ 30,117,600
	Subtotal of Estimated Construction Cost						\$ 561,913,097
	Right of Way	267	Ac			\$ 20,000	\$ 5,345,702
	Contingency	20%					\$ 113,451,760
	Total Estimated Project Cost						\$ 680,710,559
	Project services		20%				\$ 136,142,112
	TOTAL CAPITAL COST						\$ 816,853,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$230,208
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$109,032

Annual O&M

\$339,240

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 350,687		\$350,687
2		\$ 362,521		\$362,521
3		\$ 374,753		\$374,753
4		\$ 387,398		\$387,398
5		\$ 400,470		\$400,470
6		\$ 413,983		\$413,983
7		\$ 427,952		\$427,952
8		\$ 442,393		\$442,393
9		\$ 457,321		\$457,321
10		\$ 472,752		\$472,752
11		\$ 488,704		\$488,704
12		\$ 505,194		\$505,194
13		\$ 522,241		\$522,241
14		\$ 539,863		\$539,863
15		\$ 558,080		\$558,080
16		\$ 576,911		\$576,911
17		\$ 596,378		\$596,378
18		\$ 616,501		\$616,501
19		\$ 637,304		\$637,304
20		\$ 658,809		\$658,809
21		\$ 681,039	\$ 58,851,635	\$59,532,674
22		\$ 704,019		\$704,019
23		\$ 727,775	\$ 2,907,724	\$3,635,499
24		\$ 752,332		\$752,332
25		\$ 777,718		\$777,718
26		\$ 803,961		\$803,961
27		\$ 831,089		\$831,089
28		\$ 859,132		\$859,132
29		\$ 888,122		\$888,122
30		\$ 918,090		\$918,090

Present value of O&M

\$41,668,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 29,315,280	\$ 68,402,320	\$ 464,195,497	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$15,828,000	\$29,545,000	\$300,751,000	\$346,124,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

512,397,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4A Kawaihae Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
- 1 COH WWTP - Makai WWTP	Gravity Sewer 8 inch	26,278	LF			\$ 1,600	\$ 42,044,944
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	7,812	LF			\$ 6,525	\$ 50,973,235
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	29,380	LF			\$ 900	\$ 26,442,027
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	8	EA			\$ 1,200,000	\$ 9,600,000
	COH Makai WWTPs, level of treatment - R2		LS			\$ 8,544,000	\$ 8,544,000
	Subtotal of Estimated Construction Cost						\$ 186,604,206
	Right of Way	70	Ac			\$ 20,000	\$ 1,400,617
	Contingency	20%					\$ 37,600,965
	Total Estimated Project Cost						\$ 225,605,788
	Project services		20%				\$ 45,121,158
	TOTAL CAPITAL COST						\$ 270,727,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$58,500
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$12,980
Annual O&M					\$71,480

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 73,891		\$73,891
2		\$ 76,385		\$76,385
3		\$ 78,962		\$78,962
4		\$ 81,627		\$81,627
5		\$ 84,381		\$84,381
6		\$ 87,228		\$87,228
7		\$ 90,172		\$90,172
8		\$ 93,214		\$93,214
9		\$ 96,360		\$96,360
10		\$ 99,611		\$99,611
11		\$ 102,972		\$102,972
12		\$ 106,447		\$106,447
13		\$ 110,039		\$110,039
14		\$ 113,752		\$113,752
15		\$ 117,590		\$117,590
16		\$ 121,558		\$121,558
17		\$ 125,660		\$125,660
18		\$ 129,900		\$129,900
19		\$ 134,283		\$134,283
20		\$ 138,814		\$138,814
21		\$ 143,498	\$ 40,438,306	\$40,581,804
22		\$ 148,340		\$148,340
23		\$ 153,346	\$ 477,261	\$630,607
24		\$ 158,520		\$158,520
25		\$ 163,869		\$163,869
26		\$ 169,398		\$169,398
27		\$ 175,114		\$175,114
28		\$ 181,023		\$181,023
29		\$ 187,131		\$187,131
30		\$ 193,446		\$193,446

Present value of O&M

\$23,008,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 20,143,200	\$ 47,000,800	\$ 119,460,206	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$10,876,000	\$20,301,000	\$77,398,000	\$108,575,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

185,160,000

Alternative 4A Puako Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
	Gravity Sewer 8 inch	12,852	LF			\$ 1,600	\$ 20,563,712
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	16,276	LF			\$ 900	\$ 14,648,769
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	2	EA			\$ 7,000,000	\$ 14,000,000
	Neighborhood PS	5	EA			\$ 1,200,000	\$ 6,000,000
			LS			\$	\$ -
	Subtotal of Estimated Construction Cost						\$ 55,212,481
	Right of Way	30	Ac			\$ 20,000	\$ 607,277
	Contingency	20%					\$ 11,163,952
	Total Estimated Project Cost						\$ 66,983,710
	Project services		20%				\$ 13,396,742
	TOTAL CAPITAL COST						\$ 80,380,000

O&M

Item	QUAN	UN	Unit Cost	Total Annual
R3 level of treatment annual O&M				\$16,217
R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$0

Annual O&M

\$16,217

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 16,764		\$16,764
2		\$ 17,330		\$17,330
3		\$ 17,915		\$17,915
4		\$ 18,519		\$18,519
5		\$ 19,144		\$19,144
6		\$ 19,790		\$19,790
7		\$ 20,458		\$20,458
8		\$ 21,148		\$21,148
9		\$ 21,862		\$21,862
10		\$ 22,599		\$22,599
11		\$ 23,362		\$23,362
12		\$ 24,150		\$24,150
13		\$ 24,965		\$24,965
14		\$ 25,808		\$25,808
15		\$ 26,678		\$26,678
16		\$ 27,579		\$27,579
17		\$ 28,509		\$28,509
18		\$ 29,471		\$29,471
19		\$ 30,466		\$30,466
20		\$ 31,494		\$31,494
21		\$ 32,556	\$ 12,045,248	\$12,077,804
22		\$ 33,655		\$33,655
23		\$ 34,791	\$ 179,932	\$214,723
24		\$ 35,965		\$35,965
25		\$ 37,178		\$37,178
26		\$ 38,433		\$38,433
27		\$ 39,729		\$39,729
28		\$ 41,070		\$41,070
29		\$ 42,456		\$42,456
30		\$ 43,888		\$43,888

Present value of O&M \$6,718,000

replace elec./ motorized equipment
sewer inspection at yr 10 of serviceResidual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 6,000,000	\$ 14,000,000	\$ 35,212,481	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,239,000	\$6,047,000	\$22,814,000	\$32,100,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

54,998,000

Alternative 4A Waikoloa Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
- 1 COH WWTP	Gravity Sewer 8 inch	15,967	LF			\$ 1,600	\$ 25,547,440
- East Waikoloa WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch		LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch		LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch		LF			\$ 15,200	\$ -
	Force main 4 inch		LF			\$ 600	\$ -
	Force main 6 inch	2,237	LF			\$ 900	\$ 2,013,363
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Regional PS	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
	COH East Waikoloa WWTP), level of treatment - R2		LS			\$ 4,485,600	\$ 4,485,600
	Subtotal of Estimated Construction Cost						\$ 33,246,403
	Right of Way	21	Ac			\$ 20,000	\$ 424,660
	Contingency	20%					\$ 6,734,213
	Total Estimated Project Cost						\$ 40,405,275
	Project services		20%				\$ 8,081,055
	TOTAL CAPITAL COST						\$ 48,486,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$4,849
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$2,950
Annual O&M					\$7,799

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 8,063		\$8,063
2		\$ 8,335		\$8,335
3		\$ 8,616		\$8,616
4		\$ 8,907		\$8,907
5		\$ 9,207		\$9,207
6		\$ 9,518		\$9,518
7		\$ 9,839		\$9,839
8		\$ 10,171		\$10,171
9		\$ 10,514		\$10,514
10		\$ 10,869		\$10,869
11		\$ 11,236		\$11,236
12		\$ 11,615		\$11,615
13		\$ 12,007		\$12,007
14		\$ 12,412		\$12,412
15		\$ 12,831		\$12,831
16		\$ 13,264		\$13,264
17		\$ 13,711		\$13,711
18		\$ 14,174		\$14,174
19		\$ 14,652		\$14,652
20		\$ 15,146		\$15,146
21		\$ 15,658	\$ 3,424,223	\$3,439,881
22		\$ 16,186		\$16,186
23		\$ 16,732	\$ 223,540	\$240,272
24		\$ 17,297		\$17,297
25		\$ 17,880		\$17,880
26		\$ 18,484		\$18,484
27		\$ 19,107		\$19,107
28		\$ 19,752		\$19,752
29		\$ 20,419		\$20,419
30		\$ 21,108		\$21,108

Present value of O&M \$2,089,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 1,705,680	\$ 3,979,920	\$ 27,560,803	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$921,000	\$1,719,000	\$17,857,000	\$20,497,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

30,078,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4A	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Includes four Mauka COH Plant and one Makai COH Plant, Urban Sewering w/ Private and County Plants, All Gravity Sewers. Private plant service areas unchanged. IWS for all low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to new COH Mauka (Waimea and East Waikoloa) area or Makai (Puako) WWTP.	Gravity Sewer 8 inch	224,302	LF			\$ 1,600	\$ 358,882,496
	Gravity Sewer 12 inch	29,833	LF			\$ 3,070	\$ 91,587,801
	Gravity Sewer 16 inch	6,544	LF			\$ 5,800	\$ 37,957,984
	Gravity Sewer 18 inch	9,925	LF			\$ 6,525	\$ 64,760,168
	Gravity Sewer 24 inch	-	LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	85,779	LF			\$ 900	\$ 77,201,037
	Force main 8 inch	-	LF			\$ 1,600	\$ -
	Force main 10 inch	9,435	LF			\$ 1,700	\$ 16,039,500
	Force main 12 inch	-	LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	13	EA			\$ 7,000,000	\$ 91,000,000
	Neighborhood PS	47	EA			\$ 1,200,000	\$ 56,400,000
	COH WWTPs (5 total), level of treatment - R1		LS			\$ 56,177,654	\$ 56,177,654
	Subtotal of Estimated Construction Cost					\$ 850,006,641	
	Right of Way	389	Ac			\$ 20,000	\$ 7,778,256
	Contingency	20%					\$ 171,556,979
	Total Estimated Project Cost						\$ 1,029,341,877
	Project services		20%				\$ 205,868,375
	TOTAL CAPITAL COST						\$ 1,235,210,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$309,774
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$145,083

Annual O&M

\$454,857

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 470,205		\$470,205
2		\$ 486,072		\$486,072
3		\$ 502,473		\$502,473
4		\$ 519,428		\$519,428
5		\$ 536,955		\$536,955
6		\$ 555,074		\$555,074
7		\$ 573,804		\$573,804
8		\$ 593,165		\$593,165
9		\$ 613,181		\$613,181
10		\$ 633,871		\$633,871
11		\$ 655,260		\$655,260
12		\$ 677,370		\$677,370
13		\$ 700,227		\$700,227
14		\$ 723,855		\$723,855
15		\$ 748,280		\$748,280
16		\$ 773,529		\$773,529
17		\$ 799,630		\$799,630
18		\$ 826,612		\$826,612
19		\$ 854,505		\$854,505
20		\$ 883,338		\$883,338
21		\$ 913,145	\$ 122,607,165	\$123,520,309
22		\$ 943,957		\$943,957
23		\$ 975,809	\$ 3,788,458	\$4,764,267
24		\$ 1,008,736		\$1,008,736
25		\$ 1,042,773		\$1,042,773
26		\$ 1,077,960		\$1,077,960
27		\$ 1,114,333		\$1,114,333
28		\$ 1,151,934		\$1,151,934
29		\$ 1,190,804		\$1,190,804
30		\$ 1,230,985		\$1,230,985

Present value of O&M

\$78,092,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 61,073,296	\$ 142,504,358	\$ 646,428,986	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$32,974,000	\$61,552,000	\$418,819,000	\$513,345,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

799,957,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4A	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waimea Area							
- 3 COH WWTPs							
- East Waimea WWTP	Gravity Sewer 8 inch	169,204	LF			\$ 1,600	\$ 270,726,400
- Waimea Town WWTP	Gravity Sewer 12 inch	29,833	LF			\$ 3,070	\$ 91,587,801
- West Waimea WWTP	Gravity Sewer 16 inch	6,544	LF			\$ 5,800	\$ 37,957,984
	Gravity Sewer 18 inch	2,113	LF			\$ 6,525	\$ 13,786,934
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	37,885	LF			\$ 900	\$ 34,096,878
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch	9,435	LF			\$ 1,700	\$ 16,039,500
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	33	EA			\$ 1,200,000	\$ 39,600,000
	COH WWTPs (3 total), level of treatment - R1		LS			\$ 39,213,115	\$ 39,213,115
	Subtotal of Estimated Construction Cost						\$ 571,008,612
	Right of Way	267	Ac			\$ 20,000	\$ 5,345,702
	Contingency	20%					\$ 115,270,863
	Total Estimated Project Cost						\$ 691,625,177
	Project services		20%				\$ 138,325,035
	TOTAL CAPITAL COST						\$ 829,950,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$230,208
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$126,588

Annual O&M

\$356,796

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 368,836		\$368,836
2		\$ 381,281		\$381,281
3		\$ 394,147		\$394,147
4		\$ 407,447		\$407,447
5		\$ 421,195		\$421,195
6		\$ 435,407		\$435,407
7		\$ 450,099		\$450,099
8		\$ 465,287		\$465,287
9		\$ 480,987		\$480,987
10		\$ 497,217		\$497,217
11		\$ 513,995		\$513,995
12		\$ 531,339		\$531,339
13		\$ 549,268		\$549,268
14		\$ 567,802		\$567,802
15		\$ 586,961		\$586,961
16		\$ 606,767		\$606,767
17		\$ 627,241		\$627,241
18		\$ 648,406		\$648,406
19		\$ 670,285		\$670,285
20		\$ 692,903		\$692,903
21		\$ 716,283	\$ 64,329,522	\$65,045,805
22		\$ 740,453		\$740,453
23		\$ 765,438	\$ 2,907,724	\$3,673,162
24		\$ 791,266		\$791,266
25		\$ 817,966		\$817,966
26		\$ 845,566		\$845,566
27		\$ 874,098		\$874,098
28		\$ 903,593		\$903,593
29		\$ 934,083		\$934,083
30		\$ 965,602		\$965,602

Present value of O&M \$44,992,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 32,043,935	\$ 74,769,181	\$ 464,195,497	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$17,301,000	\$32,295,000	\$300,751,000	\$350,347,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

524,595,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4A	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area							
- 1 COH WWTP	Gravity Sewer 8 inch	26,278	LF			\$ 1,600	\$ 42,044,944
- Makai WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	7,812	LF			\$ 6,525	\$ 50,973,235
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch		LF			\$ 600	\$ -
	Force main 6 inch	29,380	LF			\$ 900	\$ 26,442,027
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Regional PS	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	8	EA			\$ 1,200,000	\$ 9,600,000
	COH Makai WWTPs, level of treatment - R1		LS			\$ 11,124,288	\$ 11,124,288
	Subtotal of Estimated Construction Cost					\$ 189,184,494	
	Right of Way	70	Ac			\$ 20,000	\$ 1,400,617
	Contingency	20%					\$ 38,117,022
	Total Estimated Project Cost						\$ 228,702,133
	Project services		20%				\$ 45,740,427
	TOTAL CAPITAL COST						\$ 274,443,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$58,500
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$15,070
Annual O&M					\$73,570

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 76,052		\$76,052
2		\$ 78,618		\$78,618
3		\$ 81,271		\$81,271
4		\$ 84,013		\$84,013
5		\$ 86,848		\$86,848
6		\$ 89,779		\$89,779
7		\$ 92,808		\$92,808
8		\$ 95,940		\$95,940
9		\$ 99,177		\$99,177
10		\$ 102,524		\$102,524
11		\$ 105,983		\$105,983
12		\$ 109,559		\$109,559
13		\$ 113,256		\$113,256
14		\$ 117,078		\$117,078
15		\$ 121,028		\$121,028
16		\$ 125,112		\$125,112
17		\$ 129,334		\$129,334
18		\$ 133,698		\$133,698
19		\$ 138,209		\$138,209
20		\$ 142,873		\$142,873
21		\$ 147,694	\$ 41,992,316	\$42,140,010
22		\$ 152,677		\$152,677
23		\$ 157,829	\$ 477,261	\$635,090
24		\$ 163,155		\$163,155
25		\$ 168,660		\$168,660
26		\$ 174,351		\$174,351
27		\$ 180,235		\$180,235
28		\$ 186,316		\$186,316
29		\$ 192,603		\$192,603
30		\$ 199,102		\$199,102

Present value of O&M \$23,863,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 20,917,286	\$ 48,807,002	\$ 119,460,206	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$11,294,000	\$21,081,000	\$77,398,000	\$109,773,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

188,533,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4A	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area	Gravity Sewer 8 inch	12,852	LF			\$ 1,600	\$ 20,563,712
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	16,276	LF			\$ 900	\$ 14,648,769
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Regional PS	2	EA			\$ 7,000,000	\$ 14,000,000
	Neighborhood PS	5	EA			\$ 1,200,000	\$ 6,000,000
			LS			\$ -	
	Subtotal of Estimated Construction Cost						\$ 55,212,481
	Right of Way	30	Ac			\$ 20,000	\$ 607,277
	Contingency	20%					\$ 11,163,952
	Total Estimated Project Cost						\$ 66,983,710
	Project services		20%				\$ 13,396,742
	TOTAL CAPITAL COST						\$ 80,380,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$16,217
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$0
Annual O&M					\$16,217

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 16,764		\$16,764
2		\$ 17,330		\$17,330
3		\$ 17,915		\$17,915
4		\$ 18,519		\$18,519
5		\$ 19,144		\$19,144
6		\$ 19,790		\$19,790
7		\$ 20,458		\$20,458
8		\$ 21,148		\$21,148
9		\$ 21,862		\$21,862
10		\$ 22,599		\$22,599
11		\$ 23,362		\$23,362
12		\$ 24,150		\$24,150
13		\$ 24,965		\$24,965
14		\$ 25,808		\$25,808
15		\$ 26,678		\$26,678
16		\$ 27,579		\$27,579
17		\$ 28,509		\$28,509
18		\$ 29,471		\$29,471
19		\$ 30,466		\$30,466
20		\$ 31,494		\$31,494
21		\$ 32,556	\$ 12,045,248	\$12,077,804
22		\$ 33,655		\$33,655
23		\$ 34,791	\$ 179,932	\$214,723
24		\$ 35,965		\$35,965
25		\$ 37,178		\$37,178
26		\$ 38,433		\$38,433
27		\$ 39,729		\$39,729
28		\$ 41,070		\$41,070
29		\$ 42,456		\$42,456
30		\$ 43,888		\$43,888

Present value of O&M \$6,718,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 6,000,000	\$ 14,000,000	\$ 35,212,481	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,239,000	\$6,047,000	\$22,814,000	\$32,100,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value) 54,998,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4A	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikoloa Area							
- 1 COH WWTP							
- East Waikoloa WWTP	Gravity Sewer 8 inch	15,967	LF			\$ 1,600	\$ 25,547,440
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	2,237	LF			\$ 900	\$ 2,013,363
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
	COH East Waikoloa WWTP), level of treatment - R1		LS			\$ 5,840,251	\$ 5,840,251
	Subtotal of Estimated Construction Cost						\$ 34,601,054
	Right of Way	21	Ac			\$ 20,000	\$ 424,660
	Contingency	20%					\$ 7,005,143
	Total Estimated Project Cost						\$ 42,030,857
	Project services		20%				\$ 8,406,171
	TOTAL CAPITAL COST						\$ 50,437,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$4,849
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$3,425
Annual O&M					\$8,274

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 8,554		\$8,554
2		\$ 8,842		\$8,842
3		\$ 9,141		\$9,141
4		\$ 9,449		\$9,449
5		\$ 9,768		\$9,768
6		\$ 10,097		\$10,097
7		\$ 10,438		\$10,438
8		\$ 10,790		\$10,790
9		\$ 11,154		\$11,154
10		\$ 11,531		\$11,531
11		\$ 11,920		\$11,920
12		\$ 12,322		\$12,322
13		\$ 12,738		\$12,738
14		\$ 13,168		\$13,168
15		\$ 13,612		\$13,612
16		\$ 14,071		\$14,071
17		\$ 14,546		\$14,546
18		\$ 15,037		\$15,037
19		\$ 15,544		\$15,544
20		\$ 16,069		\$16,069
21		\$ 16,611	\$ 4,240,079	\$4,256,690
22		\$ 17,172		\$17,172
23		\$ 17,751	\$ 223,540	\$241,291
24		\$ 18,350		\$18,350
25		\$ 18,969		\$18,969
26		\$ 19,609		\$19,609
27		\$ 20,271		\$20,271
28		\$ 20,955		\$20,955
29		\$ 21,662		\$21,662
30		\$ 22,393		\$22,393

Present value of O&M \$2,519,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 2,112,075	\$ 4,928,176	\$ 27,560,803	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$1,140,000	\$2,129,000	\$17,857,000	\$21,126,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

31,830,000

G-12: Alternative 4B Construction Cost and LCC Analysis

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
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Alternative 4B Includes four Mauka COH Plant and one Makai COH Plant, Urban Sewering w/ Private and County Plants, both gravity sewers and LPS to reduce the number of neighborhood pump stations. Private plant service areas unchanged. IWS for all low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to new COH Mauka (Waimea and East Waikoloa) area or Makai (Puako) WWTP.	DESCRIPTION Level of Treatment - R3	QUAN	UN			TOTAL DIRECT COST
					UNIT COST	
Gravity Sewer 8 inch		154,435	LF		\$ 1,600	\$ 247,095,264
Gravity Sewer 12 inch		29,833	LF		\$ 3,070	\$ 91,587,801
Gravity Sewer 16 inch		6,544	LF		\$ 5,800	\$ 37,957,984
Gravity Sewer 18 inch		9,925	LF		\$ 6,525	\$ 64,760,168
Gravity Sewer 24 inch		-	LF		\$ 8,700	\$ -
Gravity Sewer 30 inch		-	LF		\$ 10,875	\$ -
Gravity Sewer 36 inch		-	LF		\$ 13,050	\$ -
Gravity Sewer 42 inch		-	LF		\$ 15,200	\$ -
Force main 4 inch		-	LF		\$ 600	\$ -
Force main 6 inch		43,520	LF		\$ 900	\$ 39,167,667
Force main 8 inch		-	LF		\$ 1,600	\$ -
Force main 10 inch		9,435	LF		\$ 1,700	\$ 16,039,500
Force main 12 inch		-	LF		\$ 3,070	\$ -
Force main 14 inch		-	LF		\$ 4,430	\$ -
Force main 16 inch		-	LF		\$ 5,800	\$ -
Force main 18 inch		-	LF		\$ 6,525	\$ -
Force main 24 inch		-	LF		\$ 8,700	\$ -
Force main 30 inch		-	LF		\$ 10,875	\$ -
Force main 36 inch		-	LF		\$ 13,050	\$ -
Force main 42 inch		-	LF		\$ 15,200	\$ -
Low Pressure Sewer In-Street (3 inch average)		73,197	LF		\$ 450	\$ 32,938,727
Low pressure sewer (On-Lot)		1,879	EA		\$ 26,000	\$ 48,854,000
Regional PS (including exist. PS that receives additional flow)		13	EA		\$ 7,000,000	\$ 91,000,000
Neighborhood PS		1	EA		\$ 1,200,000	\$ 1,200,000
COH WWTPs (5 total), level of treatment - R3			LS		\$ 40,400,000	\$ 40,400,000
Subtotal of Estimated Construction Cost						\$ 711,001,111
Right of Way	329	Ac			\$ 20,000	\$ 6,588,098
Contingency	20%					\$ 143,517,842
Total Estimated Project Cost						\$ 861,107,050
Project services		20%				\$ 172,221,410
TOTAL CAPITAL COST						\$ 1,033,328,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	445417	kWH	\$ 0.44	\$195,983
	Labor and Materials	\$ 1,065,810	LS	-	\$1,065,810

Annual O&M

\$1,261,794

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 1,304,370		\$1,304,370
2		\$ 1,348,384		\$1,348,384
3		\$ 1,393,882		\$1,393,882
4		\$ 1,440,916		\$1,440,916
5		\$ 1,489,537		\$1,489,537
6		\$ 1,539,799		\$1,539,799
7		\$ 1,591,756		\$1,591,756
8		\$ 1,645,467		\$1,645,467
9		\$ 1,700,990		\$1,700,990
10		\$ 1,758,386		\$1,758,386
11		\$ 1,817,720		\$1,817,720
12		\$ 1,879,055		\$1,879,055
13		\$ 1,942,460		\$1,942,460
14		\$ 2,008,004		\$2,008,004
15		\$ 2,075,761		\$2,075,761
16		\$ 2,145,803		\$2,145,803
17		\$ 2,218,209		\$2,218,209
18		\$ 2,293,058		\$2,293,058
19		\$ 2,370,433		\$2,370,433
20		\$ 2,450,418		\$2,450,418
21		\$ 2,533,103	\$ 109,282,920	\$111,816,023
22		\$ 2,618,578		\$2,618,578
23		\$ 2,706,936	\$ 2,810,320	\$5,517,256
24		\$ 2,798,276		\$2,798,276
25		\$ 2,892,699		\$2,892,699
26		\$ 2,990,307		\$2,990,307
27		\$ 3,091,209		\$3,091,209
28		\$ 3,195,516		\$3,195,516
29		\$ 3,303,342		\$3,303,342
30		\$ 3,414,807		\$3,414,807

Present value of O&M

\$95,265,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 54,436,200	\$ 127,017,800	\$ 529,547,111	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$29,391,000	\$54,863,000	\$343,092,000	\$427,346,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

701,247,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
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Alternative 4B	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waimea Area							
- 3 COH WWTPs							
- East Waimea WWTP	Gravity Sewer 8 inch	121,916	LF			\$ 1,600	\$ 195,066,384
- Waimea Town WWTP	Gravity Sewer 12 inch	29,833	LF			\$ 3,070	\$ 91,587,801
- West Waimea WWTP	Gravity Sewer 16 inch	6,544	LF			\$ 5,800	\$ 37,957,984
	Gravity Sewer 18 inch	2,113	LF			\$ 6,525	\$ 13,786,934
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	6,217	LF			\$ 900	\$ 5,595,048
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch	9,435	LF			\$ 1,700	\$ 16,039,500
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	47,288	LF			\$ 450	\$ 21,279,380
	Low pressure sewer (On-Lot)	1,336	EA			\$ 26,000	\$ 34,736,000
	Regional PS (including exist. PS that receives additional flow)	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH WWTPs (3 total), level of treatment - R3		LS			\$ 28,200,000	\$ 28,200,000
	Subtotal of Estimated Construction Cost						\$ 472,249,030
	Right of Way	221	Ac			\$ 20,000	\$ 4,423,183
	Contingency	20%					\$ 95,334,443
	Total Estimated Project Cost						\$ 572,006,656
	Project services		20%				\$ 114,401,331
	TOTAL CAPITAL COST						\$ 686,408,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	344579	kWH	\$ 0.44	\$151,615
	Labor and Materials	\$ 751,208	LS	-	\$751,208

Annual O&M

\$902,823

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 933,286		\$933,286
2		\$ 964,778		\$964,778
3		\$ 997,333		\$997,333
4		\$ 1,030,986		\$1,030,986
5		\$ 1,065,775		\$1,065,775
6		\$ 1,101,737		\$1,101,737
7		\$ 1,138,913		\$1,138,913
8		\$ 1,177,343		\$1,177,343
9		\$ 1,217,070		\$1,217,070
10		\$ 1,258,138		\$1,258,138
11		\$ 1,300,592		\$1,300,592
12		\$ 1,344,477		\$1,344,477
13		\$ 1,389,844		\$1,389,844
14		\$ 1,436,742		\$1,436,742
15		\$ 1,485,222		\$1,485,222
16		\$ 1,535,338		\$1,535,338
17		\$ 1,587,145		\$1,587,145
18		\$ 1,640,700		\$1,640,700
19		\$ 1,696,062		\$1,696,062
20		\$ 1,753,292		\$1,753,292
21		\$ 1,812,453	\$ 54,767,333	\$56,579,786
22		\$ 1,873,611		\$1,873,611
23		\$ 1,936,832	\$ 2,245,699	\$4,182,531
24		\$ 2,002,187		\$2,002,187
25		\$ 2,069,747		\$2,069,747
26		\$ 2,139,586		\$2,139,586
27		\$ 2,211,783		\$2,211,783
28		\$ 2,286,415		\$2,286,415
29		\$ 2,363,565		\$2,363,565
30		\$ 2,443,319		\$2,443,319

Present value of O&M

\$56,334,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 27,280,800	\$ 63,655,200	\$ 381,313,030	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$14,729,000	\$27,495,000	\$247,051,000	\$289,275,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**453,467,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4B	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area							
- 1 COH WWTP	Gravity Sewer 8 inch	18,788	LF			\$ 1,600	\$ 30,060,752
- Makai WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	7,812	LF			\$ 6,525	\$ 50,973,235
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	23,573	LF			\$ 900	\$ 21,215,403
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	9,422	LF			\$ 450	\$ 4,239,711
	Low pressure sewer (On-Lot)	212	EA			\$ 26,000	\$ 5,512,000
	Regional PS (including exist. PS that receives additional flow)	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH Makai WWTs, level of treatment - R3		LS			\$ 8,000,000	\$ 8,000,000
	Subtotal of Estimated Construction Cost						\$ 169,001,101
	Right of Way	62	Ac			\$ 20,000	\$ 1,246,790
	Contingency	20%					\$ 34,049,578
	Total Estimated Project Cost						\$ 204,297,469
	Project services		20%				\$ 40,859,494
	TOTAL CAPITAL COST						\$ 245,157,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	77164	kWH	\$ 0.44	\$33,952
	Labor and Materials	\$ 129,208	LS	-	\$129,208

Annual O&M

\$163,160

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 168,666		\$168,666
2		\$ 174,357		\$174,357
3		\$ 180,241		\$180,241
4		\$ 186,323		\$186,323
5		\$ 192,610		\$192,610
6		\$ 199,109		\$199,109
7		\$ 205,827		\$205,827
8		\$ 212,773		\$212,773
9		\$ 219,952		\$219,952
10		\$ 227,374		\$227,374
11		\$ 235,046		\$235,046
12		\$ 242,978		\$242,978
13		\$ 251,176		\$251,176
14		\$ 259,652		\$259,652
15		\$ 268,413		\$268,413
16		\$ 277,470		\$277,470
17		\$ 286,833		\$286,833
18		\$ 296,512		\$296,512
19		\$ 306,517		\$306,517
20		\$ 316,860		\$316,860
21		\$ 327,551	\$ 37,648,627	\$37,976,178
22		\$ 338,604		\$338,604
23		\$ 350,030	\$ 372,399	\$722,429
24		\$ 361,841		\$361,841
25		\$ 374,050		\$374,050
26		\$ 386,672		\$386,672
27		\$ 399,719		\$399,719
28		\$ 413,207		\$413,207
29		\$ 427,150		\$427,150
30		\$ 441,563		\$441,563

Present value of O&M

\$24,312,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 18,753,600	\$ 43,758,400	\$ 106,489,101	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$10,125,000	\$18,901,000	\$68,994,000	\$98,020,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**171,449,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4B	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area	Gravity Sewer 8 inch	0	LF			\$ 1,600	\$ -
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	13,730	LF			\$ 900	\$ 12,357,216
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	14,251	LF			\$ 450	\$ 6,412,955
	Low pressure sewer (On-Lot)	268	EA			\$ 26,000	\$ 6,968,000
	Regional PS (including exist. PS that receives additional flow)	2	EA			\$ 7,000,000	\$ 14,000,000
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
			LS			\$ -	\$ -
	Subtotal of Estimated Construction Cost						\$ 40,938,171
	Right of Way	27	Ac			\$ 20,000	\$ 544,881
	Contingency	20%					\$ 8,296,610
	Total Estimated Project Cost						\$ 49,779,661
	Project services		20%				\$ 9,955,932
	TOTAL CAPITAL COST						\$ 59,736,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	16801	kWH	\$ 0.44	\$7,393
	Labor and Materials	\$ 151,112	LS	-	\$151,112

Annual O&M

\$158,505

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 163,853		\$163,853
2		\$ 169,382		\$169,382
3		\$ 175,097		\$175,097
4		\$ 181,006		\$181,006
5		\$ 187,113		\$187,113
6		\$ 193,427		\$193,427
7		\$ 199,954		\$199,954
8		\$ 206,701		\$206,701
9		\$ 213,676		\$213,676
10		\$ 220,886		\$220,886
11		\$ 228,339		\$228,339
12		\$ 236,044		\$236,044
13		\$ 244,009		\$244,009
14		\$ 252,242		\$252,242
15		\$ 260,754		\$260,754
16		\$ 269,552		\$269,552
17		\$ 278,648		\$278,648
18		\$ 288,050		\$288,050
19		\$ 297,770		\$297,770
20		\$ 307,818		\$307,818
21		\$ 318,204	\$ 13,350,953	\$13,669,157
22		\$ 328,942		\$328,942
23		\$ 340,041	\$ -	\$340,041
24		\$ 351,515		\$351,515
25		\$ 363,376		\$363,376
26		\$ 375,638		\$375,638
27		\$ 388,313		\$388,313
28		\$ 401,416		\$401,416
29		\$ 414,961		\$414,961
30		\$ 428,963		\$428,963

Present value of O&M

\$11,606,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 6,650,400	\$ 15,517,600	\$ 18,770,171	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,591,000	\$6,703,000	\$12,161,000	\$22,455,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**48,887,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
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Alternative 4B	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikoloa Area							
- 1 COH WWTP							
- East Waikoloa WWTP	Gravity Sewer 8 inch	13,730	LF			\$ 1,600	\$ 21,968,128
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch		LF			\$ 900	\$ -
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	2,237	LF			\$ 450	\$ 1,006,682
	Low pressure sewer (On-Lot)	63	EA			\$ 26,000	\$ 1,638,000
	Regional PS (including exist. PS that receives additional flow)	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH East Waikoloa WWTP, level of treatment - R3		LS			\$ 4,200,000	\$ 4,200,000
	Subtotal of Estimated Construction Cost						\$ 28,812,810
	Right of Way	19	Ac			\$ 20,000	\$ 373,244
	Contingency	20%					\$ 5,837,211
	Total Estimated Project Cost						\$ 35,023,265
	Project services		20%				\$ 7,004,653
	TOTAL CAPITAL COST						\$ 42,028,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	6873	kWH	\$ 0.44	\$3,024
	Labor and Materials	\$ 34,282	LS	-	\$34,282

Annual O&M

\$37,306

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 38,565		\$38,565
2		\$ 39,866		\$39,866
3		\$ 41,212		\$41,212
4		\$ 42,602		\$42,602
5		\$ 44,040		\$44,040
6		\$ 45,526		\$45,526
7		\$ 47,062		\$47,062
8		\$ 48,650		\$48,650
9		\$ 50,291		\$50,291
10		\$ 51,988		\$51,988
11		\$ 53,743		\$53,743
12		\$ 55,556		\$55,556
13		\$ 57,431		\$57,431
14		\$ 59,369		\$59,369
15		\$ 61,372		\$61,372
16		\$ 63,443		\$63,443
17		\$ 65,584		\$65,584
18		\$ 67,797		\$67,797
19		\$ 70,084		\$70,084
20		\$ 72,449		\$72,449
21		\$ 74,894	\$ 3,516,008	\$3,590,902
				replace elec./motorized equipment
22		\$ 77,421		\$77,421
23		\$ 80,033	\$ 192,221	\$272,254
				sewer inspection at yr 10 of service
24		\$ 82,734		\$82,734
25		\$ 85,525		\$85,525
26		\$ 88,411		\$88,411
27		\$ 91,395		\$91,395
28		\$ 94,479		\$94,479
29		\$ 97,667		\$97,667
30		\$ 100,962		\$100,962

Present value of O&M

\$3,014,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 1,751,400	\$ 4,086,600	\$ 22,974,810	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$946,000	\$1,765,000	\$14,885,000	\$17,596,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

27,446,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4B Includes four Mauka COH Plant and one Makai COH Plant, Urban Sewering w/ Private and County Plants, both gravity sewers and LPS to reduce the number of neighborhood pump stations. . Private plant service areas unchanged. IWS for all low density zoning areas >1 acre. COH sewers/VWPS from high density (commercial or <1 acre lots) to new COH Mauka (Waimea and East Waikoloa) area or Makai (Puako) WWTP.	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Gravity Sewer 8 inch		154,435	LF			\$ 1,600	\$ 247,095,264
Gravity Sewer 12 inch		29,833	LF			\$ 3,070	\$ 91,587,801
Gravity Sewer 16 inch		6,544	LF			\$ 5,800	\$ 37,957,984
Gravity Sewer 18 inch		9,925	LF			\$ 6,525	\$ 64,760,168
Gravity Sewer 24 inch		-	LF			\$ 8,700	\$ -
Gravity Sewer 30 inch		-	LF			\$ 10,875	\$ -
Gravity Sewer 36 inch		-	LF			\$ 13,050	\$ -
Gravity Sewer 42 inch		-	LF			\$ 15,200	\$ -
Force main 4 inch		-	LF			\$ 600	\$ -
Force main 6 inch		43,520	LF			\$ 900	\$ 39,167,667
Force main 8 inch		-	LF			\$ 1,600	\$ -
Force main 10 inch		9,435	LF			\$ 1,700	\$ 16,039,500
Force main 12 inch		-	LF			\$ 3,070	\$ -
Force main 14 inch		-	LF			\$ 4,430	\$ -
Force main 16 inch		-	LF			\$ 5,800	\$ -
Force main 18 inch		-	LF			\$ 6,525	\$ -
Force main 24 inch		-	LF			\$ 8,700	\$ -
Force main 30 inch		-	LF			\$ 10,875	\$ -
Force main 36 inch		-	LF			\$ 13,050	\$ -
Force main 42 inch		-	LF			\$ 15,200	\$ -
Low Pressure Sewer In-Street (3 inch average)		73,197	LF			\$ 450	\$ 32,938,727
Low pressure sewer (On-Lot)		1,879	EA			\$ 26,000	\$ 48,854,000
Regional PS (including exist. PS that receives additional flow)		13	EA			\$ 7,000,000	\$ 91,000,000
Neighborhood PS		1	EA			\$ 1,200,000	\$ 1,200,000
COH WWTPs (5 total), level of treatment - R2			LS			\$ 43,147,200	\$ 43,147,200
Subtotal of Estimated Construction Cost							\$ 713,748,311
Right of Way				329	Ac		\$ 6,588,098
Contingency				20%			\$ 144,067,282
Total Estimated Project Cost							\$ 864,403,690
Project services				20%			\$ 172,880,738
TOTAL CAPITAL COST							\$ 1,037,284,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$1,261,794
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$124,962
Annual O&M					\$1,386,756

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 1,433,549		\$1,433,549
2		\$ 1,481,921		\$1,481,921
3		\$ 1,531,926		\$1,531,926
4		\$ 1,583,618		\$1,583,618
5		\$ 1,637,054		\$1,637,054
6		\$ 1,692,293		\$1,692,293
7		\$ 1,749,396		\$1,749,396
8		\$ 1,808,426		\$1,808,426
9		\$ 1,869,448		\$1,869,448
10		\$ 1,932,528		\$1,932,528
11		\$ 1,997,738		\$1,997,738
12		\$ 2,065,148		\$2,065,148
13		\$ 2,134,832		\$2,134,832
14		\$ 2,206,868		\$2,206,868
15		\$ 2,281,334		\$2,281,334
16		\$ 2,358,313		\$2,358,313
17		\$ 2,437,890		\$2,437,890
18		\$ 2,520,152		\$2,520,152
19		\$ 2,605,189		\$2,605,189
20		\$ 2,693,096		\$2,693,096
21		\$ 2,783,969	\$ 110,937,455	\$113,721,424
22		\$ 2,877,909		\$2,877,909
23		\$ 2,975,018	\$ 2,810,320	\$5,785,338
24		\$ 3,075,404		\$3,075,404
25		\$ 3,179,178		\$3,179,178
26		\$ 3,286,453		\$3,286,453
27		\$ 3,397,348		\$3,397,348
28		\$ 3,511,985		\$3,511,985
29		\$ 3,630,490		\$3,630,490
30		\$ 3,752,993		\$3,752,993

Present value of O&M \$99,893,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 55,260,360	\$ 128,940,840	\$ 529,547,111	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$29,836,000	\$55,694,000	\$343,092,000	\$428,622,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

708,555,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
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Alternative 4B Waimea Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
- 3 COH WWTPs							
- East Waimea WWTP	Gravity Sewer 8 inch	121,916	LF			\$ 1,600	\$ 195,066,384
- Waimea Town WWTP	Gravity Sewer 12 inch	29,833	LF			\$ 3,070	\$ 91,587,801
- West Waimea WWTP	Gravity Sewer 16 inch	6,544	LF			\$ 5,800	\$ 37,957,984
	Gravity Sewer 18 inch	2,113	LF			\$ 6,525	\$ 13,786,934
	Gravity Sewer 24 inch	-	LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	6,217	LF			\$ 900	\$ 5,595,048
	Force main 8 inch	-	LF			\$ 1,600	\$ -
	Force main 10 inch	9,435	LF			\$ 1,700	\$ 16,039,500
	Force main 12 inch	-	LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	47,288	LF			\$ 450	\$ 21,279,380
	Low pressure sewer (On-Lot)	1,336	EA			\$ 26,000	\$ 34,736,000
	Regional PS (including exist. PS that receives additional flow)	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	-	EA			\$ 1,200,000	\$ -
	COH WWTPs (3 total), level of treatment - R2	-	LS			\$ 30,117,600	\$ 30,117,600
	Subtotal of Estimated Construction Cost						\$ 474,166,630
	Right of Way	221	Ac			\$ 20,000	\$ 4,423,183
	Contingency	20%					\$ 95,717,963
	Total Estimated Project Cost						\$ 574,307,776
	Project services		20%				\$ 114,861,555
	TOTAL CAPITAL COST						\$ 689,169,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$902,823
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$109,032

Annual O&M

\$1,011,855

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 1,045,998		\$1,045,998
2		\$ 1,081,293		\$1,081,293
3		\$ 1,117,779		\$1,117,779
4		\$ 1,155,496		\$1,155,496
5		\$ 1,194,486		\$1,194,486
6		\$ 1,234,792		\$1,234,792
7		\$ 1,276,457		\$1,276,457
8		\$ 1,319,529		\$1,319,529
9		\$ 1,364,054		\$1,364,054
10		\$ 1,410,081		\$1,410,081
11		\$ 1,457,661		\$1,457,661
12		\$ 1,506,847		\$1,506,847
13		\$ 1,557,693		\$1,557,693
14		\$ 1,610,254		\$1,610,254
15		\$ 1,664,589		\$1,664,589
16		\$ 1,720,757		\$1,720,757
17		\$ 1,778,821		\$1,778,821
18		\$ 1,838,844		\$1,838,844
19		\$ 1,900,892		\$1,900,892
20		\$ 1,965,034		\$1,965,034
21		\$ 2,031,340	\$ 55,922,231	\$57,953,571
22		\$ 2,099,883		\$2,099,883
23		\$ 2,170,740	\$ 2,245,699	\$4,416,439
24		\$ 2,243,987		\$2,243,987
25		\$ 2,319,706		\$2,319,706
26		\$ 2,397,980		\$2,397,980
27		\$ 2,478,895		\$2,478,895
28		\$ 2,562,540		\$2,562,540
29		\$ 2,649,008		\$2,649,008
30		\$ 2,738,394		\$2,738,394

Present value of O&M

\$60,224,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 27,856,080	\$ 64,997,520	\$ 381,313,030	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$15,040,000	\$28,074,000	\$247,051,000	\$290,165,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

459,228,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
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Alternative 4B Kawaihae Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
- 1 COH WWTP	Gravity Sewer 8 inch	18,788	LF			\$ 1,600	\$ 30,060,752
- Makai WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	7,812	LF			\$ 6,525	\$ 50,973,235
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	23,573	LF			\$ 900	\$ 21,215,403
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	9,422	LF			\$ 450	\$ 4,239,711
	Low pressure sewer (On-Lot)	212	EA			\$ 26,000	\$ 5,512,000
	Regional PS (including exist. PS that receives additional flow)	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH Makai WWTPs, level of treatment - R2		LS			\$ 8,544,000	\$ 8,544,000
	Subtotal of Estimated Construction Cost						\$ 169,545,101
	Right of Way	62	Ac			\$ 20,000	\$ 1,246,790
	Contingency	20%					\$ 34,158,378
	Total Estimated Project Cost						\$ 204,950,269
	Project services		20%				\$ 40,990,054
	TOTAL CAPITAL COST						\$ 245,940,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$163,160
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$12,980

Annual O&M

\$176,140

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 182,084		\$182,084
2		\$ 188,228		\$188,228
3		\$ 194,579		\$194,579
4		\$ 201,145		\$201,145
5		\$ 207,932		\$207,932
6		\$ 214,949		\$214,949
7		\$ 222,202		\$222,202
8		\$ 229,699		\$229,699
9		\$ 237,450		\$237,450
10		\$ 245,462		\$245,462
11		\$ 253,745		\$253,745
12		\$ 262,307		\$262,307
13		\$ 271,158		\$271,158
14		\$ 280,308		\$280,308
15		\$ 289,766		\$289,766
16		\$ 299,544		\$299,544
17		\$ 309,652		\$309,652
18		\$ 320,100		\$320,100
19		\$ 330,901		\$330,901
20		\$ 342,067		\$342,067
21		\$ 353,609	\$ 37,976,257	\$38,329,867
22		\$ 365,541		\$365,541
23		\$ 377,876	\$ 372,399	\$750,275
24		\$ 390,626		\$390,626
25		\$ 403,807		\$403,807
26		\$ 417,433		\$417,433
27		\$ 431,518		\$431,518
28		\$ 446,079		\$446,079
29		\$ 461,131		\$461,131
30		\$ 476,691		\$476,691

Present value of O&M

\$24,872,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 18,916,800	\$ 44,139,200	\$ 106,489,101	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$10,213,000	\$19,065,000	\$68,994,000	\$98,272,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

172,540,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4B Puako Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Gravity Sewer 8 inch		0	LF			\$ 1,600	\$ -
Gravity Sewer 12 inch			LF			\$ 3,070	\$ -
Gravity Sewer 16 inch			LF			\$ 5,800	\$ -
Gravity Sewer 18 inch			LF			\$ 6,525	\$ -
Gravity Sewer 24 inch			LF			\$ 8,700	\$ -
Gravity Sewer 30 inch		-	LF			\$ 10,875	\$ -
Gravity Sewer 36 inch		-	LF			\$ 13,050	\$ -
Gravity Sewer 42 inch		-	LF			\$ 15,200	\$ -
Force main 4 inch		-	LF			\$ 600	\$ -
Force main 6 inch		13,730	LF			\$ 900	\$ 12,357,216
Force main 8 inch			LF			\$ 1,600	\$ -
Force main 10 inch			LF			\$ 1,700	\$ -
Force main 12 inch			LF			\$ 3,070	\$ -
Force main 14 inch		-	LF			\$ 4,430	\$ -
Force main 16 inch		-	LF			\$ 5,800	\$ -
Force main 18 inch		-	LF			\$ 6,525	\$ -
Force main 24 inch		-	LF			\$ 8,700	\$ -
Force main 30 inch		-	LF			\$ 10,875	\$ -
Force main 36 inch		-	LF			\$ 13,050	\$ -
Force main 42 inch		-	LF			\$ 15,200	\$ -
Low Pressure Sewer In-Street (3 inch average)		14,251	LF			\$ 450	\$ 6,412,955
Low pressure sewer (On-Lot)		268	EA			\$ 26,000	\$ 6,968,000
Regional PS (including exist. PS that receives additional flow)		2	EA			\$ 7,000,000	\$ 14,000,000
Neighborhood PS		1	EA			\$ 1,200,000	\$ 1,200,000
			LS			\$ -	
Subtotal of Estimated Construction Cost						\$ 40,938,171	
Right of Way	27	Ac				\$ 544,881	
Contingency	20%					\$ 8,296,610	
Total Estimated Project Cost						\$ 49,779,661	
Project services		20%				\$ 9,955,932	
TOTAL CAPITAL COST						\$ 59,736,000	

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$158,505
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$0

Annual O&M

\$158,505

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 163,853		\$163,853
2		\$ 169,382		\$169,382
3		\$ 175,097		\$175,097
4		\$ 181,006		\$181,006
5		\$ 187,113		\$187,113
6		\$ 193,427		\$193,427
7		\$ 199,954		\$199,954
8		\$ 206,701		\$206,701
9		\$ 213,676		\$213,676
10		\$ 220,886		\$220,886
11		\$ 228,339		\$228,339
12		\$ 236,044		\$236,044
13		\$ 244,009		\$244,009
14		\$ 252,242		\$252,242
15		\$ 260,754		\$260,754
16		\$ 269,552		\$269,552
17		\$ 278,648		\$278,648
18		\$ 288,050		\$288,050
19		\$ 297,770		\$297,770
20		\$ 307,818		\$307,818
21		\$ 318,204	\$ 13,350,953	\$13,669,157
22		\$ 328,942		\$328,942
23		\$ 340,041	\$ -	\$340,041
24		\$ 351,515		\$351,515
25		\$ 363,376		\$363,376
26		\$ 375,638		\$375,638
27		\$ 388,313		\$388,313
28		\$ 401,416		\$401,416
29		\$ 414,961		\$414,961
30		\$ 428,963		\$428,963

Present value of O&M

\$11,606,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 6,650,400	\$ 15,517,600	\$ 18,770,171	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,591,000	\$6,703,000	\$12,161,000	\$22,455,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

48,887,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4B Waikoloa Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
- 1 COH WWTP	Gravity Sewer 8 inch	13,730	LF			\$ 1,600	\$ 21,968,128
- East Waikoloa WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch		LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch		LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch		LF			\$ 15,200	\$ -
	Force main 4 inch		LF			\$ 600	\$ -
	Force main 6 inch		LF			\$ 900	\$ -
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	2,237	LF			\$ 450	\$ 1,006,682
	Low pressure sewer (On-Lot)	63	EA			\$ 26,000	\$ 1,638,000
	Regional PS (including exist. PS that receives additional flow)		EA			\$ 7,000,000	\$ -
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH East Waikoloa WWTP), level of treatment - R2		LS			\$ 4,485,600	\$ 4,485,600
	Subtotal of Estimated Construction Cost						\$ 29,098,410
	Right of Way	19	Ac			\$ 20,000	\$ 373,244
	Contingency	20%					\$ 5,894,331
	Total Estimated Project Cost						\$ 35,365,985
	Project services		20%				\$ 7,073,197
	TOTAL CAPITAL COST						\$ 42,439,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$37,306
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$2,950
Annual O&M					\$40,256

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 41,615		\$41,615
2		\$ 43,019		\$43,019
3		\$ 44,470		\$44,470
4		\$ 45,971		\$45,971
5		\$ 47,522		\$47,522
6		\$ 49,126		\$49,126
7		\$ 50,783		\$50,783
8		\$ 52,497		\$52,497
9		\$ 54,268		\$54,268
10		\$ 56,099		\$56,099
11		\$ 57,992		\$57,992
12		\$ 59,949		\$59,949
13		\$ 61,972		\$61,972
14		\$ 64,063		\$64,063
15		\$ 66,225		\$66,225
16		\$ 68,460		\$68,460
17		\$ 70,770		\$70,770
18		\$ 73,158		\$73,158
19		\$ 75,626		\$75,626
20		\$ 78,178		\$78,178
21		\$ 80,816	\$ 3,688,014	\$3,768,830
22		\$ 83,543		\$83,543
23		\$ 86,362	\$ 192,221	\$278,583
24		\$ 89,276		\$89,276
25		\$ 92,288		\$92,288
26		\$ 95,403		\$95,403
27		\$ 98,622		\$98,622
28		\$ 101,949		\$101,949
29		\$ 105,390		\$105,390
30		\$ 108,946		\$108,946

Present value of O&M \$3,191,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 1,837,080	\$ 4,286,520	\$ 22,974,810	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$992,000	\$1,851,000	\$14,885,000	\$17,728,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

27,902,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4B	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
'Includes four Mauka COH Plant and one Makai COH Plant, Urban Sewering w/ Private and County Plants, both gravity sewers and LPS to reduce the number of neighborhood pump stations. Private plant service areas unchanged. IWS for all low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to new COH Mauka (Waimea and East Waikoloa) area or Makai (Puako) WWTP.	Gravity Sewer 8 inch	154,435	LF			\$ 1,600	\$ 247,095,264
	Gravity Sewer 12 inch	29,833	LF			\$ 3,070	\$ 91,587,801
	Gravity Sewer 16 inch	6,544	LF			\$ 5,800	\$ 37,957,984
	Gravity Sewer 18 inch	9,925	LF			\$ 6,525	\$ 64,760,168
	Gravity Sewer 24 inch	-	LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	43,520	LF			\$ 900	\$ 39,167,667
	Force main 8 inch	-	LF			\$ 1,600	\$ -
	Force main 10 inch	9,435	LF			\$ 1,700	\$ 16,039,500
	Force main 12 inch	-	LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	73,197	LF			\$ 450	\$ 32,938,727
	Low pressure sewer (On-Lot)	1,879	EA			\$ 26,000	\$ 48,854,000
	Regional PS (including exist. PS that receives additional flow)	13	EA			\$ 7,000,000	\$ 91,000,000
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
	COH WWTPs (5 total), level of treatment - R1		LS			\$ 56,177,654	\$ 56,177,654
	Subtotal of Estimated Construction Cost						\$ 726,778,765
	Right of Way	329	Ac			\$ 20,000	\$ 6,588,098
	Contingency	20%					\$ 146,673,373
	Total Estimated Project Cost						\$ 880,040,235
	Project services		20%				\$ 176,008,047
	TOTAL CAPITAL COST						\$ 1,056,048,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$1,261,794
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$145,083
Annual O&M					\$1,406,877

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 1,454,349		\$1,454,349
2		\$ 1,503,423		\$1,503,423
3		\$ 1,554,153		\$1,554,153
4		\$ 1,606,595		\$1,606,595
5		\$ 1,660,806		\$1,660,806
6		\$ 1,716,847		\$1,716,847
7		\$ 1,774,779		\$1,774,779
8		\$ 1,834,665		\$1,834,665
9		\$ 1,896,572		\$1,896,572
10		\$ 1,960,568		\$1,960,568
11		\$ 2,026,724		\$2,026,724
12		\$ 2,095,112		\$2,095,112
13		\$ 2,165,807		\$2,165,807
14		\$ 2,238,888		\$2,238,888
15		\$ 2,314,435		\$2,314,435
16		\$ 2,392,531		\$2,392,531
17		\$ 2,473,262		\$2,473,262
18		\$ 2,556,717		\$2,556,717
19		\$ 2,642,989		\$2,642,989
20		\$ 2,732,171		\$2,732,171
21		\$ 2,824,363	\$ 118,785,208	\$121,609,571
22		\$ 2,919,666		\$2,919,666
23		\$ 3,018,184	\$ 2,810,320	\$5,828,504
24		\$ 3,120,027		\$3,120,027
25		\$ 3,225,306		\$3,225,306
26		\$ 3,334,137		\$3,334,137
27		\$ 3,446,641		\$3,446,641
28		\$ 3,562,941		\$3,562,941
29		\$ 3,683,166		\$3,683,166
30		\$ 3,807,447		\$3,807,447

Present value of O&M \$104,502,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 59,169,496	\$ 138,062,158	\$ 529,547,111	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$31,946,000	\$59,633,000	\$343,092,000	\$434,671,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

725,879,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4B	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waimea Area							
- 3 COH WWTPs							
- East Waimea WWTP	Gravity Sewer 8 inch	121,916	LF			\$ 1,600	\$ 195,066,384
- Waimea Town WWTP	Gravity Sewer 12 inch	29,833	LF			\$ 3,070	\$ 91,587,801
- West Waimea WWTP	Gravity Sewer 16 inch	6,544	LF			\$ 5,800	\$ 37,957,984
	Gravity Sewer 18 inch	2,113	LF			\$ 6,525	\$ 13,786,934
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	6,217	LF			\$ 900	\$ 5,595,048
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch	9,435	LF			\$ 1,700	\$ 16,039,500
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	47,288	LF			\$ 450	\$ 21,279,380
	Low pressure sewer (On-Lot)	1,336	EA			\$ 26,000	\$ 34,736,000
	Regional PS (including exist. PS that receives additional flow)	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH WWTPs (3 total), level of treatment - R1		LS			\$ 39,213,115	\$ 39,213,115
	Subtotal of Estimated Construction Cost						\$ 483,262,145
	Right of Way	221	Ac			\$ 20,000	\$ 4,423,183
	Contingency	20%					\$ 97,537,066
	Total Estimated Project Cost						\$ 585,222,394
	Project services		20%				\$ 117,044,479
	TOTAL CAPITAL COST						\$ 702,267,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$902,823
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$126,588

Annual O&M

\$1,029,411

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 1,064,146		\$1,064,146
2		\$ 1,100,053		\$1,100,053
3		\$ 1,137,173		\$1,137,173
4		\$ 1,175,544		\$1,175,544
5		\$ 1,215,211		\$1,215,211
6		\$ 1,256,216		\$1,256,216
7		\$ 1,298,604		\$1,298,604
8		\$ 1,342,423		\$1,342,423
9		\$ 1,387,720		\$1,387,720
10		\$ 1,434,546		\$1,434,546
11		\$ 1,482,952		\$1,482,952
12		\$ 1,532,991		\$1,532,991
13		\$ 1,584,719		\$1,584,719
14		\$ 1,638,192		\$1,638,192
15		\$ 1,693,470		\$1,693,470
16		\$ 1,750,613		\$1,750,613
17		\$ 1,809,684		\$1,809,684
18		\$ 1,870,748		\$1,870,748
19		\$ 1,933,873		\$1,933,873
20		\$ 1,999,127		\$1,999,127
21		\$ 2,066,584	\$ 61,400,118	\$63,466,702
22		\$ 2,136,317		\$2,136,317
23		\$ 2,208,403	\$ 2,245,699	\$4,454,102
24		\$ 2,282,921		\$2,282,921
25		\$ 2,359,954		\$2,359,954
26		\$ 2,439,586		\$2,439,586
27		\$ 2,521,905		\$2,521,905
28		\$ 2,607,001		\$2,607,001
29		\$ 2,694,969		\$2,694,969
30		\$ 2,785,906		\$2,785,906

Present value of O&M

\$63,548,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 30,584,735	\$ 71,364,381	\$ 381,313,030	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$16,513,000	\$30,824,000	\$247,051,000	\$294,388,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**471,427,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4B	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area							
- 1 COH WWTP	Gravity Sewer 8 inch	18,788	LF			\$ 1,600	\$ 30,060,752
- Makai WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	7,812	LF			\$ 6,525	\$ 50,973,235
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch		LF			\$ 600	\$ -
	Force main 6 inch	23,573	LF			\$ 900	\$ 21,215,403
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	9,422	LF			\$ 450	\$ 4,239,711
	Low pressure sewer (On-Lot)	212	EA			\$ 26,000	\$ 5,512,000
	Regional PS (including exist. PS that receives additional flow)	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH Makai WWTPs, level of treatment - R1		LS			\$ 11,124,288	\$ 11,124,288
	Subtotal of Estimated Construction Cost						\$ 172,125,389
	Right of Way	62	Ac			\$ 20,000	\$ 1,246,790
	Contingency	20%					\$ 34,674,436
	Total Estimated Project Cost						\$ 208,046,614
	Project services		20%				\$ 41,609,323
	TOTAL CAPITAL COST						\$ 249,656,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$163,160
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$15,070

Annual O&M

\$178,230

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 184,245		\$184,245
2		\$ 190,461		\$190,461
3		\$ 196,888		\$196,888
4		\$ 203,532		\$203,532
5		\$ 210,400		\$210,400
6		\$ 217,499		\$217,499
7		\$ 224,838		\$224,838
8		\$ 232,425		\$232,425
9		\$ 240,268		\$240,268
10		\$ 248,375		\$248,375
11		\$ 256,756		\$256,756
12		\$ 265,420		\$265,420
13		\$ 274,376		\$274,376
14		\$ 283,634		\$283,634
15		\$ 293,205		\$293,205
16		\$ 303,098		\$303,098
17		\$ 313,326		\$313,326
18		\$ 323,898		\$323,898
19		\$ 334,828		\$334,828
20		\$ 346,126		\$346,126
21		\$ 357,805	\$ 39,530,268	\$39,888,073
22		\$ 369,878		\$369,878
23		\$ 382,359	\$ 372,399	\$754,759
24		\$ 395,261		\$395,261
25		\$ 408,599		\$408,599
26		\$ 422,386		\$422,386
27		\$ 436,639		\$436,639
28		\$ 451,372		\$451,372
29		\$ 466,603		\$466,603
30		\$ 482,347		\$482,347

Present value of O&M

\$25,727,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 19,690,886	\$ 45,945,402	\$ 106,489,101	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$10,631,000	\$19,845,000	\$68,994,000	\$99,470,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

175,913,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
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 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
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Alternative 4B	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area	Gravity Sewer 8 inch	0	LF			\$ 1,600	\$ -
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	13,730	LF			\$ 900	\$ 12,357,216
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	14,251	LF			\$ 450	\$ 6,412,955
	Low pressure sewer (On-Lot)	268	EA			\$ 26,000	\$ 6,968,000
	Regional PS (including exist. PS that receives additional flow)	2	EA			\$ 7,000,000	\$ 14,000,000
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
			LS			\$ -	\$ -
	Subtotal of Estimated Construction Cost						\$ 40,938,171
	Right of Way	27	Ac			\$ 20,000	\$ 544,881
	Contingency	20%					\$ 8,296,610
	Total Estimated Project Cost						\$ 49,779,661
	Project services		20%				\$ 9,955,932
	TOTAL CAPITAL COST						\$ 59,736,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$158,505
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$0

Annual O&M

\$158,505

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 163,853		\$163,853
2		\$ 169,382		\$169,382
3		\$ 175,097		\$175,097
4		\$ 181,006		\$181,006
5		\$ 187,113		\$187,113
6		\$ 193,427		\$193,427
7		\$ 199,954		\$199,954
8		\$ 206,701		\$206,701
9		\$ 213,676		\$213,676
10		\$ 220,886		\$220,886
11		\$ 228,339		\$228,339
12		\$ 236,044		\$236,044
13		\$ 244,009		\$244,009
14		\$ 252,242		\$252,242
15		\$ 260,754		\$260,754
16		\$ 269,552		\$269,552
17		\$ 278,648		\$278,648
18		\$ 288,050		\$288,050
19		\$ 297,770		\$297,770
20		\$ 307,818		\$307,818
21		\$ 318,204	\$ 13,350,953	\$13,669,157
22		\$ 328,942		\$328,942
23		\$ 340,041	\$ -	\$340,041
24		\$ 351,515		\$351,515
25		\$ 363,376		\$363,376
26		\$ 375,638		\$375,638
27		\$ 388,313		\$388,313
28		\$ 401,416		\$401,416
29		\$ 414,961		\$414,961
30		\$ 428,963		\$428,963

Present value of O&M

\$11,606,000

replace elec./motorized equipment

sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 6,650,400	\$ 15,517,600	\$ 18,770,171	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,591,000	\$6,703,000	\$12,161,000	\$22,455,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**48,887,000**

JOB #: South Kohala Wastewater Master Plan
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 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
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Alternative 4B	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikoloa Area							
- 1 COH WWTP							
- East Waikoloa WWTP	Gravity Sewer 8 inch	13,730	LF			\$ 1,600	\$ 21,968,128
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch		LF			\$ 900	\$ -
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	2,237	LF			\$ 450	\$ 1,006,682
	Low pressure sewer (On-Lot)	63	EA			\$ 26,000	\$ 1,638,000
	Regional PS (including exist. PS that receives additional flow)	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH East Waikoloa WWTP, level of treatment - R1		LS			\$ 5,840,251	\$ 5,840,251
	Subtotal of Estimated Construction Cost						\$ 30,453,061
	Right of Way	19	Ac			\$ 20,000	\$ 373,244
	Contingency	20%					\$ 6,165,261
	Total Estimated Project Cost						\$ 36,991,566
	Project services		20%				\$ 7,398,313
	TOTAL CAPITAL COST						\$ 44,390,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$37,306
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$3,425
Annual O&M					\$40,731

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 42,106		\$42,106
2		\$ 43,526		\$43,526
3		\$ 44,995		\$44,995
4		\$ 46,513		\$46,513
5		\$ 48,083		\$48,083
6		\$ 49,705		\$49,705
7		\$ 51,382		\$51,382
8		\$ 53,116		\$53,116
9		\$ 54,909		\$54,909
10		\$ 56,761		\$56,761
11		\$ 58,677		\$58,677
12		\$ 60,657		\$60,657
13		\$ 62,703		\$62,703
14		\$ 64,819		\$64,819
15		\$ 67,006		\$67,006
16		\$ 69,267		\$69,267
17		\$ 71,605		\$71,605
18		\$ 74,021		\$74,021
19		\$ 76,518		\$76,518
20		\$ 79,100		\$79,100
21		\$ 81,770	\$ 4,503,869	\$4,585,639
				replace elec./ motorized equipment
22		\$ 84,529		\$84,529
23		\$ 87,381	\$ 192,221	\$279,602
				sewer inspection at yr 10 of service
24		\$ 90,329		\$90,329
25		\$ 93,377		\$93,377
26		\$ 96,528		\$96,528
27		\$ 99,785		\$99,785
28		\$ 103,152		\$103,152
29		\$ 106,633		\$106,633
30		\$ 110,231		\$110,231

Present value of O&M \$3,622,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 2,243,475	\$ 5,234,776	\$ 22,974,810	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$1,211,000	\$2,261,000	\$14,885,000	\$18,357,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value) 29,655,000

G-13: Alternative 4C Construction Cost and LCC Analysis

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
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Alternative 4C	DESCRIPTION Level of Treatment - R3	QUAN	UN			TOTAL DIRECT COST
					UNIT COST	
Includes four Mauka COH Plant and one Makai COH Plant, Urban Sewering w/ Private and County Plants, All Gravity Sewers. Cross country sewers with new easements are used to reduce the number of pump stations. Private plant service areas unchanged. IWS for all low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to new COH Mauka (Waimea and East Waikoloa) area or Makai (Puako) WWTP.	Gravity Sewer 8 inch	237,945	LF		\$ 1,600	\$ 380,712,288
	Gravity Sewer 12 inch	29,833	LF		\$ 3,070	\$ 91,587,801
	Gravity Sewer 16 inch	6,544	LF		\$ 5,800	\$ 37,957,984
	Gravity Sewer 18 inch	9,925	LF		\$ 6,525	\$ 64,760,168
	Gravity Sewer 24 inch	-	LF		\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF		\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF		\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF		\$ 15,200	\$ -
	Force main 4 inch	-	LF		\$ 600	\$ -
	Force main 6 inch	48,434	LF		\$ 900	\$ 43,590,861
	Force main 8 inch	-	LF		\$ 1,600	\$ -
	Force main 10 inch	9,435	LF		\$ 1,700	\$ 16,039,500
	Force main 12 inch	-	LF		\$ 3,070	\$ -
	Force main 14 inch	-	LF		\$ 4,430	\$ -
	Force main 16 inch	-	LF		\$ 5,800	\$ -
	Force main 18 inch	-	LF		\$ 6,525	\$ -
	Force main 24 inch	-	LF		\$ 8,700	\$ -
	Force main 30 inch	-	LF		\$ 10,875	\$ -
	Force main 36 inch	-	LF		\$ 13,050	\$ -
	Force main 42 inch	-	LF		\$ 15,200	\$ -
	Regional PS	13	EA		\$ 7,000,000	\$ 91,000,000
	Neighborhood PS	10	EA		\$ 1,200,000	\$ 12,000,000
	COH WWTPs (5 total), level of treatment - R3		LS		\$ 40,400,000	\$ 40,400,000
	Subtotal of Estimated Construction Cost					\$ 778,048,602
	Right of Way	348	Ac		\$ 20,000	\$ 6,960,745
	Contingency	20%				\$ 157,001,869
	Total Estimated Project Cost					\$ 942,011,216
	Project services		20%			\$ 188,402,243
	TOTAL CAPITAL COST					\$ 1,130,413,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	478469	kwh	\$ 0.44	\$210,527
	Labor and Materials	55,811	LS	-	\$55,811

Annual O&M

\$266,338

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 275,325		\$275,325
2		\$ 284,615		\$284,615
3		\$ 294,219		\$294,219
4		\$ 304,147		\$304,147
5		\$ 314,410		\$314,410
6		\$ 325,019		\$325,019
7		\$ 335,986		\$335,986
8		\$ 347,323		\$347,323
9		\$ 359,043		\$359,043
10		\$ 371,158		\$371,158
11		\$ 383,682		\$383,682
12		\$ 396,629		\$396,629
13		\$ 410,012		\$410,012
14		\$ 423,847		\$423,847
15		\$ 438,149		\$438,149
16		\$ 452,934		\$452,934
17		\$ 468,217		\$468,217
18		\$ 484,016		\$484,016
19		\$ 500,348		\$500,348
20		\$ 517,231		\$517,231
21		\$ 534,684	\$ 86,364,427	\$86,899,111
22		\$ 552,726		\$552,726
23		\$ 571,377	\$ 3,979,469	\$4,550,845
24		\$ 590,657		\$590,657
25		\$ 610,588		\$610,588
26		\$ 631,191		\$631,191
27		\$ 652,489		\$652,489
28		\$ 674,506		\$674,506
29		\$ 697,266		\$697,266
30		\$ 720,794		\$720,794

Present value of O&M

\$54,000,000

replace elec./ motorized equipment

sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 43,020,000	\$ 100,380,000	\$ 634,648,602	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$23,227,000	\$43,357,000	\$411,186,000	\$477,770,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

706,643,000

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Alternative 4C	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waimea Area							
- 3 COH WWTPs							
- East Waimea WWTP	Gravity Sewer 8 inch	181,535	LF			\$ 1,600	\$ 290,456,448
- Waimea Town WWTP	Gravity Sewer 12 inch	29,833	LF			\$ 3,070	\$ 91,587,801
- West Waimea WWTP	Gravity Sewer 16 inch	6,544	LF			\$ 5,800	\$ 37,957,984
	Gravity Sewer 18 inch	2,113	LF			\$ 6,525	\$ 13,786,934
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	9,159	LF			\$ 900	\$ 8,243,496
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch	9,435	LF			\$ 1,700	\$ 16,039,500
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	2	EA			\$ 1,200,000	\$ 2,400,000
	COH WWTPs (3 total), level of treatment - R3		LS			\$ 28,200,000	\$ 28,200,000
	Subtotal of Estimated Construction Cost						\$ 516,672,163
	Right of Way	236	Ac			\$ 20,000	\$ 4,724,358
	Contingency	20%					\$ 104,279,304
	Total Estimated Project Cost						\$ 625,675,825
	Project services		20%				\$ 125,135,165
	TOTAL CAPITAL COST						\$ 750,811,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	358386	kWH	\$ 0.44	\$157,690
	Labor and Materials	\$ 36,994	LS	-	\$36,994

Annual O&M

\$194,684

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 201,253		\$201,253
2		\$ 208,044		\$208,044
3		\$ 215,064		\$215,064
4		\$ 222,321		\$222,321
5		\$ 229,822		\$229,822
6		\$ 237,577		\$237,577
7		\$ 245,594		\$245,594
8		\$ 253,881		\$253,881
9		\$ 262,448		\$262,448
10		\$ 271,303		\$271,303
11		\$ 280,458		\$280,458
12		\$ 289,922		\$289,922
13		\$ 299,704		\$299,704
14		\$ 309,817		\$309,817
15		\$ 320,271		\$320,271
16		\$ 331,078		\$331,078
17		\$ 342,250		\$342,250
18		\$ 353,799		\$353,799
19		\$ 365,737		\$365,737
20		\$ 378,078		\$378,078
21		\$ 390,835	\$ 35,292,576	\$35,683,411
22		\$ 404,023		\$404,023
23		\$ 417,656	\$ 3,080,362	\$3,498,018
24		\$ 431,749		\$431,749
25		\$ 446,318		\$446,318
26		\$ 461,378		\$461,378
27		\$ 476,946		\$476,946
28		\$ 493,040		\$493,040
29		\$ 509,676		\$509,676
30		\$ 526,874		\$526,874

Present value of O&M

\$25,364,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 17,580,000	\$ 41,020,000	\$ 458,072,163	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$9,492,000	\$17,718,000	\$296,783,000	\$323,993,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

452,182,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4C	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area							
- 1 COH WWTP	Gravity Sewer 8 inch	25,985	LF			\$ 1,600	\$ 41,576,448
- Makai WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	7,812	LF			\$ 6,525	\$ 50,973,235
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	22,998	LF			\$ 900	\$ 20,698,596
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Regional PS	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	3	EA			\$ 1,200,000	\$ 3,600,000
	COH Makai WWTP, level of treatment - R3		LS			\$ 8,000,000	\$ 8,000,000
	Subtotal of Estimated Construction Cost						\$ 173,848,279
	Right of Way	61	Ac			\$ 20,000	\$ 1,226,386
	Contingency	20%					\$ 35,014,933
	Total Estimated Project Cost						\$ 210,089,598
	Project services		20%				\$ 42,017,920
	TOTAL CAPITAL COST						\$ 252,108,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	85412	kWH	\$ 0.44	\$37,581
	Labor and Materials	\$ 14,325	LS	-	\$14,325

Annual O&M

\$51,907

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 53,658		\$53,658
2		\$ 55,469		\$55,469
3		\$ 57,340		\$57,340
4		\$ 59,275		\$59,275
5		\$ 61,275		\$61,275
6		\$ 63,343		\$63,343
7		\$ 65,480		\$65,480
8		\$ 67,690		\$67,690
9		\$ 69,974		\$69,974
10		\$ 72,335		\$72,335
11		\$ 74,776		\$74,776
12		\$ 77,299		\$77,299
13		\$ 79,907		\$79,907
14		\$ 82,604		\$82,604
15		\$ 85,391		\$85,391
16		\$ 88,272		\$88,272
17		\$ 91,251		\$91,251
18		\$ 94,330		\$94,330
19		\$ 97,513		\$97,513
20		\$ 100,803		\$100,803
21		\$ 104,205	\$ 36,497,101	\$36,601,305
22		\$ 107,721		\$107,721
23		\$ 111,356	\$ 473,162	\$584,517
24		\$ 115,113		\$115,113
25		\$ 118,997		\$118,997
26		\$ 123,013		\$123,013
27		\$ 127,163		\$127,163
28		\$ 131,454		\$131,454
29		\$ 135,890		\$135,890
30		\$ 140,475		\$140,475

Present value of O&M

\$20,404,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 18,180,000	\$ 42,420,000	\$ 113,248,279	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$9,816,000	\$18,323,000	\$73,373,000	\$101,512,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

171,000,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4C	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area	Gravity Sewer 8 inch	12,852	LF			\$ 1,600	\$ 20,563,712
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	16,276	LF			\$ 900	\$ 14,648,769
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	2	EA			\$ 7,000,000	\$ 14,000,000
	Neighborhood PS	5	EA			\$ 1,200,000	\$ 6,000,000
			LS			\$	-
	Subtotal of Estimated Construction Cost					\$ 55,212,481	
	Right of Way	30	Ac			\$ 20,000	\$ 607,277
	Contingency	20%				\$	\$ 11,163,952
	Total Estimated Project Cost					\$	\$ 66,983,710
	Project services		20%			\$	\$ 13,396,742
	TOTAL CAPITAL COST						\$ 80,380,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	27798	kWH	\$ 0.44	\$12,231
	Labor and Materials	\$ 3,986	LS	-	\$3,986

Annual O&M

\$16,217

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 16,764		\$16,764
2		\$ 17,330		\$17,330
3		\$ 17,915		\$17,915
4		\$ 18,519		\$18,519
5		\$ 19,144		\$19,144
6		\$ 19,790		\$19,790
7		\$ 20,458		\$20,458
8		\$ 21,148		\$21,148
9		\$ 21,862		\$21,862
10		\$ 22,599		\$22,599
11		\$ 23,362		\$23,362
12		\$ 24,150		\$24,150
13		\$ 24,965		\$24,965
14		\$ 25,808		\$25,808
15		\$ 26,678		\$26,678
16		\$ 27,579		\$27,579
17		\$ 28,509		\$28,509
18		\$ 29,471		\$29,471
19		\$ 30,466		\$30,466
20		\$ 31,494		\$31,494
21		\$ 32,556	\$ 12,045,248	\$12,077,804
22		\$ 33,655		\$33,655
23		\$ 34,791	\$ 179,932	\$214,723
24		\$ 35,965		\$35,965
25		\$ 37,178		\$37,178
26		\$ 38,433		\$38,433
27		\$ 39,729		\$39,729
28		\$ 41,070		\$41,070
29		\$ 42,456		\$42,456
30		\$ 43,888		\$43,888

Present value of O&M

\$6,718,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 6,000,000	\$ 14,000,000	\$ 35,212,481	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,239,000	\$6,047,000	\$22,814,000	\$32,100,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

54,998,000

JOB #: South Kohala Wastewater Master Plan

DATE: June 8, 2024

LOCATION: South Kohala, County of Hawaii

PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM

Construction Cost Estimate

Conceptual Level

Wastewater Master Plan Estimates

Alternative 4C	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikoloa Area							
- 1 COH WWTP							
- East Waikoloa WWTP	Gravity Sewer 8 inch	17,572	LF			\$ 1,600	\$ 28,115,680
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch		LF			\$ 900	\$ -
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS		EA			\$ 7,000,000	\$ -
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH East Waikoloa WWTP), level of treatment - R3		LS			\$ 4,200,000	\$ 4,200,000
	Subtotal of Estimated Construction Cost						\$ 32,315,680
	Right of Way	20	Ac			\$ 20,000	\$ 402,724
	Contingency	20%					\$ 6,543,681
	Total Estimated Project Cost						\$ 39,262,084
	Project services		20%				\$ 7,852,417
	TOTAL CAPITAL COST						\$ 47,115,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	6873	kWH	\$ 0.44	\$3,024
	Labor and Materials	\$ 507	LS	-	\$507

Annual O&M

\$3,531

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 3,650		\$3,650
2		\$ 3,773		\$3,773
3		\$ 3,900		\$3,900
4		\$ 4,032		\$4,032
5		\$ 4,168		\$4,168
6		\$ 4,309		\$4,309
7		\$ 4,454		\$4,454
8		\$ 4,604		\$4,604
9		\$ 4,760		\$4,760
10		\$ 4,920		\$4,920
11		\$ 5,086		\$5,086
12		\$ 5,258		\$5,258
13		\$ 5,435		\$5,435
14		\$ 5,619		\$5,619
15		\$ 5,808		\$5,808
16		\$ 6,004		\$6,004
17		\$ 6,207		\$6,207
18		\$ 6,416		\$6,416
19		\$ 6,633		\$6,633
20		\$ 6,857		\$6,857
21		\$ 7,088	\$ 2,529,502	\$2,536,590
22		\$ 7,327		\$7,327
23		\$ 7,575	\$ 246,012	\$253,587
24		\$ 7,830		\$7,830
25		\$ 8,094		\$8,094
26		\$ 8,368		\$8,368
27		\$ 8,650		\$8,650
28		\$ 8,942		\$8,942
29		\$ 9,243		\$9,243
30		\$ 9,555		\$9,555

Present value of O&M

\$1,514,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 1,260,000	\$ 2,940,000	\$ 28,115,680	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$680,000	\$1,270,000	\$18,216,000	\$20,166,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**28,463,000**

Alternative 4C	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Includes four Mauka COH Plant and one Makai COH Plant, Urban Sewering w/ Private and County Plants, All Gravity Sewers. Cross county sewers with new easements are used to reduce the number of pump stations. Private plant service areas unchanged. IWS for all low density zoning areas >1 acre. COH sewers/VWPS from high density (commercial or <1 acre lots) to new COH Mauka (Waimea and East Waikoloa) area or Makai (Puako) WWTP.	Gravity Sewer 8 inch	237,945	LF			\$ 1,600	\$ 380,712,288
	Gravity Sewer 12 inch	29,833	LF			\$ 3,070	\$ 91,587,801
	Gravity Sewer 16 inch	6,544	LF			\$ 5,800	\$ 37,957,984
	Gravity Sewer 18 inch	9,925	LF			\$ 6,525	\$ 64,760,168
	Gravity Sewer 24 inch	-	LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	48,434	LF			\$ 900	\$ 43,590,861
	Force main 8 inch	-	LF			\$ 1,600	\$ -
	Force main 10 inch	9,435	LF			\$ 1,700	\$ 16,039,500
	Force main 12 inch	-	LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	13	EA			\$ 7,000,000	\$ 91,000,000
	Neighborhood PS	10	EA			\$ 1,200,000	\$ 12,000,000
	COH WWTPs (5 total), level of treatment - R2		LS			\$ 43,147,200	\$ 43,147,200
	Subtotal of Estimated Construction Cost						\$ 780,795,802
	Right of Way	348	Ac			\$ 20,000	\$ 6,960,745
	Contingency	20%					\$ 157,551,309
	Total Estimated Project Cost						\$ 945,307,856
	Project services		20%				\$ 189,061,571
	TOTAL CAPITAL COST						\$ 1,134,369,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$266,338
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$124,962

Annual O&M

\$391,300

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 404,504		\$404,504
2		\$ 418,153		\$418,153
3		\$ 432,263		\$432,263
4		\$ 446,848		\$446,848
5		\$ 461,926		\$461,926
6		\$ 477,513		\$477,513
7		\$ 493,626		\$493,626
8		\$ 510,282		\$510,282
9		\$ 527,501		\$527,501
10		\$ 545,300		\$545,300
11		\$ 563,700		\$563,700
12		\$ 582,721		\$582,721
13		\$ 602,384		\$602,384
14		\$ 622,710		\$622,710
15		\$ 643,723		\$643,723
16		\$ 665,444		\$665,444
17		\$ 687,898		\$687,898
18		\$ 711,110		\$711,110
19		\$ 735,105		\$735,105
20		\$ 759,909		\$759,909
21		\$ 785,551	\$ 88,018,962	\$88,804,513
22		\$ 812,058		\$812,058
23		\$ 839,459	\$ 3,979,469	\$4,818,927
24		\$ 867,785		\$867,785
25		\$ 897,067		\$897,067
26		\$ 927,336		\$927,336
27		\$ 958,627		\$958,627
28		\$ 990,974		\$990,974
29		\$ 1,024,413		\$1,024,413
30		\$ 1,058,980		\$1,058,980

Present value of O&M

\$58,627,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 43,844,160	\$ 102,303,040	\$ 634,648,602	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$23,672,000	\$44,188,000	\$411,186,000	\$479,046,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

713,950,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4C Waimea Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
- 3 COH WWTPs							
- East Waimea WWTP	Gravity Sewer 8 inch	181,535	LF			\$ 1,600	\$ 290,456,448
- Waimea Town WWTP	Gravity Sewer 12 inch	29,833	LF			\$ 3,070	\$ 91,587,801
- West Waimea WWTP	Gravity Sewer 16 inch	6,544	LF			\$ 5,800	\$ 37,957,984
	Gravity Sewer 18 inch	2,113	LF			\$ 6,525	\$ 13,786,934
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch		LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch		LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch		LF			\$ 15,200	\$ -
	Force main 4 inch		LF			\$ 600	\$ -
	Force main 6 inch	9,159	LF			\$ 900	\$ 8,243,496
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch	9,435	LF			\$ 1,700	\$ 16,039,500
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Regional PS	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	2	EA			\$ 1,200,000	\$ 2,400,000
	COH WWTPs (3 total), level of treatment - R2		LS			\$ 30,117,600	\$ 30,117,600
	Subtotal of Estimated Construction Cost						\$ 518,589,763
	Right of Way	236	Ac			\$ 20,000	\$ 4,724,358
	Contingency	20%					\$ 104,662,824
	Total Estimated Project Cost						\$ 627,976,945
	Project services		20%				\$ 125,595,389
	TOTAL CAPITAL COST						\$ 753,572,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$194,684
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$109,032

Annual O&M

\$303,716

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 313,964		\$313,964
2		\$ 324,558		\$324,558
3		\$ 335,510		\$335,510
4		\$ 346,831		\$346,831
5		\$ 358,534		\$358,534
6		\$ 370,632		\$370,632
7		\$ 383,138		\$383,138
8		\$ 396,066		\$396,066
9		\$ 409,431		\$409,431
10		\$ 423,246		\$423,246
11		\$ 437,528		\$437,528
12		\$ 452,291		\$452,291
13		\$ 467,553		\$467,553
14		\$ 483,330		\$483,330
15		\$ 499,639		\$499,639
16		\$ 516,498		\$516,498
17		\$ 533,926		\$533,926
18		\$ 551,942		\$551,942
19		\$ 570,567		\$570,567
20		\$ 589,819		\$589,819
21		\$ 609,722	\$ 36,447,474	\$37,057,196
22		\$ 630,295		\$630,295
23		\$ 651,563	\$ 3,080,362	\$3,731,926
24		\$ 673,549		\$673,549
25		\$ 696,277		\$696,277
26		\$ 719,771		\$719,771
27		\$ 744,059		\$744,059
28		\$ 769,165		\$769,165
29		\$ 795,119		\$795,119
30		\$ 821,949		\$821,949

Present value of O&M

\$29,254,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 18,155,280	\$ 42,362,320	\$ 458,072,163	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$9,802,000	\$18,298,000	\$296,783,000	\$324,883,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

457,943,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4C Kawaihae Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
- 1 COH WWTP - Makai WWTP	Gravity Sewer 8 inch	25,985	LF			\$ 1,600	\$ 41,576,448
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	7,812	LF			\$ 6,525	\$ 50,973,235
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	22,998	LF			\$ 900	\$ 20,698,596
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	3	EA			\$ 1,200,000	\$ 3,600,000
	COH Makai WWTP, level of treatment - R2		LS			\$ 8,544,000	\$ 8,544,000
	Subtotal of Estimated Construction Cost						\$ 174,392,279
	Right of Way	61	Ac			\$ 20,000	\$ 1,226,386
	Contingency	20%					\$ 35,123,733
	Total Estimated Project Cost						\$ 210,742,398
	Project services		20%				\$ 42,148,480
	TOTAL CAPITAL COST						\$ 252,891,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$51,907
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$12,980
Annual O&M					\$64,887

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 67,076		\$67,076
2		\$ 69,339		\$69,339
3		\$ 71,679		\$71,679
4		\$ 74,098		\$74,098
5		\$ 76,598		\$76,598
6		\$ 79,183		\$79,183
7		\$ 81,855		\$81,855
8		\$ 84,617		\$84,617
9		\$ 87,472		\$87,472
10		\$ 90,423		\$90,423
11		\$ 93,475		\$93,475
12		\$ 96,629		\$96,629
13		\$ 99,889		\$99,889
14		\$ 103,260		\$103,260
15		\$ 106,744		\$106,744
16		\$ 110,346		\$110,346
17		\$ 114,069		\$114,069
18		\$ 117,918		\$117,918
19		\$ 121,897		\$121,897
20		\$ 126,010		\$126,010
21		\$ 130,262	\$ 36,824,732	\$36,954,994
22		\$ 134,658		\$134,658
23		\$ 139,202	\$ 473,162	\$612,363
24		\$ 143,899		\$143,899
25		\$ 148,754		\$148,754
26		\$ 153,774		\$153,774
27		\$ 158,963		\$158,963
28		\$ 164,326		\$164,326
29		\$ 169,871		\$169,871
30		\$ 175,603		\$175,603

Present value of O&M

\$20,964,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 18,343,200	\$ 42,800,800	\$ 113,248,279	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$9,904,000	\$18,487,000	\$73,373,000	\$101,764,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

172,091,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4C Puako Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
	Gravity Sewer 8 inch					\$ 1,600	\$ 20,563,712
	Gravity Sewer 12 inch					\$ 3,070	\$ -
	Gravity Sewer 16 inch					\$ 5,800	\$ -
	Gravity Sewer 18 inch					\$ 6,525	\$ -
	Gravity Sewer 24 inch					\$ 8,700	\$ -
	Gravity Sewer 30 inch					\$ 10,875	\$ -
	Gravity Sewer 36 inch					\$ 13,050	\$ -
	Gravity Sewer 42 inch					\$ 15,200	\$ -
	Force main 4 inch					\$ 600	\$ -
	Force main 6 inch	16,276	LF			\$ 900	\$ 14,648,769
	Force main 8 inch					\$ 1,600	\$ -
	Force main 10 inch					\$ 1,700	\$ -
	Force main 12 inch					\$ 3,070	\$ -
	Force main 14 inch					\$ 4,430	\$ -
	Force main 16 inch					\$ 5,800	\$ -
	Force main 18 inch					\$ 6,525	\$ -
	Force main 24 inch					\$ 8,700	\$ -
	Force main 30 inch					\$ 10,875	\$ -
	Force main 36 inch					\$ 13,050	\$ -
	Force main 42 inch					\$ 15,200	\$ -
	Regional PS	2	EA			\$ 7,000,000	\$ 14,000,000
	Neighborhood PS	5	EA			\$ 1,200,000	\$ 6,000,000
			LS			\$ -	\$ -
	Subtotal of Estimated Construction Cost						\$ 55,212,481
	Right of Way	30	Ac			\$ 20,000	\$ 607,277
	Contingency	20%					\$ 11,163,952
	Total Estimated Project Cost						\$ 66,983,710
	Project services		20%				\$ 13,396,742
	TOTAL CAPITAL COST						\$ 80,380,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$16,217
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$0

Annual O&M

\$16,217

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 16,764		\$16,764
2		\$ 17,330		\$17,330
3		\$ 17,915		\$17,915
4		\$ 18,519		\$18,519
5		\$ 19,144		\$19,144
6		\$ 19,790		\$19,790
7		\$ 20,458		\$20,458
8		\$ 21,148		\$21,148
9		\$ 21,862		\$21,862
10		\$ 22,599		\$22,599
11		\$ 23,362		\$23,362
12		\$ 24,150		\$24,150
13		\$ 24,965		\$24,965
14		\$ 25,808		\$25,808
15		\$ 26,678		\$26,678
16		\$ 27,579		\$27,579
17		\$ 28,509		\$28,509
18		\$ 29,471		\$29,471
19		\$ 30,466		\$30,466
20		\$ 31,494		\$31,494
21		\$ 32,556	\$ 12,045,248	\$12,077,804
22		\$ 33,655		\$33,655
23		\$ 34,791	\$ 179,932	\$214,723
24		\$ 35,965		\$35,965
25		\$ 37,178		\$37,178
26		\$ 38,433		\$38,433
27		\$ 39,729		\$39,729
28		\$ 41,070		\$41,070
29		\$ 42,456		\$42,456
30		\$ 43,888		\$43,888

Present value of O&M

\$6,718,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 6,000,000	\$ 14,000,000	\$ 35,212,481	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,239,000	\$6,047,000	\$22,814,000	\$32,100,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

54,998,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4C Waikoloa Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
- 1 COH WWTP	Gravity Sewer 8 inch	17,572	LF			\$ 1,600	\$ 28,115,680
- East Waikoloa WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch		LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch		LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch		LF			\$ 15,200	\$ -
	Force main 4 inch		LF			\$ 600	\$ -
	Force main 6 inch		LF			\$ 900	\$ -
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Regional PS		EA			\$ 7,000,000	\$ -
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH East Waikoloa WWTP), level of treatment - R2		LS			\$ 4,485,600	\$ 4,485,600
	Subtotal of Estimated Construction Cost						\$ 32,601,280
	Right of Way	20	Ac			\$ 20,000	\$ 402,724
	Contingency	20%					\$ 6,600,801
	Total Estimated Project Cost						\$ 39,604,804
	Project services		20%				\$ 7,920,961
	TOTAL CAPITAL COST						\$ 47,526,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$3,531
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$2,950
Annual O&M					\$6,481

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 6,699		\$6,699
2		\$ 6,926		\$6,926
3		\$ 7,159		\$7,159
4		\$ 7,401		\$7,401
5		\$ 7,650		\$7,650
6		\$ 7,909		\$7,909
7		\$ 8,176		\$8,176
8		\$ 8,451		\$8,451
9		\$ 8,737		\$8,737
10		\$ 9,031		\$9,031
11		\$ 9,336		\$9,336
12		\$ 9,651		\$9,651
13		\$ 9,977		\$9,977
14		\$ 10,313		\$10,313
15		\$ 10,661		\$10,661
16		\$ 11,021		\$11,021
17		\$ 11,393		\$11,393
18		\$ 11,778		\$11,778
19		\$ 12,175		\$12,175
20		\$ 12,586		\$12,586
21		\$ 13,010	\$ 2,701,508	\$2,714,519
22		\$ 13,449		\$13,449
23		\$ 13,903	\$ 246,012	\$259,915
24		\$ 14,372		\$14,372
25		\$ 14,857		\$14,857
26		\$ 15,359		\$15,359
27		\$ 15,877		\$15,877
28		\$ 16,413		\$16,413
29		\$ 16,966		\$16,966
30		\$ 17,539		\$17,539

Present value of O&M \$1,691,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 1,345,680	\$ 3,139,920	\$ 28,115,680	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$727,000	\$1,356,000	\$18,216,000	\$20,299,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

28,918,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4C	DESCRIPTION Level of Treatment - R1	QUAN	UN			TOTAL DIRECT COST
					UNIT COST	
Includes four Mauka COH Plant and one Makai COH Plant, Urban Sewering w/ Private and County Plants, All Gravity Sewers. Cross country sewers with new easements are used to reduce the number of pump stations. Private plant service areas unchanged. IWS for all low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to new COH Mauka (Waimea and East Waikoloa) area or Makai (Puako) WWTP.	Gravity Sewer 8 inch	237,945	LF		\$ 1,600	\$ 380,712,288
	Gravity Sewer 12 inch	29,833	LF		\$ 3,070	\$ 91,587,801
	Gravity Sewer 16 inch	6,544	LF		\$ 5,800	\$ 37,957,984
	Gravity Sewer 18 inch	9,925	LF		\$ 6,525	\$ 64,760,168
	Gravity Sewer 24 inch	-	LF		\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF		\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF		\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF		\$ 15,200	\$ -
	Force main 4 inch	-	LF		\$ 600	\$ -
	Force main 6 inch	48,434	LF		\$ 900	\$ 43,590,861
	Force main 8 inch	-	LF		\$ 1,600	\$ -
	Force main 10 inch	9,435	LF		\$ 1,700	\$ 16,039,500
	Force main 12 inch	-	LF		\$ 3,070	\$ -
	Force main 14 inch	-	LF		\$ 4,430	\$ -
	Force main 16 inch	-	LF		\$ 5,800	\$ -
	Force main 18 inch	-	LF		\$ 6,525	\$ -
	Force main 24 inch	-	LF		\$ 8,700	\$ -
	Force main 30 inch	-	LF		\$ 10,875	\$ -
	Force main 36 inch	-	LF		\$ 13,050	\$ -
	Force main 42 inch	-	LF		\$ 15,200	\$ -
	Regional PS	13	EA		\$ 7,000,000	\$ 91,000,000
	Neighborhood PS	10	EA		\$ 1,200,000	\$ 12,000,000
	COH WWTPs (5 total), level of treatment - R1		LS		\$ 56,177,654	\$ 56,177,654
	Subtotal of Estimated Construction Cost					\$ 793,826,257
	Right of Way	348	Ac		\$ 20,000	\$ 6,960,745
	Contingency	20%				\$ 160,157,400
	Total Estimated Project Cost					\$ 960,944,402
	Project services		20%			\$ 192,188,880
	TOTAL CAPITAL COST					\$ 1,153,133,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$266,338
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$145,083

Annual O&M

\$411,421

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 425,304		\$425,304
2		\$ 439,655		\$439,655
3		\$ 454,490		\$454,490
4		\$ 469,826		\$469,826
5		\$ 485,679		\$485,679
6		\$ 502,067		\$502,067
7		\$ 519,009		\$519,009
8		\$ 536,522		\$536,522
9		\$ 554,625		\$554,625
10		\$ 573,340		\$573,340
11		\$ 592,686		\$592,686
12		\$ 612,685		\$612,685
13		\$ 633,359		\$633,359
14		\$ 654,731		\$654,731
15		\$ 676,823		\$676,823
16		\$ 699,661		\$699,661
17		\$ 723,270		\$723,270
18		\$ 747,675		\$747,675
19		\$ 772,904		\$772,904
20		\$ 798,984		\$798,984
21		\$ 825,945	\$ 95,866,715	\$96,692,659
22		\$ 853,814		\$853,814
23		\$ 882,625	\$ 3,979,469	\$4,862,093
24		\$ 912,407		\$912,407
25		\$ 943,195		\$943,195
26		\$ 975,021		\$975,021
27		\$ 1,007,921		\$1,007,921
28		\$ 1,041,931		\$1,041,931
29		\$ 1,077,089		\$1,077,089
30		\$ 1,113,433		\$1,113,433

Present value of O&M

\$63,237,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 47,753,296	\$ 111,424,358	\$ 634,648,602	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$25,783,000	\$48,128,000	\$411,186,000	\$485,097,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

731,273,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4C	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waimea Area							
- 3 COH WWTPs							
- East Waimea WWTP	Gravity Sewer 8 inch	181,535	LF			\$ 1,600	\$ 290,456,448
- Waimea Town WWTP	Gravity Sewer 12 inch	29,833	LF			\$ 3,070	\$ 91,587,801
- West Waimea WWTP	Gravity Sewer 16 inch	6,544	LF			\$ 5,800	\$ 37,957,984
	Gravity Sewer 18 inch	2,113	LF			\$ 6,525	\$ 13,786,934
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	9,159	LF			\$ 900	\$ 8,243,496
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch	9,435	LF			\$ 1,700	\$ 16,039,500
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	2	EA			\$ 1,200,000	\$ 2,400,000
	COH WWTPs (3 total), level of treatment - R1		LS			\$ 39,213,115	\$ 39,213,115
	Subtotal of Estimated Construction Cost						\$ 527,685,278
	Right of Way	236	Ac			\$ 20,000	\$ 4,724,358
	Contingency	20%					\$ 106,481,927
	Total Estimated Project Cost						\$ 638,891,563
	Project services		20%				\$ 127,778,313
	TOTAL CAPITAL COST						\$ 766,670,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$194,684
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$126,588
Annual O&M					\$321,272

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 332,112		\$332,112
2		\$ 343,319		\$343,319
3		\$ 354,903		\$354,903
4		\$ 366,879		\$366,879
5		\$ 379,258		\$379,258
6		\$ 392,056		\$392,056
7		\$ 405,285		\$405,285
8		\$ 418,960		\$418,960
9		\$ 433,097		\$433,097
10		\$ 447,711		\$447,711
11		\$ 462,819		\$462,819
12		\$ 478,436		\$478,436
13		\$ 494,579		\$494,579
14		\$ 511,268		\$511,268
15		\$ 528,520		\$528,520
16		\$ 546,354		\$546,354
17		\$ 564,789		\$564,789
18		\$ 583,847		\$583,847
19		\$ 603,548		\$603,548
20		\$ 623,913		\$623,913
21		\$ 644,966	\$ 41,925,361	\$42,570,327
22		\$ 666,729		\$666,729
23		\$ 689,227	\$ 3,080,362	\$3,769,589
24		\$ 712,483		\$712,483
25		\$ 736,524		\$736,524
26		\$ 761,377		\$761,377
27		\$ 787,068		\$787,068
28		\$ 813,626		\$813,626
29		\$ 841,080		\$841,080
30		\$ 869,461		\$869,461

Present value of O&M \$32,578,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 20,883,935	\$ 48,729,181	\$ 458,072,163	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$11,276,000	\$21,048,000	\$296,783,000	\$329,107,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**470,141,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4C	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area							
- 1 COH WWTP	Gravity Sewer 8 inch	25,985	LF			\$ 1,600	\$ 41,576,448
- Makai WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	7,812	LF			\$ 6,525	\$ 50,973,235
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch		LF			\$ 600	\$ -
	Force main 6 inch	22,998	LF			\$ 900	\$ 20,698,596
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Regional PS	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	3	EA			\$ 1,200,000	\$ 3,600,000
	COH Makai WWTP, level of treatment - R1		LS			\$ 11,124,288	\$ 11,124,288
	Subtotal of Estimated Construction Cost					\$ 176,972,567	
	Right of Way	61	Ac			\$ 20,000	\$ 1,226,386
	Contingency	20%					\$ 35,639,791
	Total Estimated Project Cost						\$ 213,838,743
	Project services		20%				\$ 42,767,749
	TOTAL CAPITAL COST						\$ 256,606,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$51,907
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$15,070
Annual O&M					\$66,977

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 69,237		\$69,237
2		\$ 71,573		\$71,573
3		\$ 73,988		\$73,988
4		\$ 76,484		\$76,484
5		\$ 79,065		\$79,065
6		\$ 81,733		\$81,733
7		\$ 84,491		\$84,491
8		\$ 87,342		\$87,342
9		\$ 90,289		\$90,289
10		\$ 93,336		\$93,336
11		\$ 96,485		\$96,485
12		\$ 99,741		\$99,741
13		\$ 103,107		\$103,107
14		\$ 106,586		\$106,586
15		\$ 110,182		\$110,182
16		\$ 113,900		\$113,900
17		\$ 117,744		\$117,744
18		\$ 121,717		\$121,717
19		\$ 125,824		\$125,824
20		\$ 130,069		\$130,069
21		\$ 134,458	\$ 38,378,742	\$38,513,200
22		\$ 138,995		\$138,995
23		\$ 143,685	\$ 473,162	\$616,847
24		\$ 148,534		\$148,534
25		\$ 153,546		\$153,546
26		\$ 158,727		\$158,727
27		\$ 164,083		\$164,083
28		\$ 169,619		\$169,619
29		\$ 175,343		\$175,343
30		\$ 181,259		\$181,259

Present value of O&M \$21,820,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 19,117,286	\$ 44,607,002	\$ 113,248,279	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$10,322,000	\$19,267,000	\$73,373,000	\$102,962,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

175,464,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4C	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area	Gravity Sewer 8 inch	12,852	LF			\$ 1,600	\$ 20,563,712
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	16,276	LF			\$ 900	\$ 14,648,769
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Regional PS	2	EA			\$ 7,000,000	\$ 14,000,000
	Neighborhood PS	5	EA			\$ 1,200,000	\$ 6,000,000
			LS			\$ -	
	Subtotal of Estimated Construction Cost						\$ 55,212,481
	Right of Way	30	Ac			\$ 20,000	\$ 607,277
	Contingency	20%					\$ 11,163,952
	Total Estimated Project Cost						\$ 66,983,710
	Project services		20%				\$ 13,396,742
	TOTAL CAPITAL COST						\$ 80,380,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$16,217
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$0
Annual O&M					\$16,217

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 16,764		\$16,764
2		\$ 17,330		\$17,330
3		\$ 17,915		\$17,915
4		\$ 18,519		\$18,519
5		\$ 19,144		\$19,144
6		\$ 19,790		\$19,790
7		\$ 20,458		\$20,458
8		\$ 21,148		\$21,148
9		\$ 21,862		\$21,862
10		\$ 22,599		\$22,599
11		\$ 23,362		\$23,362
12		\$ 24,150		\$24,150
13		\$ 24,965		\$24,965
14		\$ 25,808		\$25,808
15		\$ 26,678		\$26,678
16		\$ 27,579		\$27,579
17		\$ 28,509		\$28,509
18		\$ 29,471		\$29,471
19		\$ 30,466		\$30,466
20		\$ 31,494		\$31,494
21		\$ 32,556	\$ 12,045,248	\$12,077,804
22		\$ 33,655		\$33,655
23		\$ 34,791	\$ 179,932	\$214,723
24		\$ 35,965		\$35,965
25		\$ 37,178		\$37,178
26		\$ 38,433		\$38,433
27		\$ 39,729		\$39,729
28		\$ 41,070		\$41,070
29		\$ 42,456		\$42,456
30		\$ 43,888		\$43,888
Present value of O&M				\$6,718,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 6,000,000	\$ 14,000,000	\$ 35,212,481	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,239,000	\$6,047,000	\$22,814,000	\$32,100,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value) 54,998,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 4C	DESCRIPTION Level of Treatment - R1	QUAN	UN			TOTAL DIRECT COST
					UNIT COST	
Waikoloa Area						
- 1 COH WWTP						
- East Waikoloa WWTP	Gravity Sewer 8 inch	17,572	LF	\$ 1,600	\$ 28,115,680	
	Gravity Sewer 12 inch		LF	\$ 3,070	\$ -	
	Gravity Sewer 16 inch		LF	\$ 5,800	\$ -	
	Gravity Sewer 18 inch		LF	\$ 6,525	\$ -	
	Gravity Sewer 24 inch		LF	\$ 8,700	\$ -	
	Gravity Sewer 30 inch	-	LF	\$ 10,875	\$ -	
	Gravity Sewer 36 inch	-	LF	\$ 13,050	\$ -	
	Gravity Sewer 42 inch	-	LF	\$ 15,200	\$ -	
	Force main 4 inch	-	LF	\$ 600	\$ -	
	Force main 6 inch	-	LF	\$ 900	\$ -	
	Force main 8 inch		LF	\$ 1,600	\$ -	
	Force main 10 inch		LF	\$ 1,700	\$ -	
	Force main 12 inch		LF	\$ 3,070	\$ -	
	Force main 14 inch	-	LF	\$ 4,430	\$ -	
	Force main 16 inch	-	LF	\$ 5,800	\$ -	
	Force main 18 inch	-	LF	\$ 6,525	\$ -	
	Force main 24 inch	-	LF	\$ 8,700	\$ -	
	Force main 30 inch	-	LF	\$ 10,875	\$ -	
	Force main 36 inch	-	LF	\$ 13,050	\$ -	
	Force main 42 inch	-	LF	\$ 15,200	\$ -	
	Regional PS	-	EA	\$ 7,000,000	\$ -	
	Neighborhood PS		EA	\$ 1,200,000	\$ -	
	COH East Waikoloa WWTP), level of treatment - R1		LS	\$ 5,840,251	\$ 5,840,251	
	Subtotal of Estimated Construction Cost				\$ 33,955,931	
	Right of Way	20	Ac	\$ 20,000	\$ 402,724	
	Contingency	20%			\$ 6,871,731	
	Total Estimated Project Cost				\$ 41,230,386	
	Project services		20%		\$ 8,246,077	
	TOTAL CAPITAL COST				\$ 49,476,000	

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$3,531
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$3,425
Annual O&M					\$6,956

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 7,190		\$7,190
2		\$ 7,433		\$7,433
3		\$ 7,684		\$7,684
4		\$ 7,943		\$7,943
5		\$ 8,211		\$8,211
6		\$ 8,488		\$8,488
7		\$ 8,775		\$8,775
8		\$ 9,071		\$9,071
9		\$ 9,377		\$9,377
10		\$ 9,693		\$9,693
11		\$ 10,020		\$10,020
12		\$ 10,358		\$10,358
13		\$ 10,708		\$10,708
14		\$ 11,069		\$11,069
15		\$ 11,443		\$11,443
16		\$ 11,829		\$11,829
17		\$ 12,228		\$12,228
18		\$ 12,641		\$12,641
19		\$ 13,067		\$13,067
20		\$ 13,508		\$13,508
21		\$ 13,964	\$ 3,517,364	\$3,531,328
22		\$ 14,435		\$14,435
23		\$ 14,922	\$ 246,012	\$260,934
24		\$ 15,426		\$15,426
25		\$ 15,946		\$15,946
26		\$ 16,484		\$16,484
27		\$ 17,041		\$17,041
28		\$ 17,616		\$17,616
29		\$ 18,210		\$18,210
30		\$ 18,824		\$18,824

Present value of O&M \$2,122,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 1,752,075	\$ 4,088,176	\$ 28,115,680	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$946,000	\$1,766,000	\$18,216,000	\$20,928,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

30,670,000

G-14: Alternative 5A Construction Cost and LCC Analysis

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5A	DESCRIPTION Level of Treatment - R3	QUAN	UN			TOTAL DIRECT COST
					UNIT COST	
Same as 4A, but sewer sizing is bigger to accommodate redevelopment of existing parcels. Includes three Mauka COH Plant and one Makai COH Plant, Urban Sewering w/ Private and County Plants. All Gravity Sewers. Private plant service areas unchanged. IWS for all low density zoning areas >1 acre. COH sewers/VWPS from high density (commercial or <1 acre lots) to new COH Mauka (Waimea, West Waikoloa, and Waikii) area or Makai (Puako) WWTP.	Gravity Sewer 8 inch	434,272	LF		\$ 1,600	\$ 694,834,544
	Gravity Sewer 12 inch	9,095	LF		\$ 3,070	\$ 27,923,093
	Gravity Sewer 16 inch	10,249	LF		\$ 5,800	\$ 59,446,114
	Gravity Sewer 18 inch	27,419	LF		\$ 6,525	\$ 178,911,520
	Gravity Sewer 24 inch	19,265	LF		\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF		\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF		\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF		\$ 15,200	\$ -
	Force main 4 inch	-	LF		\$ 600	\$ -
	Force main 6 inch	87,223	LF		\$ 900	\$ 78,500,718
	Force main 8 inch	2,645	LF		\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF		\$ 1,700	\$ 7,512,300
	Force main 12 inch	5,016	LF		\$ 3,070	\$ 15,399,120
	Force main 14 inch	-	LF		\$ 4,430	\$ -
	Force main 16 inch	-	LF		\$ 5,800	\$ -
	Force main 18 inch	-	LF		\$ 6,525	\$ -
	Force main 24 inch	-	LF		\$ 8,700	\$ -
	Force main 30 inch	-	LF		\$ 10,875	\$ -
	Force main 36 inch	-	LF		\$ 13,050	\$ -
	Force main 42 inch	-	LF		\$ 15,200	\$ -
	Regional PS	13	EA		\$ 7,000,000	\$ 91,000,000
	Neighborhood PS	54	EA		\$ 1,200,000	\$ 64,800,000
	COH WWTPs (4 total), level of treatment - R3		LS		\$ 48,200,000	\$ 48,200,000
	Subtotal of Estimated Construction Cost					\$ 1,438,364,909
	Right of Way	608	Ac		\$ 20,000	\$ 12,164,156
	Contingency	20%				\$ 290,105,813
	Total Estimated Project Cost					\$ 1,740,634,878
	Project services		20%			\$ 348,126,976
	TOTAL CAPITAL COST					\$ 2,088,762,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	863066	kwh	\$ 0.44	\$379,749
	Labor and Materials	84,461	LS	-	\$84,461

Annual O&M

\$464,210

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 479,874		\$479,874
2		\$ 496,066		\$496,066
3		\$ 512,805		\$512,805
4		\$ 530,109		\$530,109
5		\$ 547,996		\$547,996
6		\$ 566,487		\$566,487
7		\$ 585,602		\$585,602
8		\$ 605,362		\$605,362
9		\$ 625,789		\$625,789
10		\$ 646,905		\$646,905
11		\$ 668,733		\$668,733
12		\$ 691,298		\$691,298
13		\$ 714,625		\$714,625
14		\$ 738,739		\$738,739
15		\$ 763,666		\$763,666
16		\$ 789,434		\$789,434
17		\$ 816,072		\$816,072
18		\$ 843,609		\$843,609
19		\$ 872,075		\$872,075
20		\$ 901,501		\$901,501
21		\$ 931,921	\$ 122,861,528	\$123,793,448
22		\$ 963,367		\$963,367
23		\$ 995,873	\$ 7,004,211	\$8,000,084
24		\$ 1,029,477		\$1,029,477
25		\$ 1,064,215		\$1,064,215
26		\$ 1,100,125		\$1,100,125
27		\$ 1,137,246		\$1,137,246
28		\$ 1,175,620		\$1,175,620
29		\$ 1,215,289		\$1,215,289
30		\$ 1,256,297		\$1,256,297

Present value of O&M \$80,047,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 61,200,000	\$ 142,800,000	\$ 1,234,364,909	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$33,043,000	\$61,680,000	\$799,740,000	\$894,463,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

1,274,346,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5A	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waimea Area							
- 1 COH WWTP	Gravity Sewer 8 inch	169,204	LF			\$ 1,600	\$ 270,726,400
- West Waimea WWTP	Gravity Sewer 12 inch	2,118	LF			\$ 3,070	\$ 6,500,909
	Gravity Sewer 16 inch	10,249	LF			\$ 5,800	\$ 59,446,114
	Gravity Sewer 18 inch	22,374	LF			\$ 6,525	\$ 145,991,329
	Gravity Sewer 24 inch	19,265	LF			\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	35,240	LF			\$ 900	\$ 31,716,378
	Force main 8 inch	2,645	LF			\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF			\$ 1,700	\$ 7,512,300
	Force main 12 inch	5,016	LF			\$ 3,070	\$ 15,399,120
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	33	EA			\$ 1,200,000	\$ 39,600,000
	COH West Wiamea WWTP, level of treatment - R3		LS			\$ 22,000,000	\$ 22,000,000
	Subtotal of Estimated Construction Cost						\$ 798,730,050
	Right of Way	278	Ac			\$ 20,000	\$ 5,550,651
	Contingency	20%					\$ 160,856,140
	Total Estimated Project Cost						\$ 965,136,841
	Project services		20%				\$ 193,027,368
	TOTAL CAPITAL COST						\$ 1,158,164,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	531775	kWH	\$ 0.44	\$233,981
	Labor and Materials	\$ 50,867	LS	-	\$50,867
Annual O&M					\$284,849

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 294,460		\$294,460
2		\$ 304,396		\$304,396
3		\$ 314,667		\$314,667
4		\$ 325,285		\$325,285
5		\$ 336,261		\$336,261
6		\$ 347,608		\$347,608
7		\$ 359,337		\$359,337
8		\$ 371,462		\$371,462
9		\$ 383,997		\$383,997
10		\$ 396,954		\$396,954
11		\$ 410,348		\$410,348
12		\$ 424,195		\$424,195
13		\$ 438,508		\$438,508
14		\$ 453,305		\$453,305
15		\$ 468,601		\$468,601
16		\$ 484,413		\$484,413
17		\$ 500,758		\$500,758
18		\$ 517,655		\$517,655
19		\$ 535,123		\$535,123
20		\$ 553,179		\$553,179
21		\$ 571,845	\$ 53,962,710	\$54,534,555
				replace elec./motorized equipment
22		\$ 591,141		\$591,141
23		\$ 611,088	\$ 3,124,941	\$3,736,028
				sewer inspection at yr 10 of service
24		\$ 631,708		\$631,708
25		\$ 653,024		\$653,024
26		\$ 675,059		\$675,059
27		\$ 697,837		\$697,837
28		\$ 721,384		\$721,384
29		\$ 745,726		\$745,726
30		\$ 770,889		\$770,889

Present value of O&M **\$37,633,000**Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 26,880,000	\$ 62,720,000	\$ 709,130,050	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$14,513,000	\$27,091,000	\$459,443,000	\$501,047,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**694,750,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5A	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area							
- 1 COH WWTP	Gravity Sewer 8 inch	29,045	LF			\$ 1,600	\$ 46,471,760
- Makai WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	5,045	LF			\$ 6,525	\$ 32,920,191
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	27,449	LF			\$ 900	\$ 24,703,713
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Regional PS	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	8	EA			\$ 1,200,000	\$ 9,600,000
	COH Makai WWTP, level of treatment - R3		LS			\$ 8,300,000	\$ 8,300,000
	Subtotal of Estimated Construction Cost						\$ 170,995,664
	Right of Way	68	Ac			\$ 20,000	\$ 1,365,145
	Contingency	20%					\$ 34,472,162
	Total Estimated Project Cost						\$ 206,832,971
	Project services		20%				\$ 41,366,594
	TOTAL CAPITAL COST						\$ 248,200,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	116143	kWH	\$ 0.44	\$51,103
	Labor and Materials	16,422	LS	-	\$16,422
Annual O&M					\$67,525

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 69,804		\$69,804
2		\$ 72,159		\$72,159
3		\$ 74,594		\$74,594
4		\$ 77,111		\$77,111
5		\$ 79,713		\$79,713
6		\$ 82,403		\$82,403
7		\$ 85,183		\$85,183
8		\$ 88,057		\$88,057
9		\$ 91,029		\$91,029
10		\$ 94,100		\$94,100
11		\$ 97,275		\$97,275
12		\$ 100,558		\$100,558
13		\$ 103,951		\$103,951
14		\$ 107,459		\$107,459
15		\$ 111,085		\$111,085
16		\$ 114,833		\$114,833
17		\$ 118,708		\$118,708
18		\$ 122,713		\$122,713
19		\$ 126,854		\$126,854
20		\$ 131,134		\$131,134
21		\$ 135,559	\$ 40,291,354	\$40,426,913
22		\$ 140,133		\$140,133
23		\$ 144,862	\$ 477,261	\$622,123
24		\$ 149,750		\$149,750
25		\$ 154,803		\$154,803
26		\$ 160,027		\$160,027
27		\$ 165,426		\$165,426
28		\$ 171,008		\$171,008
29		\$ 176,779		\$176,779
30		\$ 182,744		\$182,744

Present value of O&M \$22,813,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 20,070,000	\$ 46,830,000	\$ 104,095,664	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$10,836,000	\$20,227,000	\$67,443,000	\$98,506,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

172,507,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5A	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area	Gravity Sewer 8 inch	12,852	LF			\$ 1,600	\$ 20,563,712
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	16,276	LF			\$ 900	\$ 14,648,769
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Regional PS	2	EA			\$ 7,000,000	\$ 14,000,000
	Neighborhood PS	5	EA			\$ 1,200,000	\$ 6,000,000
			LS			\$	-
	Subtotal of Estimated Construction Cost						\$ 55,212,481
	Right of Way	30	Ac			\$ 20,000	\$ 607,277
	Contingency	20%					\$ 11,163,952
	Total Estimated Project Cost						\$ 66,983,710
	Project services		20%				\$ 13,396,742
	TOTAL CAPITAL COST						\$ 80,380,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	30120	kWH	\$ 0.44	\$13,253
	Labor and Materials	\$ 4,285	LS	-	\$4,285

Annual O&M

\$17,538

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 18,130		\$18,130
2		\$ 18,741		\$18,741
3		\$ 19,374		\$19,374
4		\$ 20,027		\$20,027
5		\$ 20,703		\$20,703
6		\$ 21,402		\$21,402
7		\$ 22,124		\$22,124
8		\$ 22,871		\$22,871
9		\$ 23,642		\$23,642
10		\$ 24,440		\$24,440
11		\$ 25,265		\$25,265
12		\$ 26,117		\$26,117
13		\$ 26,998		\$26,998
14		\$ 27,909		\$27,909
15		\$ 28,851		\$28,851
16		\$ 29,825		\$29,825
17		\$ 30,831		\$30,831
18		\$ 31,871		\$31,871
19		\$ 32,947		\$32,947
20		\$ 34,059		\$34,059
21		\$ 35,208	\$ 12,045,248	\$12,080,456
22		\$ 36,396		\$36,396
23		\$ 37,624	\$ 179,932	\$217,556
24		\$ 38,894		\$38,894
25		\$ 40,206		\$40,206
26		\$ 41,563		\$41,563
27		\$ 42,965		\$42,965
28		\$ 44,415		\$44,415
29		\$ 45,914		\$45,914
30		\$ 47,463		\$47,463

Present value of O&M

\$6,758,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 6,000,000	\$ 14,000,000	\$ 35,212,481	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,239,000	\$6,047,000	\$22,814,000	\$32,100,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

55,038,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
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Alternative 5A	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikoloa Area							
- 1 COH WWTP	Gravity Sewer 8 inch	178,763	LF			\$ 1,600	\$ 286,021,088
- West Waikoloa WWTP	Gravity Sewer 12 inch	6,978	LF			\$ 3,070	\$ 21,422,184
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	6,855	LF			\$ 900	\$ 6,169,500
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS	7	EA			\$ 1,200,000	\$ 8,400,000
	COH West Waikoloa WWTP, level of treatment - R3		LS			\$ 12,000,000	\$ 12,000,000
	Subtotal of Estimated Construction Cost						\$ 334,012,772
	Right of Way	185	Ac			\$ 20,000	\$ 3,709,432
	Contingency	20%					\$ 67,544,441
	Total Estimated Project Cost						\$ 405,266,645
	Project services		20%				\$ 81,053,329
	TOTAL CAPITAL COST						\$ 486,320,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	173206	kWH	\$ 0.44	\$76,211
	Labor and Materials	\$ 12,109	LS	-	\$12,109

Annual O&M

\$88,319

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 91,300		\$91,300
2		\$ 94,380		\$94,380
3		\$ 97,565		\$97,565
4		\$ 100,857		\$100,857
5		\$ 104,260		\$104,260
6		\$ 107,778		\$107,778
7		\$ 111,415		\$111,415
8		\$ 115,175		\$115,175
9		\$ 119,061		\$119,061
10		\$ 123,078		\$123,078
11		\$ 127,231		\$127,231
12		\$ 131,525		\$131,525
13		\$ 135,963		\$135,963
14		\$ 140,551		\$140,551
15		\$ 145,293		\$145,293
16		\$ 150,196		\$150,196
17		\$ 155,264		\$155,264
18		\$ 160,503		\$160,503
19		\$ 165,919		\$165,919
20		\$ 171,517		\$171,517
21		\$ 177,305	\$ 12,286,153	\$12,463,458
22		\$ 183,288		\$183,288
23		\$ 189,472	\$ 2,600,375	\$2,789,848
24		\$ 195,866		\$195,866
25		\$ 202,475		\$202,475
26		\$ 209,307		\$209,307
27		\$ 216,370		\$216,370
28		\$ 223,671		\$223,671
29		\$ 231,218		\$231,218
30		\$ 239,020		\$239,020

Present value of O&M

\$10,184,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 6,120,000	\$ 14,280,000	\$ 313,612,772	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,304,000	\$6,168,000	\$203,189,000	\$212,661,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

283,843,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5A	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikii Area							
- 1 COH WWTP	Gravity Sewer 8 inch	44,407	LF			\$ 1,600	\$ 71,051,584
- Waikii WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	1,403	LF			\$ 900	\$ 1,262,358
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Regional PS	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
	COH Waikii WWTP, level of treatment - R3		LS			\$ 5,900,000	\$ 5,900,000
	Subtotal of Estimated Construction Cost						\$ 79,413,942
	Right of Way	47	Ac			\$ 20,000	\$ 931,650
	Contingency	20%					\$ 16,069,118
	Total Estimated Project Cost						\$ 96,414,711
	Project services		20%				\$ 19,282,942
	TOTAL CAPITAL COST						\$ 115,698,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	11822	kWH	\$ 0.44	\$5,202
	Labor and Materials	\$ 778	LS	-	\$778

Annual O&M

\$5,979

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 6,181		\$6,181
2		\$ 6,390		\$6,390
3		\$ 6,605		\$6,605
4		\$ 6,828		\$6,828
5		\$ 7,058		\$7,058
6		\$ 7,297		\$7,297
7		\$ 7,543		\$7,543
8		\$ 7,797		\$7,797
9		\$ 8,060		\$8,060
10		\$ 8,332		\$8,332
11		\$ 8,614		\$8,614
12		\$ 8,904		\$8,904
13		\$ 9,205		\$9,205
14		\$ 9,515		\$9,515
15		\$ 9,836		\$9,836
16		\$ 10,168		\$10,168
17		\$ 10,511		\$10,511
18		\$ 10,866		\$10,866
19		\$ 11,233		\$11,233
20		\$ 11,612		\$11,612
21		\$ 12,004	\$ 4,276,063	\$4,288,066
22		\$ 12,409		\$12,409
23		\$ 12,827	\$ 621,701	\$634,529
24		\$ 13,260		\$13,260
25		\$ 13,708		\$13,708
26		\$ 14,170		\$14,170
27		\$ 14,648		\$14,648
28		\$ 15,142		\$15,142
29		\$ 15,653		\$15,653
30		\$ 16,182		\$16,182

Present value of O&M

\$2,659,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 2,130,000	\$ 4,970,000	\$ 72,313,942	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$1,150,000	\$2,147,000	\$46,852,000	\$50,149,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

68,208,000

Alternative 5A Same as 4A, but sewer sizing is bigger to accommodate redevelopment of existing parcels. Includes three Mauka COH Plant and one Makai COH Plant, Urban Sewering w/ Private and County Plants, All Gravity Sewers. Private plan service areas unchanged. IWS for all low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to new COH Mauka (Waimea, West Waikoloa, and Waikiki area or Makai (Puako) WWTP.	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Gravity Sewer 8 inch		434,272	LF			\$ 1,600	\$ 694,834,544
Gravity Sewer 12 inch		9,095	LF			\$ 3,070	\$ 27,923,093
Gravity Sewer 16 inch		10,249	LF			\$ 5,800	\$ 59,446,114
Gravity Sewer 18 inch		27,419	LF			\$ 6,525	\$ 178,911,520
Gravity Sewer 24 inch		19,265	LF			\$ 8,700	\$ 167,605,500
Gravity Sewer 30 inch		-	LF			\$ 10,875	\$ -
Gravity Sewer 36 inch		-	LF			\$ 13,050	\$ -
Gravity Sewer 42 inch		-	LF			\$ 15,200	\$ -
Force main 4 inch		-	LF			\$ 600	\$ -
Force main 6 inch		87,223	LF			\$ 900	\$ 78,500,718
Force main 8 inch		2,645	LF			\$ 1,600	\$ 4,232,000
Force main 10 inch		4,419	LF			\$ 1,700	\$ 7,512,300
Force main 12 inch		5,016	LF			\$ 3,070	\$ 15,399,120
Force main 14 inch		-	LF			\$ 4,430	\$ -
Force main 16 inch		-	LF			\$ 5,800	\$ -
Force main 18 inch		-	LF			\$ 6,525	\$ -
Force main 24 inch		-	LF			\$ 8,700	\$ -
Force main 30 inch		-	LF			\$ 10,875	\$ -
Force main 36 inch		-	LF			\$ 13,050	\$ -
Force main 42 inch		-	LF			\$ 15,200	\$ -
Regional PS		13	EA			\$ 7,000,000	\$ 91,000,000
Neighborhood PS		54	EA			\$ 1,200,000	\$ 64,800,000
COH WWTPs (4 total), level of treatment - R2			LS			\$ 51,477,600	\$ 51,477,600
Subtotal of Estimated Construction Cost							\$ 1,441,642,509
Right of Way	608	Ac				\$ 20,000	\$ 12,164,156
Contingency	20%						\$ 290,761,333
Total Estimated Project Cost							\$ 1,744,567,998
Project services		20%					\$ 348,913,600
TOTAL CAPITAL COST							\$ 2,093,482,000

O&M

Item	QUAN	UN	Unit cost	Total Annual
R3 level of treatment annual O&M				\$464,210
R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$228,094

Annual O&M

\$692,304

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 715,664		\$715,664
2		\$ 739,813		\$739,813
3		\$ 764,777		\$764,777
4		\$ 790,583		\$790,583
5		\$ 817,259		\$817,259
6		\$ 844,836		\$844,836
7		\$ 873,343		\$873,343
8		\$ 902,813		\$902,813
9		\$ 933,276		\$933,276
10		\$ 964,768		\$964,768
11		\$ 997,322		\$997,322
12		\$ 1,030,975		\$1,030,975
13		\$ 1,065,763		\$1,065,763
14		\$ 1,101,725		\$1,101,725
15		\$ 1,138,900		\$1,138,900
16		\$ 1,177,330		\$1,177,330
17		\$ 1,217,057		\$1,217,057
18		\$ 1,258,124		\$1,258,124
19		\$ 1,300,577		\$1,300,577
20		\$ 1,344,463		\$1,344,463
21		\$ 1,389,829	\$ 124,835,503	\$126,225,332 replace elec./ motorized equipment
22		\$ 1,436,726		\$1,436,726
23		\$ 1,485,205	\$ 7,004,211	\$8,489,416 sewer inspection at yr 10 of service
24		\$ 1,535,321		\$1,535,321
25		\$ 1,587,127		\$1,587,127
26		\$ 1,640,681		\$1,640,681
27		\$ 1,696,043		\$1,696,043
28		\$ 1,753,273		\$1,753,273
29		\$ 1,812,433		\$1,812,433
30		\$ 1,873,590		\$1,873,590

Present value of O&M \$87,960,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 62,183,280	\$ 145,094,320	\$ 1,234,364,909	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$33,574,000	\$62,671,000	\$799,740,000	\$895,985,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

1,285,457,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5A Waimea Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
- 1 COH WWTP	Gravity Sewer 8 inch	169,204	LF			\$ 1,600	\$ 270,726,400
- West Waimea WWTP	Gravity Sewer 12 inch	2,118	LF			\$ 3,070	\$ 6,500,909
	Gravity Sewer 16 inch	10,249	LF			\$ 5,800	\$ 59,446,114
	Gravity Sewer 18 inch	22,374	LF			\$ 6,525	\$ 145,991,329
	Gravity Sewer 24 inch	19,265	LF			\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	35,240	LF			\$ 900	\$ 31,716,378
	Force main 8 inch	2,645	LF			\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF			\$ 1,700	\$ 7,512,300
	Force main 12 inch	5,016	LF			\$ 3,070	\$ 15,399,120
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	33	EA			\$ 1,200,000	\$ 39,600,000
	COH West Waimea WWTP, level of treatment - R2		LS			\$ 23,496,000	\$ 23,496,000
	Subtotal of Estimated Construction Cost						\$ 800,226,050
	Right of Way	278	Ac			\$ 20,000	\$ 5,550,651
	Contingency	20%					\$ 161,155,340
	Total Estimated Project Cost						\$ 966,932,041
	Project services		20%				\$ 193,386,408
	TOTAL CAPITAL COST						\$ 1,160,318,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$284,849
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$142,780
Annual O&M					\$427,629

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 442,058		\$442,058
2		\$ 456,974		\$456,974
3		\$ 472,394		\$472,394
4		\$ 488,334		\$488,334
5		\$ 504,812		\$504,812
6		\$ 521,846		\$521,846
7		\$ 539,455		\$539,455
8		\$ 557,657		\$557,657
9		\$ 576,474		\$576,474
10		\$ 595,926		\$595,926
11		\$ 616,035		\$616,035
12		\$ 636,822		\$636,822
13		\$ 658,310		\$658,310
14		\$ 680,523		\$680,523
15		\$ 703,486		\$703,486
16		\$ 727,224		\$727,224
17		\$ 751,763		\$751,763
18		\$ 777,129		\$777,129
19		\$ 803,352		\$803,352
20		\$ 830,460		\$830,460
21		\$ 858,482	\$ 54,863,695	\$55,722,177
22		\$ 887,450		\$887,450
23		\$ 917,395	\$ 3,124,941	\$4,042,335
24		\$ 948,351		\$948,351
25		\$ 980,351		\$980,351
26		\$ 1,013,431		\$1,013,431
27		\$ 1,047,627		\$1,047,627
28		\$ 1,082,977		\$1,082,977
29		\$ 1,119,520		\$1,119,520
30		\$ 1,157,296		\$1,157,296

Present value of O&M

\$42,416,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 27,328,800	\$ 63,767,200	\$ 709,130,050	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$14,755,000	\$27,543,000	\$459,443,000	\$501,741,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

700,993,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
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Alternative 5A Kawaihae Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
- 1 COH WWTP	Gravity Sewer 8 inch	29,045	LF			\$ 1,600	\$ 46,471,760
- Makai WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	5,045	LF			\$ 6,525	\$ 32,920,191
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	27,449	LF			\$ 900	\$ 24,703,713
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	8	EA			\$ 1,200,000	\$ 9,600,000
	COH Makai WWTP, level of treatment - R2		LS			\$ 8,864,400	\$ 8,864,400
	Subtotal of Estimated Construction Cost						\$ 171,560,064
	Right of Way	68	Ac			\$ 20,000	\$ 1,365,145
	Contingency	20%					\$ 34,585,042
	Total Estimated Project Cost						\$ 207,510,251
	Project services		20%				\$ 41,502,050
	TOTAL CAPITAL COST						\$ 249,012,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$67,525
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$15,340
Annual O&M					\$82,865

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 85,661		\$85,661
2		\$ 88,552		\$88,552
3		\$ 91,540		\$91,540
4		\$ 94,628		\$94,628
5		\$ 97,821		\$97,821
6		\$ 101,122		\$101,122
7		\$ 104,534		\$104,534
8		\$ 108,062		\$108,062
9		\$ 111,708		\$111,708
10		\$ 115,477		\$115,477
11		\$ 119,374		\$119,374
12		\$ 123,402		\$123,402
13		\$ 127,566		\$127,566
14		\$ 131,871		\$131,871
15		\$ 136,320		\$136,320
16		\$ 140,920		\$140,920
17		\$ 145,675		\$145,675
18		\$ 150,591		\$150,591
19		\$ 155,672		\$155,672
20		\$ 160,925		\$160,925
21		\$ 166,355	\$ 40,631,271	\$40,797,626
22		\$ 171,968		\$171,968
23		\$ 177,771	\$ 477,261	\$655,032
24		\$ 183,770		\$183,770
25		\$ 189,971		\$189,971
26		\$ 196,381		\$196,381
27		\$ 203,007		\$203,007
28		\$ 209,857		\$209,857
29		\$ 216,938		\$216,938
30		\$ 224,259		\$224,259

Present value of O&M

\$23,451,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 20,239,320	\$ 47,225,080	\$ 104,095,664	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$10,927,000	\$20,398,000	\$67,443,000	\$98,768,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

173,695,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
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Alternative 5A Puako Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
	Gravity Sewer 8 inch					\$ 1,600	\$ 20,563,712
	Gravity Sewer 12 inch					\$ 3,070	\$ -
	Gravity Sewer 16 inch					\$ 5,800	\$ -
	Gravity Sewer 18 inch					\$ 6,525	\$ -
	Gravity Sewer 24 inch					\$ 8,700	\$ -
	Gravity Sewer 30 inch					\$ 10,875	\$ -
	Gravity Sewer 36 inch					\$ 13,050	\$ -
	Gravity Sewer 42 inch					\$ 15,200	\$ -
	Force main 4 inch					\$ 600	\$ -
	Force main 6 inch	16,276	LF			\$ 900	\$ 14,648,769
	Force main 8 inch					\$ 1,600	\$ -
	Force main 10 inch					\$ 1,700	\$ -
	Force main 12 inch					\$ 3,070	\$ -
	Force main 14 inch					\$ 4,430	\$ -
	Force main 16 inch					\$ 5,800	\$ -
	Force main 18 inch					\$ 6,525	\$ -
	Force main 24 inch					\$ 8,700	\$ -
	Force main 30 inch					\$ 10,875	\$ -
	Force main 36 inch					\$ 13,050	\$ -
	Force main 42 inch					\$ 15,200	\$ -
	Regional PS	2	EA			\$ 7,000,000	\$ 14,000,000
	Neighborhood PS	5	EA			\$ 1,200,000	\$ 6,000,000
			LS			\$ -	\$ -
	Subtotal of Estimated Construction Cost						\$ 55,212,481
	Right of Way	30	Ac			\$ 20,000	\$ 607,277
	Contingency	20%					\$ 11,163,952
	Total Estimated Project Cost						\$ 66,983,710
	Project services		20%				\$ 13,396,742
	TOTAL CAPITAL COST						\$ 80,380,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$17,538
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$0
Annual O&M					\$17,538

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 18,130		\$18,130
2		\$ 18,741		\$18,741
3		\$ 19,374		\$19,374
4		\$ 20,027		\$20,027
5		\$ 20,703		\$20,703
6		\$ 21,402		\$21,402
7		\$ 22,124		\$22,124
8		\$ 22,871		\$22,871
9		\$ 23,642		\$23,642
10		\$ 24,440		\$24,440
11		\$ 25,265		\$25,265
12		\$ 26,117		\$26,117
13		\$ 26,998		\$26,998
14		\$ 27,909		\$27,909
15		\$ 28,851		\$28,851
16		\$ 29,825		\$29,825
17		\$ 30,831		\$30,831
18		\$ 31,871		\$31,871
19		\$ 32,947		\$32,947
20		\$ 34,059		\$34,059
21		\$ 35,208	\$ 12,045,248	\$12,080,456
22		\$ 36,396		\$36,396
23		\$ 37,624	\$ 179,932	\$217,556
24		\$ 38,894		\$38,894
25		\$ 40,206		\$40,206
26		\$ 41,563		\$41,563
27		\$ 42,965		\$42,965
28		\$ 44,415		\$44,415
29		\$ 45,914		\$45,914
30		\$ 47,463		\$47,463

Present value of O&M \$6,758,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 6,000,000	\$ 14,000,000	\$ 35,212,481	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,239,000	\$6,047,000	\$22,814,000	\$32,100,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

55,038,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
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Alternative 5A Waikoloa Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
- 1 COH WWTP	Gravity Sewer 8 inch	178,763	LF			\$ 1,600	\$ 286,021,088
- West Waikoloa WWTP	Gravity Sewer 12 inch	6,978	LF			\$ 3,070	\$ 21,422,184
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	6,855	LF			\$ 900	\$ 6,169,500
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS	7	EA			\$ 1,200,000	\$ 8,400,000
	COH West Waikoloa WWTP, level of treatment - R2		LS			\$ 12,816,000	\$ 12,816,000
	Subtotal of Estimated Construction Cost						\$ 334,828,772
	Right of Way	185	Ac			\$ 20,000	\$ 3,709,432
	Contingency	20%					\$ 67,707,641
	Total Estimated Project Cost						\$ 406,245,845
	Project services		20%				\$ 81,249,169
	TOTAL CAPITAL COST						\$ 487,495,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$88,319
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$66,080
Annual O&M					\$154,399

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 159,609		\$159,609
2		\$ 164,995		\$164,995
3		\$ 170,562		\$170,562
4		\$ 176,318		\$176,318
5		\$ 182,267		\$182,267
6		\$ 188,417		\$188,417
7		\$ 194,775		\$194,775
8		\$ 201,348		\$201,348
9		\$ 208,142		\$208,142
10		\$ 215,165		\$215,165
11		\$ 222,425		\$222,425
12		\$ 229,931		\$229,931
13		\$ 237,689		\$237,689
14		\$ 245,709		\$245,709
15		\$ 254,000		\$254,000
16		\$ 262,571		\$262,571
17		\$ 271,431		\$271,431
18		\$ 280,590		\$280,590
19		\$ 290,058		\$290,058
20		\$ 299,845		\$299,845
21		\$ 309,963	\$ 12,777,599	\$13,087,562
22		\$ 320,422		\$320,422
23		\$ 331,234	\$ 2,600,375	\$2,931,610
24		\$ 342,411		\$342,411
25		\$ 353,965		\$353,965
26		\$ 365,909		\$365,909
27		\$ 378,256		\$378,256
28		\$ 391,019		\$391,019
29		\$ 404,214		\$404,214
30		\$ 417,853		\$417,853

Present value of O&M

\$12,436,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 6,364,800	\$ 14,851,200	\$ 313,612,772	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,436,000	\$6,415,000	\$203,189,000	\$213,040,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

286,891,000

Alternative 5A	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikii Area	Gravity Sewer 8 inch	44,407	LF			\$ 1,600	\$ 71,051,584
- 1 COH WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
- Waikii WWTP	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	1,403	LF			\$ 900	\$ 1,262,358
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
	COH Waikii WWTP, level of treatment - R2		LS			\$ 6,301,200	\$ 6,301,200
	Subtotal of Estimated Construction Cost						\$ 79,815,142
	Right of Way	47	Ac			\$ 20,000	\$ 931,650
	Contingency	20%					\$ 16,149,358
	Total Estimated Project Cost						\$ 96,896,151
	Project services		20%				\$ 19,379,230
	TOTAL CAPITAL COST						\$ 116,275,000

O&M

Item	QUAN	UN	Unit Cost	Total Annual
R3 level of treatment annual O&M				\$5,979
R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$3,894

Annual O&M

\$9,873

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 10,206		\$10,206
2		\$ 10,551		\$10,551
3		\$ 10,907		\$10,907
4		\$ 11,275		\$11,275
5		\$ 11,655		\$11,655
6		\$ 12,049		\$12,049
7		\$ 12,455		\$12,455
8		\$ 12,875		\$12,875
9		\$ 13,310		\$13,310
10		\$ 13,759		\$13,759
11		\$ 14,223		\$14,223
12		\$ 14,703		\$14,703
13		\$ 15,199		\$15,199
14		\$ 15,712		\$15,712
15		\$ 16,242		\$16,242
16		\$ 16,790		\$16,790
17		\$ 17,357		\$17,357
18		\$ 17,943		\$17,943
19		\$ 18,548		\$18,548
20		\$ 19,174		\$19,174
21		\$ 19,821	\$ 4,517,691	\$4,537,512 replace elec./ motorized equipment
22		\$ 20,490		\$20,490
23		\$ 21,181	\$ 621,701	\$642,882 sewer inspection at yr 10 of service
24		\$ 21,896		\$21,896
25		\$ 22,635		\$22,635
26		\$ 23,398		\$23,398
27		\$ 24,188		\$24,188
28		\$ 25,004		\$25,004
29		\$ 25,848		\$25,848
30		\$ 26,720		\$26,720

Present value of O&M \$2,900,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 2,250,360	\$ 5,250,840	\$ 72,313,942	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$1,215,000	\$2,268,000	\$46,852,000	\$50,335,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

68,840,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
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Alternative 5A	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Same as 4A, but sewer sizing is bigger to accommodate redevelopment of existing parcels. Includes three Mauka COH Plant and one Makai COH Plant, Urban Sewering w/ Private and County Plants. All Gravity Sewers. Private plant service areas unchanged. IWS for all low density zoning areas >1 acre. COH sewers/VWPS from high density (commercial or <1 acre lots) to new COH Mauka (Waimea, West Waikoloa, and Waikii) area or Makai (Puako) WWTP.	Gravity Sewer 8 inch	434,272	LF			\$ 1,600	\$ 694,834,544
	Gravity Sewer 12 inch	9,095	LF			\$ 3,070	\$ 27,923,093
	Gravity Sewer 16 inch	10,249	LF			\$ 5,800	\$ 59,446,114
	Gravity Sewer 18 inch	27,419	LF			\$ 6,525	\$ 178,911,520
	Gravity Sewer 24 inch	19,265	LF			\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	87,223	LF			\$ 900	\$ 78,500,718
	Force main 8 inch	2,645	LF			\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF			\$ 1,700	\$ 7,512,300
	Force main 12 inch	5,016	LF			\$ 3,070	\$ 15,399,120
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	13	EA			\$ 7,000,000	\$ 91,000,000
	Neighborhood PS	54	EA			\$ 1,200,000	\$ 64,800,000
	COH WWTPs (4 total), level of treatment - R1		LS			\$ 66,920,880	\$ 66,920,880
	Subtotal of Estimated Construction Cost						\$ 1,457,085,789
	Right of Way	608	Ac			\$ 20,000	\$ 12,164,156
	Contingency	20%					\$ 293,849,989
	Total Estimated Project Cost						\$ 1,763,099,934
	Project services		20%				\$ 352,619,987
	TOTAL CAPITAL COST						\$ 2,115,720,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$464,210
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$264,821

Annual O&M

\$729,031

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 753,631		\$753,631
2		\$ 779,060		\$779,060
3		\$ 805,348		\$805,348
4		\$ 832,523		\$832,523
5		\$ 860,615		\$860,615
6		\$ 889,655		\$889,655
7		\$ 919,674		\$919,674
8		\$ 950,707		\$950,707
9		\$ 982,787		\$982,787
10		\$ 1,015,949		\$1,015,949
11		\$ 1,050,230		\$1,050,230
12		\$ 1,085,668		\$1,085,668
13		\$ 1,122,302		\$1,122,302
14		\$ 1,160,172		\$1,160,172
15		\$ 1,199,320		\$1,199,320
16		\$ 1,239,788		\$1,239,788
17		\$ 1,281,622		\$1,281,622
18		\$ 1,324,868		\$1,324,868
19		\$ 1,369,573		\$1,369,573
20		\$ 1,415,787		\$1,415,787
21		\$ 1,463,560	\$ 134,136,410	\$135,599,969
22		\$ 1,512,945		\$1,512,945
23		\$ 1,563,996	\$ 7,004,211	\$8,568,207
24		\$ 1,616,770		\$1,616,770
25		\$ 1,671,325		\$1,671,325
26		\$ 1,727,720		\$1,727,720
27		\$ 1,786,019		\$1,786,019
28		\$ 1,846,285		\$1,846,285
29		\$ 1,908,584		\$1,908,584
30		\$ 1,972,985		\$1,972,985

Present value of O&M

\$93,814,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 66,816,264	\$ 155,904,616	\$ 1,234,364,909	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$36,075,000	\$67,340,000	\$799,740,000	\$903,155,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

1,306,379,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5A	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waimea Area							
- 1 COH WWTP	Gravity Sewer 8 inch	169,204	LF			\$ 1,600	\$ 270,726,400
- West Waimea WWTP	Gravity Sewer 12 inch	2,118	LF			\$ 3,070	\$ 6,500,909
	Gravity Sewer 16 inch	10,249	LF			\$ 5,800	\$ 59,446,114
	Gravity Sewer 18 inch	22,374	LF			\$ 6,525	\$ 145,991,329
	Gravity Sewer 24 inch	19,265	LF			\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	35,240	LF			\$ 900	\$ 31,716,378
	Force main 8 inch	2,645	LF			\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF			\$ 1,700	\$ 7,512,300
	Force main 12 inch	5,016	LF			\$ 3,070	\$ 15,399,120
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	33	EA			\$ 1,200,000	\$ 39,600,000
	COH West Wiamea WWTP, level of treatment - R1		LS			\$ 30,544,800	\$ 30,544,800
	Subtotal of Estimated Construction Cost						\$ 807,274,850
	Right of Way	278	Ac			\$ 20,000	\$ 5,550,651
	Contingency	20%					\$ 162,565,100
	Total Estimated Project Cost						\$ 975,390,601
	Project services		20%				\$ 195,078,120
	TOTAL CAPITAL COST						\$ 1,170,469,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$284,849
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$165,770
Annual O&M					\$450,619

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 465,824		\$465,824
2		\$ 481,542		\$481,542
3		\$ 497,791		\$497,791
4		\$ 514,588		\$514,588
5		\$ 531,951		\$531,951
6		\$ 549,901		\$549,901
7		\$ 568,456		\$568,456
8		\$ 587,638		\$587,638
9		\$ 607,467		\$607,467
10		\$ 627,964		\$627,964
11		\$ 649,154		\$649,154
12		\$ 671,058		\$671,058
13		\$ 693,702		\$693,702
14		\$ 717,109		\$717,109
15		\$ 741,307		\$741,307
16		\$ 766,321		\$766,321
17		\$ 792,179		\$792,179
18		\$ 818,909		\$818,909
19		\$ 846,542		\$846,542
20		\$ 875,107		\$875,107
21		\$ 904,635	\$ 59,108,922	\$60,013,557
22		\$ 935,160		\$935,160
23		\$ 966,716	\$ 3,124,941	\$4,091,656
24		\$ 999,335		\$999,335
25		\$ 1,033,056		\$1,033,056
26		\$ 1,067,915		\$1,067,915
27		\$ 1,103,949		\$1,103,949
28		\$ 1,141,200		\$1,141,200
29		\$ 1,179,707		\$1,179,707
30		\$ 1,219,514		\$1,219,514

Present value of O&M \$45,276,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 29,443,440	\$ 68,701,360	\$ 709,130,050	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$15,897,000	\$29,674,000	\$459,443,000	\$505,014,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**710,731,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5A	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area							
- 1 COH WWTP	Gravity Sewer 8 inch	29,045	LF			\$ 1,600	\$ 46,471,760
- Makai WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	5,045	LF			\$ 6,525	\$ 32,920,191
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	27,449	LF			\$ 900	\$ 24,703,713
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	8	EA			\$ 1,200,000	\$ 9,600,000
	COH Makai WWTP, level of treatment - R1		LS			\$ 11,523,720	\$ 11,523,720
	Subtotal of Estimated Construction Cost						\$ 174,219,384
	Right of Way	68	Ac			\$ 20,000	\$ 1,365,145
	Contingency	20%					\$ 35,116,906
	Total Estimated Project Cost						\$ 210,701,435
	Project services		20%				\$ 42,140,287
	TOTAL CAPITAL COST						\$ 252,842,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$67,525
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$17,810
Annual O&M					\$85,335

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 88,215		\$88,215
2		\$ 91,191		\$91,191
3		\$ 94,268		\$94,268
4		\$ 97,449		\$97,449
5		\$ 100,737		\$100,737
6		\$ 104,136		\$104,136
7		\$ 107,650		\$107,650
8		\$ 111,283		\$111,283
9		\$ 115,038		\$115,038
10		\$ 118,920		\$118,920
11		\$ 122,932		\$122,932
12		\$ 127,080		\$127,080
13		\$ 131,368		\$131,368
14		\$ 135,801		\$135,801
15		\$ 140,384		\$140,384
16		\$ 145,121		\$145,121
17		\$ 150,017		\$150,017
18		\$ 155,079		\$155,079
19		\$ 160,312		\$160,312
20		\$ 165,722		\$165,722
21		\$ 171,314	\$ 42,232,879	\$42,404,193
22		\$ 177,094		\$177,094
23		\$ 183,070	\$ 477,261	\$660,331
24		\$ 189,247		\$189,247
25		\$ 195,633		\$195,633
26		\$ 202,234		\$202,234
27		\$ 209,058		\$209,058
28		\$ 216,113		\$216,113
29		\$ 223,405		\$223,405
30		\$ 230,943		\$230,943

Present value of O&M \$24,342,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 21,037,116	\$ 49,086,604	\$ 104,095,664	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$11,358,000	\$21,202,000	\$67,443,000	\$100,003,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**177,181,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5A	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area	Gravity Sewer 8 inch	12,852	LF			\$ 1,600	\$ 20,563,712
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	16,276	LF			\$ 900	\$ 14,648,769
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Regional PS	2	EA			\$ 7,000,000	\$ 14,000,000
	Neighborhood PS	5	EA			\$ 1,200,000	\$ 6,000,000
			LS			\$	-
	Subtotal of Estimated Construction Cost						\$ 55,212,481
	Right of Way	30	Ac			\$ 20,000	\$ 607,277
	Contingency	20%					\$ 11,163,952
	Total Estimated Project Cost						\$ 66,983,710
	Project services		20%				\$ 13,396,742
	TOTAL CAPITAL COST						\$ 80,380,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$17,538
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$0
Annual O&M					\$17,538

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 18,130		\$18,130
2		\$ 18,741		\$18,741
3		\$ 19,374		\$19,374
4		\$ 20,027		\$20,027
5		\$ 20,703		\$20,703
6		\$ 21,402		\$21,402
7		\$ 22,124		\$22,124
8		\$ 22,871		\$22,871
9		\$ 23,642		\$23,642
10		\$ 24,440		\$24,440
11		\$ 25,265		\$25,265
12		\$ 26,117		\$26,117
13		\$ 26,998		\$26,998
14		\$ 27,909		\$27,909
15		\$ 28,851		\$28,851
16		\$ 29,825		\$29,825
17		\$ 30,831		\$30,831
18		\$ 31,871		\$31,871
19		\$ 32,947		\$32,947
20		\$ 34,059		\$34,059
21		\$ 35,208	\$ 12,045,248	\$12,080,456
22		\$ 36,396		\$36,396
23		\$ 37,624	\$ 179,932	\$217,556
24		\$ 38,894		\$38,894
25		\$ 40,206		\$40,206
26		\$ 41,563		\$41,563
27		\$ 42,965		\$42,965
28		\$ 44,415		\$44,415
29		\$ 45,914		\$45,914
30		\$ 47,463		\$47,463

Present value of O&M \$6,758,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 6,000,000	\$ 14,000,000	\$ 35,212,481	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,239,000	\$6,047,000	\$22,814,000	\$32,100,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

55,038,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5A	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikoloa Area							
- 1 COH WWTP	Gravity Sewer 8 inch	178,763	LF			\$ 1,600	\$ 286,021,088
- West Waikoloa WWTP	Gravity Sewer 12 inch	6,978	LF			\$ 3,070	\$ 21,422,184
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	6,855	LF			\$ 900	\$ 6,169,500
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS	7	EA			\$ 1,200,000	\$ 8,400,000
	COH West Waikoloa WWTP, level of treatment - R1		LS			\$ 16,660,800	\$ 16,660,800
	Subtotal of Estimated Construction Cost						\$ 338,673,572
	Right of Way	185	Ac			\$ 20,000	\$ 3,709,432
	Contingency	20%					\$ 68,476,601
	Total Estimated Project Cost						\$ 410,859,605
	Project services		20%				\$ 82,171,921
	TOTAL CAPITAL COST						\$ 493,032,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$88,319
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$76,720

Annual O&M

\$165,039

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 170,608		\$170,608
2		\$ 176,365		\$176,365
3		\$ 182,316		\$182,316
4		\$ 188,468		\$188,468
5		\$ 194,828		\$194,828
6		\$ 201,402		\$201,402
7		\$ 208,198		\$208,198
8		\$ 215,223		\$215,223
9		\$ 222,485		\$222,485
10		\$ 229,992		\$229,992
11		\$ 237,753		\$237,753
12		\$ 245,776		\$245,776
13		\$ 254,069		\$254,069
14		\$ 262,642		\$262,642
15		\$ 271,504		\$271,504
16		\$ 280,666		\$280,666
17		\$ 290,136		\$290,136
18		\$ 299,926		\$299,926
19		\$ 310,047		\$310,047
20		\$ 320,508		\$320,508
21		\$ 331,323	\$ 15,093,177	\$15,424,501
22		\$ 342,503		\$342,503
23		\$ 354,060	\$ 2,600,375	\$2,954,436
24		\$ 366,007		\$366,007
25		\$ 378,358		\$378,358
26		\$ 391,125		\$391,125
27		\$ 404,322		\$404,322
28		\$ 417,965		\$417,965
29		\$ 432,069		\$432,069
30		\$ 446,648		\$446,648

Present value of O&M

\$13,938,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 7,518,240	\$ 17,542,560	\$ 313,612,772	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$4,059,000	\$7,577,000	\$203,189,000	\$214,825,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

292,145,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5A	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikii Area							
- 1 COH WWTP	Gravity Sewer 8 inch	44,407	LF			\$ 1,600	\$ 71,051,584
- Waikii WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	1,403	LF			\$ 900	\$ 1,262,358
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
	COH Waikii WWTP, level of treatment - R1		LS			\$ 8,191,560	\$ 8,191,560
	Subtotal of Estimated Construction Cost					\$ 81,705,502	
	Right of Way	47	Ac			\$ 20,000	\$ 931,650
	Contingency	20%					\$ 16,527,430
	Total Estimated Project Cost						\$ 99,164,583
	Project services		20%				\$ 19,832,917
	TOTAL CAPITAL COST						\$ 118,997,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$5,979
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$4,521

Annual O&M

\$10,500

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 10,855		\$10,855
2		\$ 11,221		\$11,221
3		\$ 11,599		\$11,599
4		\$ 11,991		\$11,991
5		\$ 12,395		\$12,395
6		\$ 12,814		\$12,814
7		\$ 13,246		\$13,246
8		\$ 13,693		\$13,693
9		\$ 14,155		\$14,155
10		\$ 14,633		\$14,633
11		\$ 15,126		\$15,126
12		\$ 15,637		\$15,637
13		\$ 16,164		\$16,164
14		\$ 16,710		\$16,710
15		\$ 17,274		\$17,274
16		\$ 17,857		\$17,857
17		\$ 18,459		\$18,459
18		\$ 19,082		\$19,082
19		\$ 19,726		\$19,726
20		\$ 20,392		\$20,392
21		\$ 21,080	\$ 5,656,183	\$5,677,263
22		\$ 21,791		\$21,791
23		\$ 22,526	\$ 621,701	\$644,228
24		\$ 23,286		\$23,286
25		\$ 24,072		\$24,072
26		\$ 24,884		\$24,884
27		\$ 25,724		\$25,724
28		\$ 26,592		\$26,592
29		\$ 27,489		\$27,489
30		\$ 28,417		\$28,417

Present value of O&M \$3,499,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 2,817,468	\$ 6,574,092	\$ 72,313,942	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$1,521,000	\$2,840,000	\$46,852,000	\$51,213,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

71,283,000

G-15: Alternative 5B Construction Cost and LCC Analysis

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5B	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
'Same as 4B, but sewer sizing is bigger to accomodate redevelopment of existing parcels. Includes three Mauka COH Plant and one Makai COH Plant, Urban Sewering w/ Private and County Plants, both gravity sewers and LPS to reduce the number of neighborhood pump stations.. Private plant service areas unchanged. IWS for all low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to new COH Mauka (Waimea, West Waikaloa, and Waikiki area or Makai (Puako) WWTP.	Gravity Sewer 8 inch	298,600	LF			\$ 1,600	\$ 477,759,264
	Gravity Sewer 12 inch	9,095	LF			\$ 3,070	\$ 27,923,093
	Gravity Sewer 16 inch	10,249	LF			\$ 5,800	\$ 59,446,114
	Gravity Sewer 18 inch	27,419	LF			\$ 6,525	\$ 178,911,520
	Gravity Sewer 24 inch	19,265	LF			\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	40,875	LF			\$ 900	\$ 36,787,158
	Force main 8 inch	2,645	LF			\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF			\$ 1,700	\$ 7,512,300
	Force main 12 inch	5,016	LF			\$ 3,070	\$ 15,399,120
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	137,071	LF			\$ 450	\$ 61,681,833
	Low pressure sewer (On-Lot)	2,701	EA			\$ 26,000	\$ 70,226,000
	Regional PS (including exist. PS that receives additional flow)	13	EA			\$ 7,000,000	\$ 91,000,000
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
	COH WWTPs (4 total), level of treatment - R3		LS			\$ 48,200,000	\$ 48,200,000
	Subtotal of Estimated Construction Cost						\$ 1,247,883,902
	Right of Way	540	Ac			\$ 20,000	\$ 10,791,113
	Contingency	20%					\$ 251,735,003
	Total Estimated Project Cost						\$ 1,510,410,017
	Project services						\$ 302,082,003
	TOTAL CAPITAL COST						\$ 1,812,492,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	709899	kWH	\$ 0.44	\$312,356
	Labor and Materials	\$ 1,558,898	LS	-	\$1,558,898

Annual O&M

\$1,871,254

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 1,934,396		\$1,934,396
2		\$ 1,999,668		\$1,999,668
3		\$ 2,067,143		\$2,067,143
4		\$ 2,136,895		\$2,136,895
5		\$ 2,209,000		\$2,209,000
6		\$ 2,283,538		\$2,283,538
7		\$ 2,360,592		\$2,360,592
8		\$ 2,440,246		\$2,440,246
9		\$ 2,522,587		\$2,522,587
10		\$ 2,607,707		\$2,607,707
11		\$ 2,695,698		\$2,695,698
12		\$ 2,786,659		\$2,786,659
13		\$ 2,880,690		\$2,880,690
14		\$ 2,977,893		\$2,977,893
15		\$ 3,078,376		\$3,078,376
16		\$ 3,182,250		\$3,182,250
17		\$ 3,289,629		\$3,289,629
18		\$ 3,400,631		\$3,400,631
19		\$ 3,515,378		\$3,515,378
20		\$ 3,633,998		\$3,633,998
21		\$ 3,756,620	\$ 126,852,118	\$130,608,738
22		\$ 3,883,380		\$3,883,380
23		\$ 4,014,417	\$ 5,104,802	\$9,119,219
24		\$ 4,149,875		\$4,149,875
25		\$ 4,289,905		\$4,289,905
26		\$ 4,434,659		\$4,434,659
27		\$ 4,584,298		\$4,584,298
28		\$ 4,738,986		\$4,738,986
29		\$ 4,898,894		\$4,898,894
30		\$ 5,064,197		\$5,064,197

Present value of O&M

\$123,776,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 63,187,800	\$ 147,438,200	\$ 1,037,257,902	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$34,116,000	\$63,683,000	\$672,036,000	\$769,835,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**1,166,433,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5B	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waimea Area							
- 1 COH WWTP	Gravity Sewer 8 inch	121,916	LF			\$ 1,600	\$ 195,066,384
- West Waimea WWTP	Gravity Sewer 12 inch	2,118	LF			\$ 3,070	\$ 6,500,909
	Gravity Sewer 16 inch	10,249	LF			\$ 5,800	\$ 59,446,114
	Gravity Sewer 18 inch	22,374	LF			\$ 6,525	\$ 145,991,329
	Gravity Sewer 24 inch	19,265	LF			\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	3,572	LF			\$ 900	\$ 3,214,548
	Force main 8 inch	2,645	LF			\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF			\$ 1,700	\$ 7,512,300
	Force main 12 inch	5,016	LF			\$ 3,070	\$ 15,399,120
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	47,288	LF			\$ 450	\$ 21,279,380
	Low pressure sewer (On-Lot)	1,336	EA			\$ 26,000	\$ 34,736,000
	Regional PS (including exist. PS that receives additional flow)	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH West Waimea WWTP, level of treatment - R3		LS			\$ 22,000,000	\$ 22,000,000
	Subtotal of Estimated Construction Cost						\$ 710,983,583
	Right of Way	231	Ac			\$ 20,000	\$ 4,628,131
	Contingency	20%					\$ 143,122,343
	Total Estimated Project Cost						\$ 858,734,058
	Project services		20%				\$ 171,746,812
	TOTAL CAPITAL COST						\$ 1,030,481,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	441048	kWH	\$ 0.44	\$194,061
	Labor and Materials	\$ 763,401	LS	-	\$763,401
Annual O&M					\$957,463

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 989,770		\$989,770
2		\$ 1,023,168		\$1,023,168
3		\$ 1,057,693		\$1,057,693
4		\$ 1,093,383		\$1,093,383
5		\$ 1,130,277		\$1,130,277
6		\$ 1,168,416		\$1,168,416
7		\$ 1,207,842		\$1,207,842
8		\$ 1,248,598		\$1,248,598
9		\$ 1,290,730		\$1,290,730
10		\$ 1,334,283		\$1,334,283
11		\$ 1,379,305		\$1,379,305
12		\$ 1,425,847		\$1,425,847
13		\$ 1,473,960		\$1,473,960
14		\$ 1,523,696		\$1,523,696
15		\$ 1,575,110		\$1,575,110
16		\$ 1,628,259		\$1,628,259
17		\$ 1,683,201		\$1,683,201
18		\$ 1,739,997		\$1,739,997
19		\$ 1,798,710		\$1,798,710
20		\$ 1,859,404		\$1,859,404
21		\$ 1,922,146	\$ 51,033,306	\$52,955,452
22		\$ 1,987,005		\$1,987,005
23		\$ 2,054,053	\$ 2,462,915	\$4,516,968
24		\$ 2,123,363		\$2,123,363
25		\$ 2,195,011		\$2,195,011
26		\$ 2,269,078		\$2,269,078
27		\$ 2,345,643		\$2,345,643
28		\$ 2,424,792		\$2,424,792
29		\$ 2,506,612		\$2,506,612
30		\$ 2,591,193		\$2,591,193

Present value of O&M **\$56,189,000**Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 25,420,800	\$ 59,315,200	\$ 626,247,583	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$13,725,000	\$25,620,000	\$405,743,000	\$445,088,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**641,582,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5B	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area							
- 1 COH WWTP	Gravity Sewer 8 inch	21,555	LF			\$ 1,600	\$ 34,487,552
- Makai WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	5,045	LF			\$ 6,525	\$ 32,920,191
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	23,573	LF			\$ 900	\$ 21,215,394
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	7,490	LF			\$ 450	\$ 3,370,559
	Low pressure sewer (On-Lot)	349	EA			\$ 26,000	\$ 9,074,000
	Regional PS (including exist. PS that receives additional flow)	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH Makai WWTP, level of treatment - R3		LS			\$ 8,300,000	\$ 8,300,000
	Subtotal of Estimated Construction Cost						\$ 158,367,696
	Right of Way	61	Ac			\$ 20,000	\$ 1,211,318
	Contingency	20%					\$ 31,915,803
	Total Estimated Project Cost						\$ 191,494,816
	Project services		20%				\$ 38,298,963
	TOTAL CAPITAL COST						\$ 229,794,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	94148	kWH	\$ 0.44	\$41,425
	Labor and Materials	\$ 198,636	LS	-	\$198,636

Annual O&M

\$240,061

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 248,162		\$248,162
2		\$ 256,535		\$256,535
3		\$ 265,192		\$265,192
4		\$ 274,140		\$274,140
5		\$ 283,390		\$283,390
6		\$ 292,953		\$292,953
7		\$ 302,838		\$302,838
8		\$ 313,057		\$313,057
9		\$ 323,620		\$323,620
10		\$ 334,540		\$334,540
11		\$ 345,828		\$345,828
12		\$ 357,498		\$357,498
13		\$ 369,561		\$369,561
14		\$ 382,031		\$382,031
15		\$ 394,922		\$394,922
16		\$ 408,247		\$408,247
17		\$ 422,023		\$422,023
18		\$ 436,263		\$436,263
19		\$ 450,984		\$450,984
20		\$ 466,202		\$466,202
21		\$ 481,933	\$ 39,974,564	\$40,456,497
22		\$ 498,195		\$498,195
23		\$ 515,005	\$ 372,399	\$887,405
24		\$ 532,383		\$532,383
25		\$ 550,347		\$550,347
26		\$ 568,918		\$568,918
27		\$ 588,115		\$588,115
28		\$ 607,960		\$607,960
29		\$ 628,474		\$628,474
30		\$ 649,681		\$649,681

Present value of O&M

\$27,826,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 19,912,200	\$ 46,461,800	\$ 91,993,696	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$10,751,000	\$20,068,000	\$59,602,000	\$90,421,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**167,199,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5B	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area	Gravity Sewer 8 inch	0	LF			\$ 1,600	\$ -
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	13,730	LF			\$ 900	\$ 12,357,216
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	14,251	LF			\$ 450	\$ 6,412,955
	Low pressure sewer (On-Lot)	268	EA			\$ 26,000	\$ 6,968,000
	Regional PS (including exist. PS that receives additional flow)	2	EA			\$ 7,000,000	\$ 14,000,000
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
			LS			\$ -	\$ -
	Subtotal of Estimated Construction Cost						\$ 40,938,171
	Right of Way	27	Ac			\$ 20,000	\$ 544,881
	Contingency	20%					\$ 8,296,610
	Total Estimated Project Cost						\$ 49,779,661
	Project services		20%				\$ 9,955,932
	TOTAL CAPITAL COST						\$ 59,736,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	11669	kWH	\$ 0.44	\$5,134
	Labor and Materials	\$ 149,815	LS	-	\$149,815

Annual O&M

\$154,950

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 160,178		\$160,178
2		\$ 165,583		\$165,583
3		\$ 171,170		\$171,170
4		\$ 176,946		\$176,946
5		\$ 182,917		\$182,917
6		\$ 189,089		\$189,089
7		\$ 195,469		\$195,469
8		\$ 202,065		\$202,065
9		\$ 208,884		\$208,884
10		\$ 215,932		\$215,932
11		\$ 223,218		\$223,218
12		\$ 230,750		\$230,750
13		\$ 238,536		\$238,536
14		\$ 246,585		\$246,585
15		\$ 254,906		\$254,906
16		\$ 263,507		\$263,507
17		\$ 272,399		\$272,399
18		\$ 281,590		\$281,590
19		\$ 291,092		\$291,092
20		\$ 300,914		\$300,914
21		\$ 311,068	\$ 13,350,953	\$13,662,021
22		\$ 321,564		\$321,564
23		\$ 332,415	\$ -	\$332,415
24		\$ 343,632		\$343,632
25		\$ 355,227		\$355,227
26		\$ 367,213		\$367,213
27		\$ 379,604		\$379,604
28		\$ 392,413		\$392,413
29		\$ 405,654		\$405,654
30		\$ 419,342		\$419,342

Present value of O&M \$11,498,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 6,650,400	\$ 15,517,600	\$ 18,770,171	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,591,000	\$6,703,000	\$12,161,000	\$22,455,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

48,779,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5B	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikoloa Area							
- 1 COH WWTP	Gravity Sewer 8 inch	155,128	LF			\$ 1,600	\$ 248,205,328
- West Waikoloa WWTP	Gravity Sewer 12 inch	6,978	LF			\$ 3,070	\$ 21,422,184
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	-	LF			\$ 900	\$ -
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	23,635	LF			\$ 450	\$ 10,635,683
	Low pressure sewer (On-Lot)	668	EA			\$ 26,000	\$ 17,368,000
	Regional PS (including exist. PS that receives additional flow)	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH West Waikoloa WWTP, level of treatment - R3		LS			\$ 12,000,000	\$ 12,000,000
	Subtotal of Estimated Construction Cost						\$ 309,631,194
	Right of Way	176	Ac			\$ 20,000	\$ 3,511,223
	Contingency	20%					\$ 62,628,483
	Total Estimated Project Cost						\$ 375,770,901
	Project services		20%				\$ 75,154,180
	TOTAL CAPITAL COST						\$ 450,925,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	153961	kWH	\$ 0.44	\$67,743
	Labor and Materials	\$ 369,403	LS	-	\$369,403
Annual O&M					\$437,146

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 451,896		\$451,896
2		\$ 467,145		\$467,145
3		\$ 482,908		\$482,908
4		\$ 499,202		\$499,202
5		\$ 516,047		\$516,047
6		\$ 533,460		\$533,460
7		\$ 551,461		\$551,461
8		\$ 570,069		\$570,069
9		\$ 589,304		\$589,304
10		\$ 609,189		\$609,189
11		\$ 629,745		\$629,745
12		\$ 650,995		\$650,995
13		\$ 672,961		\$672,961
14		\$ 695,669		\$695,669
15		\$ 719,143		\$719,143
16		\$ 743,409		\$743,409
17		\$ 768,494		\$768,494
18		\$ 794,425		\$794,425
19		\$ 821,232		\$821,232
20		\$ 848,942		\$848,942
21		\$ 877,588	\$ 17,687,242	\$18,564,830
22		\$ 907,201		\$907,201
23		\$ 937,813	\$ 2,269,487	\$3,207,300
24		\$ 969,457		\$969,457
25		\$ 1,002,170		\$1,002,170
26		\$ 1,035,986		\$1,035,986
27		\$ 1,070,943		\$1,070,943
28		\$ 1,107,080		\$1,107,080
29		\$ 1,144,436		\$1,144,436
30		\$ 1,183,053		\$1,183,053
Present value of O&M				
\$23,342,000				

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 8,810,400	\$ 20,557,600	\$ 280,263,194	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$4,757,000	\$8,879,000	\$181,581,000	\$195,217,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**279,050,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5B	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikii Area							
- 1 COH WWTP							
- Waikii WWTP	Gravity Sewer 8 inch	0	LF			\$ 1,600	\$ -
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch		LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch		LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch		LF			\$ 15,200	\$ -
	Force main 4 inch		LF			\$ 600	\$ -
	Force main 6 inch		LF			\$ 900	\$ -
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	44,407	LF			\$ 450	\$ 19,983,258
	Low pressure sewer (On-Lot)	80	EA			\$ 26,000	\$ 2,080,000
	Regional PS (including exist. PS that receives additional flow)	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH Waikii WWTP, level of treatment - R3		LS			\$ 5,900,000	\$ 5,900,000
	Subtotal of Estimated Construction Cost						\$ 27,963,258
	Right of Way	45	Ac			\$ 20,000	\$ 895,560
	Contingency	20%					\$ 5,771,764
	Total Estimated Project Cost						\$ 34,630,582
	Project services		20%				\$ 6,926,116
	TOTAL CAPITAL COST						\$ 41,557,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	9073	kWH	\$ 0.44	\$3,992
	Labor and Materials	\$ 77,643	LS	-	\$77,643

Annual O&M

\$81,635

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 84,389		\$84,389
2		\$ 87,237		\$87,237
3		\$ 90,180		\$90,180
4		\$ 93,223		\$93,223
5		\$ 96,369		\$96,369
6		\$ 99,621		\$99,621
7		\$ 102,982		\$102,982
8		\$ 106,457		\$106,457
9		\$ 110,049		\$110,049
10		\$ 113,763		\$113,763
11		\$ 117,601		\$117,601
12		\$ 121,570		\$121,570
13		\$ 125,672		\$125,672
14		\$ 129,912		\$129,912
15		\$ 134,296		\$134,296
16		\$ 138,828		\$138,828
17		\$ 143,512		\$143,512
18		\$ 148,355		\$148,355
19		\$ 153,360		\$153,360
20		\$ 158,535		\$158,535
21		\$ 163,885	\$ 4,806,054	\$4,969,939
22		\$ 169,415		\$169,415
23		\$ 175,131	\$ -	\$175,131
24		\$ 181,041		\$181,041
25		\$ 187,150		\$187,150
26		\$ 193,465		\$193,465
27		\$ 199,993		\$199,993
28		\$ 206,741		\$206,741
29		\$ 213,717		\$213,717
30		\$ 220,929		\$220,929

Present value of O&M

\$4,922,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 2,394,000	\$ 5,586,000	\$ 19,983,258	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$1,293,000	\$2,413,000	\$12,947,000	\$16,653,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**29,826,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
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Alternative 5B Same as 4B, but sewer sizing is bigger to accomodate redevelopment of existing parcels. Includes three Mauka COH Plant and one Makai COH Plant, Urban Sewering w/ Private and County Plants, both gravity sewers and LPS to reduce the number of neighborhood pump stations. . Private plant service areas unchanged. IWS for all low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to new COH Mauka (Waimea, West Waialoa, and Waikiki) area or Makai (Puako) WWTP.	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Gravity Sewer 8 inch	298,600	LF				\$ 1,600	\$ 477,759,264
Gravity Sewer 12 inch	9,095	LF				\$ 3,070	\$ 27,923,093
Gravity Sewer 16 inch	10,249	LF				\$ 5,800	\$ 59,446,114
Gravity Sewer 18 inch	27,419	LF				\$ 6,525	\$ 178,911,520
Gravity Sewer 24 inch	19,265	LF				\$ 8,700	\$ 167,605,500
Gravity Sewer 30 inch	-	LF				\$ 10,875	\$ -
Gravity Sewer 36 inch	-	LF				\$ 13,050	\$ -
Gravity Sewer 42 inch	-	LF				\$ 15,200	\$ -
Force main 4 inch	-	LF				\$ 600	\$ -
Force main 6 inch	40,875	LF				\$ 900	\$ 36,787,158
Force main 8 inch	2,645	LF				\$ 1,600	\$ 4,232,000
Force main 10 inch	4,419	LF				\$ 1,700	\$ 7,512,300
Force main 12 inch	5,016	LF				\$ 3,070	\$ 15,399,120
Force main 14 inch	-	LF				\$ 4,430	\$ -
Force main 16 inch	-	LF				\$ 5,800	\$ -
Force main 18 inch	-	LF				\$ 6,525	\$ -
Force main 24 inch	-	LF				\$ 8,700	\$ -
Force main 30 inch	-	LF				\$ 10,875	\$ -
Force main 36 inch	-	LF				\$ 13,050	\$ -
Force main 42 inch	-	LF				\$ 15,200	\$ -
Low Pressure Sewer In-Street (3 inch average)	137,071	LF				\$ 450	\$ 61,681,833
Low pressure sewer (On-Lot)	2,701	EA				\$ 26,000	\$ 70,226,000
Regional PS (including exist. PS that receives additional flow)	13	EA				\$ 7,000,000	\$ 91,000,000
Neighborhood PS	1	EA				\$ 1,200,000	\$ 1,200,000
COH WWTPs (4 total), level of treatment - R2		LS				\$ 51,477,600	\$ 51,477,600
Subtotal of Estimated Construction Cost							\$ 1,251,161,502
Right of Way				540	Ac		\$ 10,791,113
Contingency				20%			\$ 252,390,523
Total Estimated Project Cost							\$ 1,514,343,137
Project services				20%			\$ 302,868,627
TOTAL CAPITAL COST							\$ 1,817,212,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$1,871,254
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$228,094
Annual O&M					\$2,099,348

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 2,170,186		\$2,170,186
2		\$ 2,243,415		\$2,243,415
3		\$ 2,319,115		\$2,319,115
4		\$ 2,397,369		\$2,397,369
5		\$ 2,478,263		\$2,478,263
6		\$ 2,561,887		\$2,561,887
7		\$ 2,648,333		\$2,648,333
8		\$ 2,737,696		\$2,737,696
9		\$ 2,830,074		\$2,830,074
10		\$ 2,925,569		\$2,925,569
11		\$ 3,024,287		\$3,024,287
12		\$ 3,126,336		\$3,126,336
13		\$ 3,231,828		\$3,231,828
14		\$ 3,340,879		\$3,340,879
15		\$ 3,453,611		\$3,453,611
16		\$ 3,570,146		\$3,570,146
17		\$ 3,690,614		\$3,690,614
18		\$ 3,815,146		\$3,815,146
19		\$ 3,943,881		\$3,943,881
20		\$ 4,076,959		\$4,076,959
21		\$ 4,214,528	\$ 128,826,093	\$133,040,621
22		\$ 4,356,739		\$4,356,739
23		\$ 4,503,749	\$ 5,104,802	\$9,608,551
24		\$ 4,655,719		\$4,655,719
25		\$ 4,812,817		\$4,812,817
26		\$ 4,975,216		\$4,975,216
27		\$ 5,143,095		\$5,143,095
28		\$ 5,316,638		\$5,316,638
29		\$ 5,496,038		\$5,496,038
30		\$ 5,681,491		\$5,681,491

Present value of O&M

\$131,690,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 64,171,080	\$ 149,732,520	\$ 1,037,257,902	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$34,647,000	\$64,674,000	\$672,036,000	\$771,357,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

1,177,545,000

Alternative 5B	DESCRIPTION	QUAN	UN			TOTAL DIRECT COST
					UNIT COST	
Waimea Area	Level of Treatment - R2					
- 1 COH WWTP	Gravity Sewer 8 inch	121,916	LF		\$ 1,600	\$ 195,066,384
- West Waimea WWTP	Gravity Sewer 12 inch	2,118	LF		\$ 3,070	\$ 6,500,909
	Gravity Sewer 16 inch	10,249	LF		\$ 5,800	\$ 59,446,114
	Gravity Sewer 18 inch	22,374	LF		\$ 6,525	\$ 145,991,329
	Gravity Sewer 24 inch	19,265	LF		\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF		\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF		\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF		\$ 15,200	\$ -
	Force main 4 inch	-	LF		\$ 600	\$ -
	Force main 6 inch	3,572	LF		\$ 900	\$ 3,214,548
	Force main 8 inch	2,645	LF		\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF		\$ 1,700	\$ 7,512,300
	Force main 12 inch	5,016	LF		\$ 3,070	\$ 15,399,120
	Force main 14 inch	-	LF		\$ 4,430	\$ -
	Force main 16 inch	-	LF		\$ 5,800	\$ -
	Force main 18 inch	-	LF		\$ 6,525	\$ -
	Force main 24 inch	-	LF		\$ 8,700	\$ -
	Force main 30 inch	-	LF		\$ 10,875	\$ -
	Force main 36 inch	-	LF		\$ 13,050	\$ -
	Force main 42 inch	-	LF		\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	47,288	LF		\$ 450	\$ 21,279,380
	Low pressure sewer (On-Lot)	1,336	EA		\$ 26,000	\$ 34,736,000
	Regional PS (including exist. PS that receives additional flow)	4	EA		\$ 7,000,000	\$ 28,000,000
	Neighborhood PS		EA		\$ 1,200,000	\$ -
	COH West Waimea WWTP, level of treatment - R2		LS		\$ 23,496,000	\$ 23,496,000
	Subtotal of Estimated Construction Cost					\$ 712,479,583
	Right of Way	231	Ac		\$ 20,000	\$ 4,628,131
	Contingency	20%				\$ 143,421,543
	Total Estimated Project Cost					\$ 860,529,258
	Project services		20%			\$ 172,105,852
	TOTAL CAPITAL COST					\$ 1,032,635,000

O&M

Item	QUAN	UN	Unit cost	Total Annual
R3 level of treatment annual O&M				\$957,463
R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$142,780

Annual O&M

\$1,100,243

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 1,137,368		\$1,137,368
2		\$ 1,175,747		\$1,175,747
3		\$ 1,215,420		\$1,215,420
4		\$ 1,256,432		\$1,256,432
5		\$ 1,298,828		\$1,298,828
6		\$ 1,342,654		\$1,342,654
7		\$ 1,387,959		\$1,387,959
8		\$ 1,434,793		\$1,434,793
9		\$ 1,483,207		\$1,483,207
10		\$ 1,533,255		\$1,533,255
11		\$ 1,584,992		\$1,584,992
12		\$ 1,638,474		\$1,638,474
13		\$ 1,693,761		\$1,693,761
14		\$ 1,750,914		\$1,750,914
15		\$ 1,809,995		\$1,809,995
16		\$ 1,871,070		\$1,871,070
17		\$ 1,934,206		\$1,934,206
18		\$ 1,999,472		\$1,999,472
19		\$ 2,066,940		\$2,066,940
20		\$ 2,136,685		\$2,136,685
21		\$ 2,208,783	\$ 51,934,290	\$4,143,073 replace elec./ motorized equipment
22		\$ 2,283,314		\$2,283,314
23		\$ 2,360,360	\$ 2,462,915	\$4,823,275 sewer inspection at yr 10 of service
24		\$ 2,440,005		\$2,440,005
25		\$ 2,522,339		\$2,522,339
26		\$ 2,607,450		\$2,607,450
27		\$ 2,695,433		\$2,695,433
28		\$ 2,786,385		\$2,786,385
29		\$ 2,880,406		\$2,880,406
30		\$ 2,977,600		\$2,977,600

Present value of O&M \$60,972,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 25,869,600	\$ 60,362,400	\$ 626,247,583	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$13,967,000	\$26,072,000	\$405,743,000	\$445,782,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

647,825,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
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Alternative 5B Kawaihae Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
- 1 COH WWTP	Gravity Sewer 8 inch	21,555	LF			\$ 1,600	\$ 34,487,552
- Makai WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	5,045	LF			\$ 6,525	\$ 32,920,191
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	23,573	LF			\$ 900	\$ 21,215,394
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	7,490	LF			\$ 450	\$ 3,370,559
	Low pressure sewer (On-Lot)	349	EA			\$ 26,000	\$ 9,074,000
	Regional PS (including exist. PS that receives additional flow)	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH Makai WWTP, level of treatment - R2		LS			\$ 8,864,400	\$ 8,864,400
	Subtotal of Estimated Construction Cost						\$ 158,932,096
	Right of Way	61	Ac			\$ 20,000	\$ 1,211,318
	Contingency	20%					\$ 32,028,683
	Total Estimated Project Cost						\$ 192,172,096
	Project services		20%				\$ 38,434,419
	TOTAL CAPITAL COST						\$ 230,607,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$240,061
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$15,340
Annual O&M					\$255,401

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 264,019		\$264,019
2		\$ 272,928		\$272,928
3		\$ 282,137		\$282,137
4		\$ 291,658		\$291,658
5		\$ 301,499		\$301,499
6		\$ 311,673		\$311,673
7		\$ 322,189		\$322,189
8		\$ 333,061		\$333,061
9		\$ 344,299		\$344,299
10		\$ 355,917		\$355,917
11		\$ 367,927		\$367,927
12		\$ 380,342		\$380,342
13		\$ 393,176		\$393,176
14		\$ 406,443		\$406,443
15		\$ 420,157		\$420,157
16		\$ 434,335		\$434,335
17		\$ 448,990		\$448,990
18		\$ 464,141		\$464,141
19		\$ 479,802		\$479,802
20		\$ 495,992		\$495,992
21		\$ 512,728	\$ 40,314,481	\$40,827,209
22		\$ 530,030		\$530,030
23		\$ 547,914	\$ 372,399	\$920,314
24		\$ 566,403		\$566,403
25		\$ 585,515		\$585,515
26		\$ 605,272		\$605,272
27		\$ 625,695		\$625,695
28		\$ 646,808		\$646,808
29		\$ 668,634		\$668,634
30		\$ 691,195		\$691,195

Present value of O&M

\$28,464,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 20,081,520	\$ 46,856,880	\$ 91,993,696	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$10,842,000	\$20,239,000	\$59,602,000	\$90,683,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

168,388,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
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Alternative 5B Puako Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Gravity Sewer 8 inch		0	LF			\$ 1,600	\$ -
Gravity Sewer 12 inch			LF			\$ 3,070	\$ -
Gravity Sewer 16 inch			LF			\$ 5,800	\$ -
Gravity Sewer 18 inch			LF			\$ 6,525	\$ -
Gravity Sewer 24 inch			LF			\$ 8,700	\$ -
Gravity Sewer 30 inch		-	LF			\$ 10,875	\$ -
Gravity Sewer 36 inch		-	LF			\$ 13,050	\$ -
Gravity Sewer 42 inch		-	LF			\$ 15,200	\$ -
Force main 4 inch		-	LF			\$ 600	\$ -
Force main 6 inch		13,730	LF			\$ 900	\$ 12,357,216
Force main 8 inch			LF			\$ 1,600	\$ -
Force main 10 inch			LF			\$ 1,700	\$ -
Force main 12 inch			LF			\$ 3,070	\$ -
Force main 14 inch		-	LF			\$ 4,430	\$ -
Force main 16 inch		-	LF			\$ 5,800	\$ -
Force main 18 inch		-	LF			\$ 6,525	\$ -
Force main 24 inch		-	LF			\$ 8,700	\$ -
Force main 30 inch		-	LF			\$ 10,875	\$ -
Force main 36 inch		-	LF			\$ 13,050	\$ -
Force main 42 inch		-	LF			\$ 15,200	\$ -
Low Pressure Sewer In-Street (3 inch average)		14,251	LF			\$ 450	\$ 6,412,955
Low pressure sewer (On-Lot)		268	EA			\$ 26,000	\$ 6,968,000
Regional PS (including exist. PS that receives additional flow)		2	EA			\$ 7,000,000	\$ 14,000,000
Neighborhood PS		1	EA			\$ 1,200,000	\$ 1,200,000
			LS			\$ -	
Subtotal of Estimated Construction Cost						\$ 40,938,171	
Right of Way	27	Ac				\$ 544,881	
Contingency	20%					\$ 8,296,610	
Total Estimated Project Cost						\$ 49,779,661	
Project services		20%				\$ 9,955,932	
TOTAL CAPITAL COST						\$ 59,736,000	

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$154,950
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$0

Annual O&M

\$154,950

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 160,178		\$160,178
2		\$ 165,583		\$165,583
3		\$ 171,170		\$171,170
4		\$ 176,946		\$176,946
5		\$ 182,917		\$182,917
6		\$ 189,089		\$189,089
7		\$ 195,469		\$195,469
8		\$ 202,065		\$202,065
9		\$ 208,884		\$208,884
10		\$ 215,932		\$215,932
11		\$ 223,218		\$223,218
12		\$ 230,750		\$230,750
13		\$ 238,536		\$238,536
14		\$ 246,585		\$246,585
15		\$ 254,906		\$254,906
16		\$ 263,507		\$263,507
17		\$ 272,399		\$272,399
18		\$ 281,590		\$281,590
19		\$ 291,092		\$291,092
20		\$ 300,914		\$300,914
21		\$ 311,068	\$ 13,350,953	\$13,662,021
22		\$ 321,564		\$321,564
23		\$ 332,415	\$ -	\$332,415
24		\$ 343,632		\$343,632
25		\$ 355,227		\$355,227
26		\$ 367,213		\$367,213
27		\$ 379,604		\$379,604
28		\$ 392,413		\$392,413
29		\$ 405,654		\$405,654
30		\$ 419,342		\$419,342

Present value of O&M

\$11,498,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 6,650,400	\$ 15,517,600	\$ 18,770,171	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,591,000	\$6,703,000	\$12,161,000	\$22,455,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

48,779,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5B Waikoloa Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
- 1 COH WWTP	Gravity Sewer 8 inch	155,128	LF			\$ 1,600	\$ 248,205,328
- West Waikoloa WWTP	Gravity Sewer 12 inch	6,978	LF			\$ 3,070	\$ 21,422,184
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch		LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch		LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch		LF			\$ 15,200	\$ -
	Force main 4 inch		LF			\$ 600	\$ -
	Force main 6 inch		LF			\$ 900	\$ -
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	23,635	LF			\$ 450	\$ 10,635,683
	Low pressure sewer (On-Lot)	668	EA			\$ 26,000	\$ 17,368,000
	Regional PS (including exist. PS that receives additional flow)		EA			\$ 7,000,000	\$ -
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH West Waikoloa WWTP, level of treatment - R2		LS			\$ 12,816,000	\$ 12,816,000
	Subtotal of Estimated Construction Cost						\$ 310,447,194
	Right of Way	176	Ac			\$ 20,000	\$ 3,511,223
	Contingency	20%					\$ 62,791,683
	Total Estimated Project Cost						\$ 376,750,101
	Project services		20%				\$ 75,350,020
	TOTAL CAPITAL COST						\$ 452,100,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$437,146
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$66,080

Annual O&M

\$503,226

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 520,206		\$520,206
2		\$ 537,760		\$537,760
3		\$ 555,905		\$555,905
4		\$ 574,663		\$574,663
5		\$ 594,054		\$594,054
6		\$ 614,099		\$614,099
7		\$ 634,821		\$634,821
8		\$ 656,241		\$656,241
9		\$ 678,385		\$678,385
10		\$ 701,276		\$701,276
11		\$ 724,939		\$724,939
12		\$ 749,401		\$749,401
13		\$ 774,688		\$774,688
14		\$ 800,828		\$800,828
15		\$ 827,850		\$827,850
16		\$ 855,785		\$855,785
17		\$ 884,661		\$884,661
18		\$ 914,512		\$914,512
19		\$ 945,371		\$945,371
20		\$ 977,271		\$977,271
21		\$ 1,010,247	\$ 18,178,688	\$19,188,935
22		\$ 1,044,335		\$1,044,335
23		\$ 1,079,574	\$ 2,269,487	\$3,349,062
24		\$ 1,116,003		\$1,116,003
25		\$ 1,153,660		\$1,153,660
26		\$ 1,192,588		\$1,192,588
27		\$ 1,232,829		\$1,232,829
28		\$ 1,274,429		\$1,274,429
29		\$ 1,317,432		\$1,317,432
30		\$ 1,361,886		\$1,361,886

Present value of O&M

\$25,593,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 9,055,200	\$ 21,128,800	\$ 280,263,194	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$4,889,000	\$9,126,000	\$181,581,000	\$195,596,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

282,097,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5B Waikii Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
- 1 COH WWTP	Gravity Sewer 8 inch	0	LF			\$ 1,600	\$ -
- Waikii WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch		LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch		LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch		LF			\$ 15,200	\$ -
	Force main 4 inch		LF			\$ 600	\$ -
	Force main 6 inch		LF			\$ 900	\$ -
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	44,407	LF			\$ 450	\$ 19,983,258
	Low pressure sewer (On-Lot)	80	EA			\$ 26,000	\$ 2,080,000
	Regional PS (including exist. PS that receives additional flow)		EA			\$ 7,000,000	\$ -
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH Waikii WWTP, level of treatment - R2		LS			\$ 6,301,200	\$ 6,301,200
	Subtotal of Estimated Construction Cost						\$ 28,364,458
	Right of Way	45	Ac			\$ 20,000	\$ 895,560
	Contingency	20%					\$ 5,852,004
	Total Estimated Project Cost						\$ 35,112,022
	Project services		20%				\$ 7,022,404
	TOTAL CAPITAL COST						\$ 42,134,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$81,635
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$3,894
Annual O&M					\$85,529

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 88,415		\$88,415
2		\$ 91,398		\$91,398
3		\$ 94,482		\$94,482
4		\$ 97,670		\$97,670
5		\$ 100,966		\$100,966
6		\$ 104,373		\$104,373
7		\$ 107,894		\$107,894
8		\$ 111,535		\$111,535
9		\$ 115,299		\$115,299
10		\$ 119,189		\$119,189
11		\$ 123,211		\$123,211
12		\$ 127,369		\$127,369
13		\$ 131,666		\$131,666
14		\$ 136,109		\$136,109
15		\$ 140,702		\$140,702
16		\$ 145,450		\$145,450
17		\$ 150,358		\$150,358
18		\$ 155,431		\$155,431
19		\$ 160,676		\$160,676
20		\$ 166,097		\$166,097
21		\$ 171,702	\$ 5,047,682	\$5,219,384
22		\$ 177,496		\$177,496
23		\$ 183,485	\$ -	\$183,485
24		\$ 189,676		\$189,676
25		\$ 196,077		\$196,077
26		\$ 202,693		\$202,693
27		\$ 209,532		\$209,532
28		\$ 216,603		\$216,603
29		\$ 223,911		\$223,911
30		\$ 231,467		\$231,467

Present value of O&M \$5,163,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 2,514,360	\$ 5,866,840	\$ 19,983,258	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$1,358,000	\$2,534,000	\$12,947,000	\$16,839,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

30,458,000

Alternative 5B	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
'Same as 4B, but sewer sizing is bigger to accommodate redevelopment of existing parcels. Includes three Mauka COH Plant and one Makai COH Plant, Urban Sewering w/ Private and County Plants, both gravity sewers and LPS to reduce the number of neighborhood pump stations. Private plant service areas unchanged. IWS for all low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to new COH Mauka (Waimea, West Waialoa, and Waikii) area or Makai (Puako) WWTP.	Gravity Sewer 8 inch	298,600	LF			\$ 1,600	\$ 477,759,264
	Gravity Sewer 12 inch	9,095	LF			\$ 3,070	\$ 27,923,093
	Gravity Sewer 16 inch	10,249	LF			\$ 5,800	\$ 59,446,114
	Gravity Sewer 18 inch	27,419	LF			\$ 6,525	\$ 178,911,520
	Gravity Sewer 24 inch	19,265	LF			\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	40,875	LF			\$ 900	\$ 36,787,158
	Force main 8 inch	2,645	LF			\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF			\$ 1,700	\$ 7,512,300
	Force main 12 inch	5,016	LF			\$ 3,070	\$ 15,399,120
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	137,071	LF			\$ 450	\$ 61,681,833
	Low pressure sewer (On-Lot)	2,701	EA			\$ 26,000	\$ 70,226,000
	Regional PS (including exist. PS that receives additional flow)	13	EA			\$ 7,000,000	\$ 91,000,000
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
	COH WWTPs (4 total), level of treatment - R1		LS			\$ 66,920,880	\$ 66,920,880
	Subtotal of Estimated Construction Cost						\$ 1,266,604,782
	Right of Way	540	Ac			\$ 20,000	\$ 10,791,113
	Contingency	20%					\$ 255,479,179
	Total Estimated Project Cost						\$ 1,532,875,073
	Project services		20%				\$ 306,575,015
	TOTAL CAPITAL COST						\$ 1,839,450,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$1,871,254
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$264,821
Annual O&M					\$2,136,075

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 2,208,153		\$2,208,153
2		\$ 2,282,663		\$2,282,663
3		\$ 2,359,686		\$2,359,686
4		\$ 2,439,309		\$2,439,309
5		\$ 2,521,619		\$2,521,619
6		\$ 2,606,706		\$2,606,706
7		\$ 2,694,664		\$2,694,664
8		\$ 2,785,591		\$2,785,591
9		\$ 2,879,585		\$2,879,585
10		\$ 2,976,751		\$2,976,751
11		\$ 3,077,195		\$3,077,195
12		\$ 3,181,029		\$3,181,029
13		\$ 3,288,367		\$3,288,367
14		\$ 3,399,326		\$3,399,326
15		\$ 3,514,030		\$3,514,030
16		\$ 3,632,604		\$3,632,604
17		\$ 3,755,179		\$3,755,179
18		\$ 3,881,890		\$3,881,890
19		\$ 4,012,877		\$4,012,877
20		\$ 4,148,283		\$4,148,283
21		\$ 4,288,259	\$ 138,127,000	\$142,415,259
22		\$ 4,432,958		\$4,432,958
23		\$ 4,582,539	\$ 5,104,802	\$9,687,341
24		\$ 4,737,168		\$4,737,168
25		\$ 4,897,014		\$4,897,014
26		\$ 5,062,255		\$5,062,255
27		\$ 5,233,070		\$5,233,070
28		\$ 5,409,650		\$5,409,650
29		\$ 5,592,188		\$5,592,188
30		\$ 5,780,885		\$5,780,885

Present value of O&M

\$137,543,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 68,804,064	\$ 160,542,816	\$ 1,037,257,902	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$37,148,000	\$69,343,000	\$672,036,000	\$778,527,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

1,198,466,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5B	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waimea Area							
- 1 COH WWTP	Gravity Sewer 8 inch	121,916	LF			\$ 1,600	\$ 195,066,384
- West Waimea WWTP	Gravity Sewer 12 inch	2,118	LF			\$ 3,070	\$ 6,500,909
	Gravity Sewer 16 inch	10,249	LF			\$ 5,800	\$ 59,446,114
	Gravity Sewer 18 inch	22,374	LF			\$ 6,525	\$ 145,991,329
	Gravity Sewer 24 inch	19,265	LF			\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	3,572	LF			\$ 900	\$ 3,214,548
	Force main 8 inch	2,645	LF			\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF			\$ 1,700	\$ 7,512,300
	Force main 12 inch	5,016	LF			\$ 3,070	\$ 15,399,120
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	47,288	LF			\$ 450	\$ 21,279,380
	Low pressure sewer (On-Lot)	1,336	EA			\$ 26,000	\$ 34,736,000
	Regional PS (including exist. PS that receives additional flow)	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH West Waimea WWTP, level of treatment - R1		LS			\$ 30,544,800	\$ 30,544,800
	Subtotal of Estimated Construction Cost						\$ 719,528,383
	Right of Way	231	Ac			\$ 20,000	\$ 4,628,131
	Contingency	20%					\$ 144,831,303
	Total Estimated Project Cost						\$ 868,987,818
	Project services		20%				\$ 173,797,564
	TOTAL CAPITAL COST						\$ 1,042,785,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$957,463
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$165,770

Annual O&M

\$1,123,233

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 1,161,134		\$1,161,134
2		\$ 1,200,314		\$1,200,314
3		\$ 1,240,816		\$1,240,816
4		\$ 1,282,685		\$1,282,685
5		\$ 1,325,967		\$1,325,967
6		\$ 1,370,709		\$1,370,709
7		\$ 1,416,961		\$1,416,961
8		\$ 1,464,774		\$1,464,774
9		\$ 1,514,200		\$1,514,200
10		\$ 1,565,293		\$1,565,293
11		\$ 1,618,111		\$1,618,111
12		\$ 1,672,711		\$1,672,711
13		\$ 1,729,153		\$1,729,153
14		\$ 1,787,500		\$1,787,500
15		\$ 1,847,816		\$1,847,816
16		\$ 1,910,167		\$1,910,167
17		\$ 1,974,622		\$1,974,622
18		\$ 2,041,251		\$2,041,251
19		\$ 2,110,129		\$2,110,129
20		\$ 2,181,331		\$2,181,331
21		\$ 2,254,936	\$ 56,179,518	\$58,434,454
22		\$ 2,331,025		\$2,331,025
23		\$ 2,409,680	\$ 2,462,915	\$4,872,596
24		\$ 2,490,990		\$2,490,990
25		\$ 2,575,044		\$2,575,044
26		\$ 2,661,934		\$2,661,934
27		\$ 2,751,755		\$2,751,755
28		\$ 2,844,608		\$2,844,608
29		\$ 2,940,594		\$2,940,594
30		\$ 3,039,818		\$3,039,818

Present value of O&M

\$63,832,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 27,984,240	\$ 65,296,560	\$ 626,247,583	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$15,109,000	\$28,204,000	\$405,743,000	\$449,056,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**657,561,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5B	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area							
- 1 COH WWTP	Gravity Sewer 8 inch	21,555	LF			\$ 1,600	\$ 34,487,552
- Makai WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	5,045	LF			\$ 6,525	\$ 32,920,191
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch		LF			\$ 600	\$ -
	Force main 6 inch	23,573	LF			\$ 900	\$ 21,215,394
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	7,490	LF			\$ 450	\$ 3,370,559
	Low pressure sewer (On-Lot)	349	EA			\$ 26,000	\$ 9,074,000
	Regional PS (including exist. PS that receives additional flow)	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH Makai WWTP, level of treatment - R1		LS			\$ 11,523,720	\$ 11,523,720
	Subtotal of Estimated Construction Cost						\$ 161,591,416
	Right of Way	61	Ac			\$ 20,000	\$ 1,211,318
	Contingency	20%					\$ 32,560,547
	Total Estimated Project Cost						\$ 195,363,280
	Project services		20%				\$ 39,072,656
	TOTAL CAPITAL COST						\$ 234,436,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$240,061
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$17,810

Annual O&M

\$257,871

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 266,573		\$266,573
2		\$ 275,568		\$275,568
3		\$ 284,866		\$284,866
4		\$ 294,478		\$294,478
5		\$ 304,415		\$304,415
6		\$ 314,687		\$314,687
7		\$ 325,305		\$325,305
8		\$ 336,282		\$336,282
9		\$ 347,629		\$347,629
10		\$ 359,359		\$359,359
11		\$ 371,485		\$371,485
12		\$ 384,020		\$384,020
13		\$ 396,978		\$396,978
14		\$ 410,373		\$410,373
15		\$ 424,221		\$424,221
16		\$ 438,535		\$438,535
17		\$ 453,333		\$453,333
18		\$ 468,629		\$468,629
19		\$ 484,442		\$484,442
20		\$ 500,789		\$500,789
21		\$ 517,687	\$ 41,916,089	\$42,433,776
22		\$ 535,155		\$535,155
23		\$ 553,213	\$ 372,399	\$925,613
24		\$ 571,880		\$571,880
25		\$ 591,177		\$591,177
26		\$ 611,125		\$611,125
27		\$ 631,747		\$631,747
28		\$ 653,064		\$653,064
29		\$ 675,100		\$675,100
30		\$ 697,880		\$697,880

Present value of O&M

\$29,355,000

replace elec./ motorized equipment

sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 20,879,316	\$ 48,718,404	\$ 91,993,696	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$11,273,000	\$21,043,000	\$59,602,000	\$91,918,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

171,873,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5B	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area	Gravity Sewer 8 inch	0	LF			\$ 1,600	\$ -
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	13,730	LF			\$ 900	\$ 12,357,216
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	14,251	LF			\$ 450	\$ 6,412,955
	Low pressure sewer (On-Lot)	268	EA			\$ 26,000	\$ 6,968,000
	Regional PS (including exist. PS that receives additional flow)	2	EA			\$ 7,000,000	\$ 14,000,000
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
			LS			\$ -	\$ -
	Subtotal of Estimated Construction Cost						\$ 40,938,171
	Right of Way	27	Ac			\$ 20,000	\$ 544,881
	Contingency	20%					\$ 8,296,610
	Total Estimated Project Cost						\$ 49,779,661
	Project services		20%				\$ 9,955,932
	TOTAL CAPITAL COST						\$ 59,736,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$154,950
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$0
Annual O&M					\$154,950

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 160,178		\$160,178
2		\$ 165,583		\$165,583
3		\$ 171,170		\$171,170
4		\$ 176,946		\$176,946
5		\$ 182,917		\$182,917
6		\$ 189,089		\$189,089
7		\$ 195,469		\$195,469
8		\$ 202,065		\$202,065
9		\$ 208,884		\$208,884
10		\$ 215,932		\$215,932
11		\$ 223,218		\$223,218
12		\$ 230,750		\$230,750
13		\$ 238,536		\$238,536
14		\$ 246,585		\$246,585
15		\$ 254,906		\$254,906
16		\$ 263,507		\$263,507
17		\$ 272,399		\$272,399
18		\$ 281,590		\$281,590
19		\$ 291,092		\$291,092
20		\$ 300,914		\$300,914
21		\$ 311,068	\$ 13,350,953	\$13,662,021
22		\$ 321,564		\$321,564
23		\$ 332,415	\$ -	\$332,415
24		\$ 343,632		\$343,632
25		\$ 355,227		\$355,227
26		\$ 367,213		\$367,213
27		\$ 379,604		\$379,604
28		\$ 392,413		\$392,413
29		\$ 405,654		\$405,654
30		\$ 419,342		\$419,342

Present value of O&M \$11,498,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 6,650,400	\$ 15,517,600	\$ 18,770,171	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,591,000	\$6,703,000	\$12,161,000	\$22,455,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

48,779,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5B	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikoloa Area							
- 1 COH WWTP	Gravity Sewer 8 inch	155,128	LF			\$ 1,600	\$ 248,205,328
- West Waikoloa WWTP	Gravity Sewer 12 inch	6,978	LF			\$ 3,070	\$ 21,422,184
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	-	LF			\$ 900	\$ -
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch	-	LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	23,635	LF			\$ 450	\$ 10,635,683
	Low pressure sewer (On-Lot)	668	EA			\$ 26,000	\$ 17,368,000
	Regional PS (including exist. PS that receives additional flow)	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH West Waikoloa WWTP, level of treatment - R1		LS			\$ 16,660,800	\$ 16,660,800
	Subtotal of Estimated Construction Cost						\$ 314,291,994
	Right of Way	176	Ac			\$ 20,000	\$ 3,511,223
	Contingency	20%					\$ 63,560,643
	Total Estimated Project Cost						\$ 381,363,861
	Project services		20%				\$ 76,272,772
	TOTAL CAPITAL COST						\$ 457,637,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$437,146
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$76,720

Annual O&M

\$513,866

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 531,205		\$531,205
2		\$ 549,130		\$549,130
3		\$ 567,659		\$567,659
4		\$ 586,814		\$586,814
5		\$ 606,614		\$606,614
6		\$ 627,083		\$627,083
7		\$ 648,243		\$648,243
8		\$ 670,117		\$670,117
9		\$ 692,729		\$692,729
10		\$ 716,103		\$716,103
11		\$ 740,267		\$740,267
12		\$ 765,246		\$765,246
13		\$ 791,067		\$791,067
14		\$ 817,760		\$817,760
15		\$ 845,354		\$845,354
16		\$ 873,879		\$873,879
17		\$ 903,366		\$903,366
18		\$ 933,849		\$933,849
19		\$ 965,359		\$965,359
20		\$ 997,934		\$997,934
21		\$ 1,031,607	\$ 20,494,266	\$21,525,873
22		\$ 1,066,416		\$1,066,416
23		\$ 1,102,401	\$ 2,269,487	\$3,371,888
24		\$ 1,139,599		\$1,139,599
25		\$ 1,178,052		\$1,178,052
26		\$ 1,217,803		\$1,217,803
27		\$ 1,258,896		\$1,258,896
28		\$ 1,301,375		\$1,301,375
29		\$ 1,345,287		\$1,345,287
30		\$ 1,390,681		\$1,390,681

Present value of O&M

\$27,096,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 10,208,640	\$ 23,820,160	\$ 280,263,194	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$5,512,000	\$10,289,000	\$181,581,000	\$197,382,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**287,351,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5B	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikii Area							
- 1 COH WWTP							
- Waikii WWTP	Gravity Sewer 8 inch	0	LF			\$ 1,600	\$ -
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch		LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch		LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch		LF			\$ 15,200	\$ -
	Force main 4 inch		LF			\$ 600	\$ -
	Force main 6 inch		LF			\$ 900	\$ -
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Low Pressure Sewer In-Street (3 inch average)	44,407	LF			\$ 450	\$ 19,983,258
	Low pressure sewer (On-Lot)	80	EA			\$ 26,000	\$ 2,080,000
	Regional PS (including exist. PS that receives additional flow)	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH Waikii WWTP, level of treatment - R1		LS			\$ 8,191,560	\$ 8,191,560
	Subtotal of Estimated Construction Cost						\$ 30,254,818
	Right of Way	45	Ac			\$ 20,000	\$ 895,560
	Contingency	20%					\$ 6,230,076
	Total Estimated Project Cost						\$ 37,380,454
	Project services		20%				\$ 7,476,091
	TOTAL CAPITAL COST						\$ 44,857,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$81,635
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$4,521
Annual O&M					\$86,156

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 89,063		\$89,063
2		\$ 92,068		\$92,068
3		\$ 95,175		\$95,175
4		\$ 98,386		\$98,386
5		\$ 101,706		\$101,706
6		\$ 105,138		\$105,138
7		\$ 108,685		\$108,685
8		\$ 112,353		\$112,353
9		\$ 116,144		\$116,144
10		\$ 120,063		\$120,063
11		\$ 124,114		\$124,114
12		\$ 128,302		\$128,302
13		\$ 132,632		\$132,632
14		\$ 137,107		\$137,107
15		\$ 141,733		\$141,733
16		\$ 146,516		\$146,516
17		\$ 151,460		\$151,460
18		\$ 156,571		\$156,571
19		\$ 161,854		\$161,854
20		\$ 167,315		\$167,315
21		\$ 172,961	\$ 6,186,174	\$6,359,135
22		\$ 178,797		\$178,797
23		\$ 184,830	\$ -	\$184,830
24		\$ 191,067		\$191,067
25		\$ 197,514		\$197,514
26		\$ 204,179		\$204,179
27		\$ 211,068		\$211,068
28		\$ 218,191		\$218,191
29		\$ 225,553		\$225,553
30		\$ 233,164		\$233,164

Present value of O&M \$5,762,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 3,081,468	\$ 7,190,092	\$ 19,983,258	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$1,664,000	\$3,106,000	\$12,947,000	\$17,717,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value) 32,902,000

G-16: Alternative 5C Construction Cost and LCC Analysis

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5C	DESCRIPTION Level of Treatment - R3	QUAN	UN			TOTAL DIRECT COST
					UNIT COST	
Same as 4C, but sewer sizing is bigger to accommodate redevelopment of existing parcels. Includes three Mauka COH Plant and one Makai COH Plant, Urban Sewering w/ Private and County Plants, All Gravity Sewers. Cross country sewers with new easements are used to reduce the number of pump stations. Private plant service areas unchanged. IVS for all low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to new COH Mauka (Waimea, West Waikoloa, and Waikiki area or Makai (Puako) WWTP.	Gravity Sewer 8 inch	451,622	LF		\$ 1,600	\$ 722,594,944
	Gravity Sewer 12 inch	9,095	LF		\$ 3,070	\$ 27,923,093
	Gravity Sewer 16 inch	10,249	LF		\$ 5,800	\$ 59,446,114
	Gravity Sewer 18 inch	27,419	LF		\$ 6,525	\$ 178,911,520
	Gravity Sewer 24 inch	19,265	LF		\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF		\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF		\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF		\$ 15,200	\$ -
	Force main 4 inch	-	LF		\$ 600	\$ -
	Force main 6 inch	47,233	LF		\$ 900	\$ 42,509,925
	Force main 8 inch	2,645	LF		\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF		\$ 1,700	\$ 7,512,300
	Force main 12 inch	5,016	LF		\$ 3,070	\$ 15,399,120
	Force main 14 inch	-	LF		\$ 4,430	\$ -
	Force main 16 inch	-	LF		\$ 5,800	\$ -
	Force main 18 inch	-	LF		\$ 6,525	\$ -
	Force main 24 inch	-	LF		\$ 8,700	\$ -
	Force main 30 inch	-	LF		\$ 10,875	\$ -
	Force main 36 inch	-	LF		\$ 13,050	\$ -
	Force main 42 inch	-	LF		\$ 15,200	\$ -
	Regional PS	13	EA		\$ 7,000,000	\$ 91,000,000
	Neighborhood PS	11	EA		\$ 1,200,000	\$ 13,200,000
	COH WWTPs (4 total), level of treatment - R3		LS		\$ 48,200,000	\$ 48,200,000
	Subtotal of Estimated Construction Cost					\$ 1,378,534,516
	Right of Way	565	Ac		\$ 20,000	\$ 11,304,156
	Contingency	20%				\$ 277,967,734
	Total Estimated Project Cost					\$ 1,667,806,406
	Project services		20%			\$ 333,561,281
	TOTAL CAPITAL COST					\$ 2,001,368,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	754377	KWH	\$ 0.44	\$331,926
	Labor and Materials	81,823	LS	-	\$81,823

Annual O&M

\$413,749

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 427,710		\$427,710
2		\$ 442,142		\$442,142
3		\$ 457,062		\$457,062
4		\$ 472,484		\$472,484
5		\$ 488,427		\$488,427
6		\$ 504,908		\$504,908
7		\$ 521,945		\$521,945
8		\$ 539,557		\$539,557
9		\$ 557,764		\$557,764
10		\$ 576,584		\$576,584
11		\$ 596,040		\$596,040
12		\$ 616,152		\$616,152
13		\$ 636,943		\$636,943
14		\$ 658,435		\$658,435
15		\$ 680,653		\$680,653
16		\$ 703,620		\$703,620
17		\$ 727,363		\$727,363
18		\$ 751,906		\$751,906
19		\$ 777,278		\$777,278
20		\$ 803,505		\$803,505
21		\$ 830,618	\$ 91,784,788	\$92,615,406
22		\$ 858,646		\$858,646
23		\$ 887,619	\$ 7,247,114	\$8,134,733
24		\$ 917,570		\$917,570
25		\$ 948,531		\$948,531
26		\$ 980,538		\$980,538
27		\$ 1,013,624		\$1,013,624
28		\$ 1,047,827		\$1,047,827
29		\$ 1,083,184		\$1,083,184
30		\$ 1,119,734		\$1,119,734

Present value of O&M

\$62,793,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 45,720,000	\$ 106,680,000	\$ 1,226,134,516	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$24,685,000	\$46,078,000	\$794,408,000	\$865,171,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

1,198,990,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5C	DESCRIPTION Level of Treatment - R3	QUAN	UN			TOTAL DIRECT COST
					UNIT COST	
Waimea Area						
- 1 COH WWTP	Gravity Sewer 8 inch	181,535	LF		\$ 1,600	\$ 290,456,448
- West Waimea WWTP	Gravity Sewer 12 inch	2,118	LF		\$ 3,070	\$ 6,500,909
	Gravity Sewer 16 inch	10,249	LF		\$ 5,800	\$ 59,446,114
	Gravity Sewer 18 inch	22,374	LF		\$ 6,525	\$ 145,991,329
	Gravity Sewer 24 inch	19,265	LF		\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF		\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF		\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF		\$ 15,200	\$ -
	Force main 4 inch	-	LF		\$ 600	\$ -
	Force main 6 inch	6,514	LF		\$ 900	\$ 5,862,996
	Force main 8 inch	2,645	LF		\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF		\$ 1,700	\$ 7,512,300
	Force main 12 inch	5,016	LF		\$ 3,070	\$ 15,399,120
	Force main 14 inch		LF		\$ 4,430	\$ -
	Force main 16 inch	-	LF		\$ 5,800	\$ -
	Force main 18 inch	-	LF		\$ 6,525	\$ -
	Force main 24 inch	-	LF		\$ 8,700	\$ -
	Force main 30 inch	-	LF		\$ 10,875	\$ -
	Force main 36 inch	-	LF		\$ 13,050	\$ -
	Force main 42 inch	-	LF		\$ 15,200	\$ -
	Regional PS	4	EA		\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	2	EA		\$ 1,200,000	\$ 2,400,000
	COH West Waimea WWTP, level of treatment - R3		LS		\$ 22,000,000	\$ 22,000,000
	Subtotal of Estimated Construction Cost					\$ 755,406,716
	Right of Way	246	Ac		\$ 20,000	\$ 4,929,307
	Contingency	20%				\$ 152,067,205
	Total Estimated Project Cost					\$ 912,403,227
	Project services		20%			\$ 182,480,645
	TOTAL CAPITAL COST					\$ 1,094,884,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	456078	kwh	\$ 0.44	\$200,674
	Labor and Materials	49,536	LS	-	\$49,536

Annual O&M

\$250,211

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 258,653		\$258,653
2		\$ 267,381		\$267,381
3		\$ 276,403		\$276,403
4		\$ 285,730		\$285,730
5		\$ 295,372		\$295,372
6		\$ 305,338		\$305,338
7		\$ 315,641		\$315,641
8		\$ 326,292		\$326,292
9		\$ 337,302		\$337,302
10		\$ 348,684		\$348,684
11		\$ 360,449		\$360,449
12		\$ 372,612		\$372,612
13		\$ 385,185		\$385,185
14		\$ 398,182		\$398,182
15		\$ 411,618		\$411,618
16		\$ 425,507		\$425,507
17		\$ 439,865		\$439,865
18		\$ 454,708		\$454,708
19		\$ 470,051		\$470,051
20		\$ 485,912		\$485,912
21		\$ 502,308	\$ 31,558,549	\$32,060,857
22		\$ 519,257		\$519,257
23		\$ 536,779	\$ 3,297,578	\$3,834,357
24		\$ 554,891		\$554,891
25		\$ 573,615		\$573,615
26		\$ 592,971		\$592,971
27		\$ 612,979		\$612,979
28		\$ 633,663		\$633,663
29		\$ 655,045		\$655,045
30		\$ 677,148		\$677,148

Present value of O&M

\$25,246,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 15,720,000	\$ 36,680,000	\$ 703,006,716	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$8,487,000	\$15,843,000	\$455,475,000	\$479,805,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

640,325,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5C	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area							
- 1 COH WWTP	Gravity Sewer 8 inch	28,752	LF			\$ 1,600	\$ 46,003,248
- Makai WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	5,045	LF			\$ 6,525	\$ 32,920,191
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	22,998	LF			\$ 900	\$ 20,698,587
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	3	EA			\$ 1,200,000	\$ 3,600,000
	COH Makai WWTP, level of treatment - R3		LS			\$ 8,300,000	\$ 8,300,000
	Subtotal of Estimated Construction Cost						\$ 160,522,026
	Right of Way	61	Ac			\$ 20,000	\$ 1,226,386
	Contingency	20%					\$ 32,349,682
	Total Estimated Project Cost						\$ 194,098,094
	Project services		20%				\$ 38,819,619
	TOTAL CAPITAL COST						\$ 232,918,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	102396	kWH	\$ 0.44	\$45,054
	Labor and Materials	\$ 15,878	LS	-	\$15,878

Annual O&M

\$60,932

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 62,988		\$62,988
2		\$ 65,114		\$65,114
3		\$ 67,311		\$67,311
4		\$ 69,582		\$69,582
5		\$ 71,930		\$71,930
6		\$ 74,357		\$74,357
7		\$ 76,866		\$76,866
8		\$ 79,460		\$79,460
9		\$ 82,141		\$82,141
10		\$ 84,913		\$84,913
11		\$ 87,778		\$87,778
12		\$ 90,740		\$90,740
13		\$ 93,801		\$93,801
14		\$ 96,967		\$96,967
15		\$ 100,239		\$100,239
16		\$ 103,621		\$103,621
17		\$ 107,117		\$107,117
18		\$ 110,732		\$110,732
19		\$ 114,468		\$114,468
20		\$ 118,331		\$118,331
21		\$ 122,324	\$ 36,677,780	\$36,800,103
22		\$ 126,451		\$126,451
23		\$ 130,718	\$ 473,162	\$603,880
24		\$ 135,129		\$135,129
25		\$ 139,689		\$139,689
26		\$ 144,402		\$144,402
27		\$ 149,275		\$149,275
28		\$ 154,312		\$154,312
29		\$ 159,519		\$159,519
30		\$ 164,901		\$164,901

Present value of O&M

\$20,770,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 18,270,000	\$ 42,630,000	\$ 99,622,026	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$9,864,000	\$18,413,000	\$64,545,000	\$92,822,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

160,866,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5C	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area	Gravity Sewer 8 inch	12,852	LF			\$ 1,600	\$ 20,563,712
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	16,276	LF			\$ 900	\$ 14,648,769
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	2	EA			\$ 7,000,000	\$ 14,000,000
	Neighborhood PS	5	EA			\$ 1,200,000	\$ 6,000,000
			LS			\$	-
	Subtotal of Estimated Construction Cost					\$ 55,212,481	
	Right of Way	30	Ac			\$ 20,000	\$ 607,277
	Contingency	20%				\$	\$ 11,163,952
	Total Estimated Project Cost					\$	\$ 66,983,710
	Project services		20%			\$	\$ 13,396,742
	TOTAL CAPITAL COST						\$ 80,380,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	30120	kWH	\$ 0.44	\$13,253
	Labor and Materials	\$ 4,285	LS	-	\$4,285

Annual O&M

\$17,538

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 18,130		\$18,130
2		\$ 18,741		\$18,741
3		\$ 19,374		\$19,374
4		\$ 20,027		\$20,027
5		\$ 20,703		\$20,703
6		\$ 21,402		\$21,402
7		\$ 22,124		\$22,124
8		\$ 22,871		\$22,871
9		\$ 23,642		\$23,642
10		\$ 24,440		\$24,440
11		\$ 25,265		\$25,265
12		\$ 26,117		\$26,117
13		\$ 26,998		\$26,998
14		\$ 27,909		\$27,909
15		\$ 28,851		\$28,851
16		\$ 29,825		\$29,825
17		\$ 30,831		\$30,831
18		\$ 31,871		\$31,871
19		\$ 32,947		\$32,947
20		\$ 34,059		\$34,059
21		\$ 35,208	\$ 12,045,248	\$12,080,456
22		\$ 36,396		\$36,396
23		\$ 37,624	\$ 179,932	\$217,556
24		\$ 38,894		\$38,894
25		\$ 40,206		\$40,206
26		\$ 41,563		\$41,563
27		\$ 42,965		\$42,965
28		\$ 44,415		\$44,415
29		\$ 45,914		\$45,914
30		\$ 47,463		\$47,463

Present value of O&M

\$6,758,000

replace elec./ motorized equipment
sewer inspection at yr 10 of service

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 6,000,000	\$ 14,000,000	\$ 35,212,481	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,239,000	\$6,047,000	\$22,814,000	\$32,100,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

55,038,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5C	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikoloa Area							
- 1 COH WWTP	Gravity Sewer 8 inch	182,121	LF			\$ 1,600	\$ 291,393,264
- West Waikoloa WWTP	Gravity Sewer 12 inch	6,978	LF			\$ 3,070	\$ 21,422,184
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	1,444	LF			\$ 900	\$ 1,299,573
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
	COH West Waikoloa WWTP, level of treatment - R3		LS			\$ 12,000,000	\$ 12,000,000
	Subtotal of Estimated Construction Cost						\$ 327,315,021
	Right of Way	180	Ac			\$ 20,000	\$ 3,609,737
	Contingency	20%					\$ 66,184,952
	Total Estimated Project Cost						\$ 397,109,709
	Project services		20%				\$ 79,421,942
	TOTAL CAPITAL COST						\$ 476,532,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	156710	kWH	\$ 0.44	\$68,952
	Labor and Materials	\$ 11,455	LS	-	\$11,455

Annual O&M

\$80,408

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 83,121		\$83,121
2		\$ 85,926		\$85,926
3		\$ 88,825		\$88,825
4		\$ 91,822		\$91,822
5		\$ 94,921		\$94,921
6		\$ 98,124		\$98,124
7		\$ 101,435		\$101,435
8		\$ 104,857		\$104,857
9		\$ 108,396		\$108,396
10		\$ 112,053		\$112,053
11		\$ 115,834		\$115,834
12		\$ 119,743		\$119,743
13		\$ 123,783		\$123,783
14		\$ 127,960		\$127,960
15		\$ 132,278		\$132,278
16		\$ 136,741		\$136,741
17		\$ 141,355		\$141,355
18		\$ 146,125		\$146,125
19		\$ 151,056		\$151,056
20		\$ 156,153		\$156,153
21		\$ 161,422	\$ 7,949,864	\$8,111,286
22		\$ 166,869		\$166,869
23		\$ 172,500	\$ 2,647,382	\$2,819,881
24		\$ 178,320		\$178,320
25		\$ 184,337		\$184,337
26		\$ 190,557		\$190,557
27		\$ 196,987		\$196,987
28		\$ 203,634		\$203,634
29		\$ 210,506		\$210,506
30		\$ 217,609		\$217,609

Present value of O&M

\$7,757,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 3,960,000	\$ 9,240,000	\$ 314,115,021	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$2,138,000	\$3,991,000	\$203,514,000	\$209,643,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

274,646,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5C	DESCRIPTION Level of Treatment - R3	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikii Area							
- 1 COH WWTP	Gravity Sewer 8 inch	46,361	LF			\$ 1,600	\$ 74,178,272
- Waikii WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch		LF			\$ 900	\$ -
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS		EA			\$ 7,000,000	\$ -
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH Waikii WWTP, level of treatment - R3		LS			\$ 5,900,000	\$ 5,900,000
	Subtotal of Estimated Construction Cost						\$ 80,078,272
	Right of Way	47	Ac			\$ 20,000	\$ 931,449
	Contingency	20%					\$ 16,201,944
	Total Estimated Project Cost						\$ 97,211,666
	Project services		20%				\$ 19,442,333
	TOTAL CAPITAL COST						\$ 116,654,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	Electricity	9073	kWH	\$ 0.44	\$3,992
	Labor and Materials	\$ 669	LS	-	\$669

Annual O&M

\$4,661

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 4,818		\$4,818
2		\$ 4,980		\$4,980
3		\$ 5,149		\$5,149
4		\$ 5,322		\$5,322
5		\$ 5,502		\$5,502
6		\$ 5,687		\$5,687
7		\$ 5,879		\$5,879
8		\$ 6,078		\$6,078
9		\$ 6,283		\$6,283
10		\$ 6,495		\$6,495
11		\$ 6,714		\$6,714
12		\$ 6,941		\$6,941
13		\$ 7,175		\$7,175
14		\$ 7,417		\$7,417
15		\$ 7,667		\$7,667
16		\$ 7,926		\$7,926
17		\$ 8,193		\$8,193
18		\$ 8,470		\$8,470
19		\$ 8,756		\$8,756
20		\$ 9,051		\$9,051
21		\$ 9,356	\$ 3,553,348	\$3,562,704
22		\$ 9,672		\$9,672
23		\$ 9,998	\$ 649,060	\$659,058
24		\$ 10,336		\$10,336
25		\$ 10,685		\$10,685
26		\$ 11,045		\$11,045
27		\$ 11,418		\$11,418
28		\$ 11,803		\$11,803
29		\$ 12,201		\$12,201
30		\$ 12,613		\$12,613

Present value of O&M

\$2,264,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 1,770,000	\$ 4,130,000	\$ 74,178,272	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$956,000	\$1,784,000	\$48,060,000	\$50,800,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**68,118,000**

Alternative 5C	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Same as 4C, but sewer sizing is bigger to accomodate redevelopment of existing parcels. Includes three Mauka COH Plant and one Makai COH Plant, Urban Sewering w/ Private and County Plants, All Gravity Sewers. Cross country sewers with new easements are used to reduce the number of pump stations. Private plan service areas unchanged. IWS for all low density zoning areas >1 acre. COH sewers/WWPS from high density (commercial or <1 acre lots) to new COH Mauka (Waimea, West Waikoloa, and Waikiki) area or Makai (Puako) WWTP.	Gravity Sewer 8 inch Gravity Sewer 12 inch Gravity Sewer 16 inch Gravity Sewer 18 inch Gravity Sewer 24 inch Gravity Sewer 30 inch Gravity Sewer 36 inch Gravity Sewer 42 inch Force main 4 inch Force main 6 inch Force main 8 inch Force main 10 inch Force main 12 inch Force main 14 inch Force main 16 inch Force main 18 inch Force main 24 inch Force main 30 inch Force main 36 inch Force main 42 inch Regional PS Neighborhood PS COH WWTPs (4 total), level of treatment - R2	451,622 9,095 10,249 27,419 19,265 - - - - 47,233 2,645 4,419 5,016 - - - - - - 13 11 	LF LF LF LF LF LF LF LF LF LF LF LF LF LF LF LF LF EA EA LS			\$ 1,600 \$ 3,070 \$ 5,800 \$ 6,525 \$ 8,700 \$ 10,875 \$ 13,050 \$ 15,200 \$ 600 \$ 900 \$ 1,600 \$ 1,700 \$ 3,070 \$ 4,430 \$ 5,800 \$ 6,525 \$ 8,700 \$ 10,875 \$ 13,050 \$ 15,200 \$ 7,000,000 \$ 1,200,000 \$ 51,477,600	\$ 722,594,944 \$ 27,923,093 \$ 59,446,114 \$ 178,911,520 \$ 167,605,500 - - - - \$ 42,509,925 \$ 4,232,000 \$ 7,512,300 \$ 15,399,120 - - - - - - - \$ 91,000,000 \$ 13,200,000 \$ 51,477,600 \$ 1,381,812,116 \$ 11,304,156 \$ 278,623,254 \$ 1,671,739,526 \$ 334,347,905 \$ 2,006,087,000
	Subtotal of Estimated Construction Cost Right of Way Contingency Total Estimated Project Cost Project services	565 20% 20%	Ac			\$ 20,000	
	TOTAL CAPITAL COST						

O&M

Item	QUAN	UN	Unit Cost	Total Annual
R3 level of treatment annual O&M				\$413,749
R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$228,094

Annual O&M

\$641,843

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 663,501		\$663,501
2		\$ 685,889		\$685,889
3		\$ 709,033		\$709,033
4		\$ 732,958		\$732,958
5		\$ 757,690		\$757,690
6		\$ 783,257		\$783,257
7		\$ 809,687		\$809,687
8		\$ 837,008		\$837,008
9		\$ 865,251		\$865,251
10		\$ 894,447		\$894,447
11		\$ 924,629		\$924,629
12		\$ 955,828		\$955,828
13		\$ 988,081		\$988,081
14		\$ 1,021,422		\$1,021,422
15		\$ 1,055,888		\$1,055,888
16		\$ 1,091,516		\$1,091,516
17		\$ 1,128,348		\$1,128,348
18		\$ 1,166,421		\$1,166,421
19		\$ 1,205,780		\$1,205,780
20		\$ 1,246,467		\$1,246,467
21		\$ 1,288,526	\$ 93,758,763	\$95,047,290 replace elec./ motorized equipment
22		\$ 1,332,005		\$1,332,005
23		\$ 1,376,951	\$ 7,247,114	\$8,624,065 sewer inspection at yr 10 of service
24		\$ 1,423,413		\$1,423,413
25		\$ 1,471,444		\$1,471,444
26		\$ 1,521,095		\$1,521,095
27		\$ 1,572,421		\$1,572,421
28		\$ 1,625,479		\$1,625,479
29		\$ 1,680,328		\$1,680,328
30		\$ 1,737,027		\$1,737,027

Present value of O&M \$70,706,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 46,703,280	\$ 108,974,320	\$ 1,226,134,516	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$25,216,000	\$47,069,000	\$794,408,000	\$866,693,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

1,210,100,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5C Waimea Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
- 1 COH WWTP	Gravity Sewer 8 inch	181,535	LF			\$ 1,600	\$ 290,456,448
- West Waimea WWTP	Gravity Sewer 12 inch	2,118	LF			\$ 3,070	\$ 6,500,909
	Gravity Sewer 16 inch	10,249	LF			\$ 5,800	\$ 59,446,114
	Gravity Sewer 18 inch	22,374	LF			\$ 6,525	\$ 145,991,329
	Gravity Sewer 24 inch	19,265	LF			\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	6,514	LF			\$ 900	\$ 5,862,996
	Force main 8 inch	2,645	LF			\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF			\$ 1,700	\$ 7,512,300
	Force main 12 inch	5,016	LF			\$ 3,070	\$ 15,399,120
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Regional PS	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	2	EA			\$ 1,200,000	\$ 2,400,000
	COH West Waimea WWTP, level of treatment - R2		LS			\$ 23,496,000	\$ 23,496,000
	Subtotal of Estimated Construction Cost						\$ 756,902,716
	Right of Way	246	Ac			\$ 20,000	\$ 4,929,307
	Contingency	20%					\$ 152,366,405
	Total Estimated Project Cost						\$ 914,198,427
	Project services		20%				\$ 182,839,685
	TOTAL CAPITAL COST						\$ 1,097,038,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$250,211
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$142,780

Annual O&M

\$392,991

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 406,251		\$406,251
2		\$ 419,959		\$419,959
3		\$ 434,130		\$434,130
4		\$ 448,779		\$448,779
5		\$ 463,922		\$463,922
6		\$ 479,576		\$479,576
7		\$ 495,759		\$495,759
8		\$ 512,487		\$512,487
9		\$ 529,780		\$529,780
10		\$ 547,656		\$547,656
11		\$ 566,136		\$566,136
12		\$ 585,239		\$585,239
13		\$ 604,987		\$604,987
14		\$ 625,401		\$625,401
15		\$ 646,504		\$646,504
16		\$ 668,319		\$668,319
17		\$ 690,870		\$690,870
18		\$ 714,182		\$714,182
19		\$ 738,281		\$738,281
20		\$ 763,192		\$763,192
21		\$ 788,945	\$ 32,459,534	\$33,248,479
22		\$ 815,566		\$815,566
23		\$ 843,086	\$ 3,297,578	\$4,140,664
24		\$ 871,534		\$871,534
25		\$ 900,942		\$900,942
26		\$ 931,343		\$931,343
27		\$ 962,769		\$962,769
28		\$ 995,256		\$995,256
29		\$ 1,028,839		\$1,028,839
30		\$ 1,063,555		\$1,063,555

Present value of O&M

\$30,028,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 16,168,800	\$ 37,727,200	\$ 703,006,716	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$8,730,000	\$16,296,000	\$455,475,000	\$480,501,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

646,565,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5C Kawaihae Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
- 1 COH WWTP - Makai WWTP	Gravity Sewer 8 inch	28,752	LF			\$ 1,600	\$ 46,003,248
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	5,045	LF			\$ 6,525	\$ 32,920,191
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	22,998	LF			\$ 900	\$ 20,698,587
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	3	EA			\$ 1,200,000	\$ 3,600,000
	COH Makai WWTP, level of treatment - R2		LS			\$ 8,864,400	\$ 8,864,400
	Subtotal of Estimated Construction Cost						\$ 161,086,426
	Right of Way	61	Ac			\$ 20,000	\$ 1,226,386
	Contingency	20%					\$ 32,462,562
	Total Estimated Project Cost						\$ 194,775,374
	Project services		20%				\$ 38,955,075
	TOTAL CAPITAL COST						\$ 233,730,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$60,932
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$15,340
Annual O&M					\$76,272

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 78,846		\$78,846
2		\$ 81,506		\$81,506
3		\$ 84,256		\$84,256
4		\$ 87,100		\$87,100
5		\$ 90,039		\$90,039
6		\$ 93,077		\$93,077
7		\$ 96,217		\$96,217
8		\$ 99,464		\$99,464
9		\$ 102,820		\$102,820
10		\$ 106,290		\$106,290
11		\$ 109,876		\$109,876
12		\$ 113,584		\$113,584
13		\$ 117,417		\$117,417
14		\$ 121,379		\$121,379
15		\$ 125,474		\$125,474
16		\$ 129,708		\$129,708
17		\$ 134,085		\$134,085
18		\$ 138,609		\$138,609
19		\$ 143,286		\$143,286
20		\$ 148,121		\$148,121
21		\$ 153,119	\$ 37,017,696	\$37,170,816
22		\$ 158,286		\$158,286
23		\$ 163,627	\$ 473,162	\$636,789
24		\$ 169,148		\$169,148
25		\$ 174,856		\$174,856
26		\$ 180,756		\$180,756
27		\$ 186,855		\$186,855
28		\$ 193,160		\$193,160
29		\$ 199,678		\$199,678
30		\$ 206,416		\$206,416

Present value of O&M

\$21,407,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 18,439,320	\$ 43,025,080	\$ 99,622,026	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$9,956,000	\$18,584,000	\$64,545,000	\$93,085,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

162,052,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5C Puako Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
	Gravity Sewer 8 inch					\$ 1,600	\$ 20,563,712
	Gravity Sewer 12 inch					\$ 3,070	\$ -
	Gravity Sewer 16 inch					\$ 5,800	\$ -
	Gravity Sewer 18 inch					\$ 6,525	\$ -
	Gravity Sewer 24 inch					\$ 8,700	\$ -
	Gravity Sewer 30 inch					\$ 10,875	\$ -
	Gravity Sewer 36 inch					\$ 13,050	\$ -
	Gravity Sewer 42 inch					\$ 15,200	\$ -
	Force main 4 inch					\$ 600	\$ -
	Force main 6 inch	16,276	LF			\$ 900	\$ 14,648,769
	Force main 8 inch					\$ 1,600	\$ -
	Force main 10 inch					\$ 1,700	\$ -
	Force main 12 inch					\$ 3,070	\$ -
	Force main 14 inch					\$ 4,430	\$ -
	Force main 16 inch					\$ 5,800	\$ -
	Force main 18 inch					\$ 6,525	\$ -
	Force main 24 inch					\$ 8,700	\$ -
	Force main 30 inch					\$ 10,875	\$ -
	Force main 36 inch					\$ 13,050	\$ -
	Force main 42 inch					\$ 15,200	\$ -
	Regional PS	2	EA			\$ 7,000,000	\$ 14,000,000
	Neighborhood PS	5	EA			\$ 1,200,000	\$ 6,000,000
			LS			\$ -	\$ -
	Subtotal of Estimated Construction Cost						\$ 55,212,481
	Right of Way	30	Ac			\$ 20,000	\$ 607,277
	Contingency	20%					\$ 11,163,952
	Total Estimated Project Cost						\$ 66,983,710
	Project services		20%				\$ 13,396,742
	TOTAL CAPITAL COST						\$ 80,380,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$17,538
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$0

Annual O&M

\$17,538

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 18,130		\$18,130
2		\$ 18,741		\$18,741
3		\$ 19,374		\$19,374
4		\$ 20,027		\$20,027
5		\$ 20,703		\$20,703
6		\$ 21,402		\$21,402
7		\$ 22,124		\$22,124
8		\$ 22,871		\$22,871
9		\$ 23,642		\$23,642
10		\$ 24,440		\$24,440
11		\$ 25,265		\$25,265
12		\$ 26,117		\$26,117
13		\$ 26,998		\$26,998
14		\$ 27,909		\$27,909
15		\$ 28,851		\$28,851
16		\$ 29,825		\$29,825
17		\$ 30,831		\$30,831
18		\$ 31,871		\$31,871
19		\$ 32,947		\$32,947
20		\$ 34,059		\$34,059
21		\$ 35,208	\$ 12,045,248	\$12,080,456
22		\$ 36,396		\$36,396
23		\$ 37,624	\$ 179,932	\$217,556
24		\$ 38,894		\$38,894
25		\$ 40,206		\$40,206
26		\$ 41,563		\$41,563
27		\$ 42,965		\$42,965
28		\$ 44,415		\$44,415
29		\$ 45,914		\$45,914
30		\$ 47,463		\$47,463

Present value of O&M

\$6,758,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 6,000,000	\$ 14,000,000	\$ 35,212,481	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,239,000	\$6,047,000	\$22,814,000	\$32,100,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

55,038,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5C Waikoloa Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
- 1 COH WWTP	Gravity Sewer 8 inch	182,121	LF			\$ 1,600	\$ 291,393,264
- West Waikoloa WWTP	Gravity Sewer 12 inch	6,978	LF			\$ 3,070	\$ 21,422,184
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	1,444	LF			\$ 900	\$ 1,299,573
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	*	EA			\$ 7,000,000	\$ -
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
	COH West Waikoloa WWTP, level of treatment - R2		LS			\$ 12,816,000	\$ 12,816,000
	Subtotal of Estimated Construction Cost						\$ 328,131,021
	Right of Way	180	Ac			\$ 20,000	\$ 3,609,737
	Contingency	20%					\$ 66,348,152
	Total Estimated Project Cost						\$ 398,088,909
	Project services		20%				\$ 79,617,782
	TOTAL CAPITAL COST						\$ 477,707,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$80,408
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$66,080

Annual O&M

\$146,488

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 151,431		\$151,431
2		\$ 156,541		\$156,541
3		\$ 161,823		\$161,823
4		\$ 167,283		\$167,283
5		\$ 172,928		\$172,928
6		\$ 178,763		\$178,763
7		\$ 184,795		\$184,795
8		\$ 191,030		\$191,030
9		\$ 197,476		\$197,476
10		\$ 204,140		\$204,140
11		\$ 211,028		\$211,028
12		\$ 218,149		\$218,149
13		\$ 225,510		\$225,510
14		\$ 233,119		\$233,119
15		\$ 240,985		\$240,985
16		\$ 249,117		\$249,117
17		\$ 257,523		\$257,523
18		\$ 266,212		\$266,212
19		\$ 275,195		\$275,195
20		\$ 284,481		\$284,481
21		\$ 294,080	\$ 8,441,310	\$8,735,390
22		\$ 304,004		\$304,004
23		\$ 314,262	\$ 2,647,382	\$2,961,643
24		\$ 324,866		\$324,866
25		\$ 335,828		\$335,828
26		\$ 347,160		\$347,160
27		\$ 358,874		\$358,874
28		\$ 370,983		\$370,983
29		\$ 383,501		\$383,501
30		\$ 396,442		\$396,442

Present value of O&M

\$10,008,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 4,204,800	\$ 9,811,200	\$ 314,115,021	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$2,270,000	\$4,238,000	\$203,514,000	\$210,022,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

277,693,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5C Waikiki Area	DESCRIPTION Level of Treatment - R2	QUAN	UN			UNIT COST	TOTAL DIRECT COST
- 1 COH WWTP	Gravity Sewer 8 inch	46,361	LF			\$ 1,600	\$ 74,178,272
- Waikiki WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch		LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch		LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch		LF			\$ 15,200	\$ -
	Force main 4 inch		LF			\$ 600	\$ -
	Force main 6 inch		LF			\$ 900	\$ -
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch		LF			\$ 5,800	\$ -
	Force main 18 inch		LF			\$ 6,525	\$ -
	Force main 24 inch		LF			\$ 8,700	\$ -
	Force main 30 inch		LF			\$ 10,875	\$ -
	Force main 36 inch		LF			\$ 13,050	\$ -
	Force main 42 inch		LF			\$ 15,200	\$ -
	Regional PS		EA			\$ 7,000,000	\$ -
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH Waikiki WWTP, level of treatment - R2		LS			\$ 6,301,200	\$ 6,301,200
	Subtotal of Estimated Construction Cost						\$ 80,479,472
	Right of Way	47	Ac			\$ 20,000	\$ 931,449
	Contingency	20%					\$ 16,282,184
	Total Estimated Project Cost						\$ 97,693,106
	Project services		20%				\$ 19,538,621
	TOTAL CAPITAL COST						\$ 117,232,000

O&M

	Item	QUAN.	UN.	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$4,661
	R2 level of treatment additional annual O&M (\$0.118M/mgd/yr)				\$3,894
Annual O&M					\$8,555

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 8,843		\$8,843
2		\$ 9,142		\$9,142
3		\$ 9,450		\$9,450
4		\$ 9,769		\$9,769
5		\$ 10,099		\$10,099
6		\$ 10,439		\$10,439
7		\$ 10,792		\$10,792
8		\$ 11,156		\$11,156
9		\$ 11,532		\$11,532
10		\$ 11,921		\$11,921
11		\$ 12,324		\$12,324
12		\$ 12,739		\$12,739
13		\$ 13,169		\$13,169
14		\$ 13,614		\$13,614
15		\$ 14,073		\$14,073
16		\$ 14,548		\$14,548
17		\$ 15,039		\$15,039
18		\$ 15,546		\$15,546
19		\$ 16,071		\$16,071
20		\$ 16,613		\$16,613
21		\$ 17,174	\$ 3,794,976	\$3,812,150
22		\$ 17,753		\$17,753
23		\$ 18,352	\$ 649,060	\$667,412
24		\$ 18,972		\$18,972
25		\$ 19,612		\$19,612
26		\$ 20,273		\$20,273
27		\$ 20,958		\$20,958
28		\$ 21,665		\$21,665
29		\$ 22,396		\$22,396
30		\$ 23,151		\$23,151

Present value of O&M

\$2,505,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 1,890,360	\$ 4,410,840	\$ 74,178,272	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$1,021,000	\$1,905,000	\$48,060,000	\$50,986,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

68,751,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5C	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Same as 4C, but sewer sizing is bigger to accomodate redevelopment of existing parcels. Includes three Mauka COH Plant and one Makai COH Plant, Urban Sewering w/ Private and County Plants, All Gravity Sewers. Cross country sewers with new easements are used to reduce the number of pump stations. Private plant service areas unchanged. IWS for all low density zoning areas >1 acre. COH sewers/VWPS from high density (commercial or <1 acre lots) to new COH Mauka (Waimea, West Waikoloa, and Waikii) area or Makai (Puako) WWTP.	Gravity Sewer 8 inch	451,622	LF			\$ 1,600	\$ 722,594,944
	Gravity Sewer 12 inch	9,095	LF			\$ 3,070	\$ 27,923,093
	Gravity Sewer 16 inch	10,249	LF			\$ 5,800	\$ 59,446,114
	Gravity Sewer 18 inch	27,419	LF			\$ 6,525	\$ 178,911,520
	Gravity Sewer 24 inch	19,265	LF			\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	47,233	LF			\$ 900	\$ 42,509,925
	Force main 8 inch	2,645	LF			\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF			\$ 1,700	\$ 7,512,300
	Force main 12 inch	5,016	LF			\$ 3,070	\$ 15,399,120
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	13	EA			\$ 7,000,000	\$ 91,000,000
	Neighborhood PS	11	EA			\$ 1,200,000	\$ 13,200,000
	COH WWTPs (4 total), level of treatment - R1		LS			\$ 66,920,880	\$ 66,920,880
	Subtotal of Estimated Construction Cost						\$ 1,397,255,396
	Right of Way	565	Ac			\$ 20,000	\$ 11,304,156
	Contingency	20%					\$ 281,711,910
	Total Estimated Project Cost						\$ 1,690,271,462
	Project services		20%				\$ 338,054,292
	TOTAL CAPITAL COST						\$ 2,028,326,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$413,749
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$264,821
Annual O&M					\$678,570

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 701,467		\$701,467
2		\$ 725,137		\$725,137
3		\$ 749,605		\$749,605
4		\$ 774,899		\$774,899
5		\$ 801,046		\$801,046
6		\$ 828,076		\$828,076
7		\$ 856,018		\$856,018
8		\$ 884,902		\$884,902
9		\$ 914,762		\$914,762
10		\$ 945,629		\$945,629
11		\$ 977,537		\$977,537
12		\$ 1,010,522		\$1,010,522
13		\$ 1,044,620		\$1,044,620
14		\$ 1,079,869		\$1,079,869
15		\$ 1,116,307		\$1,116,307
16		\$ 1,153,974		\$1,153,974
17		\$ 1,192,913		\$1,192,913
18		\$ 1,233,165		\$1,233,165
19		\$ 1,274,776		\$1,274,776
20		\$ 1,317,791		\$1,317,791
21		\$ 1,362,257	\$ 103,059,670	\$104,421,927
22		\$ 1,408,224		\$1,408,224
23		\$ 1,455,742	\$ 7,247,114	\$8,702,856
24		\$ 1,504,863		\$1,504,863
25		\$ 1,555,641		\$1,555,641
26		\$ 1,608,133		\$1,608,133
27		\$ 1,662,397		\$1,662,397
28		\$ 1,718,491		\$1,718,491
29		\$ 1,776,478		\$1,776,478
30		\$ 1,836,422		\$1,836,422

Present value of O&M \$76,560,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 51,336,264	\$ 119,784,616	\$ 1,226,134,516	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$27,717,000	\$51,739,000	\$794,408,000	\$873,864,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

1,231,022,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5C	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waimea Area							
- 1 COH WWTP	Gravity Sewer 8 inch	181,535	LF			\$ 1,600	\$ 290,456,448
- West Waimea WWTP	Gravity Sewer 12 inch	2,118	LF			\$ 3,070	\$ 6,500,909
	Gravity Sewer 16 inch	10,249	LF			\$ 5,800	\$ 59,446,114
	Gravity Sewer 18 inch	22,374	LF			\$ 6,525	\$ 145,991,329
	Gravity Sewer 24 inch	19,265	LF			\$ 8,700	\$ 167,605,500
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	6,514	LF			\$ 900	\$ 5,862,996
	Force main 8 inch	2,645	LF			\$ 1,600	\$ 4,232,000
	Force main 10 inch	4,419	LF			\$ 1,700	\$ 7,512,300
	Force main 12 inch	5,016	LF			\$ 3,070	\$ 15,399,120
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	4	EA			\$ 7,000,000	\$ 28,000,000
	Neighborhood PS	2	EA			\$ 1,200,000	\$ 2,400,000
	COH West Wiamea WWTP, level of treatment - R1		LS			\$ 30,544,800	\$ 30,544,800
	Subtotal of Estimated Construction Cost						\$ 763,951,516
	Right of Way	246	Ac			\$ 20,000	\$ 4,929,307
	Contingency	20%					\$ 153,776,165
	Total Estimated Project Cost						\$ 922,656,987
	Project services		20%				\$ 184,531,397
	TOTAL CAPITAL COST						\$ 1,107,188,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$250,211
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$1,674,277

Annual O&M

\$1,924,488

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 1,989,426		\$1,989,426
2		\$ 2,056,555		\$2,056,555
3		\$ 2,125,949		\$2,125,949
4		\$ 2,197,685		\$2,197,685
5		\$ 2,271,842		\$2,271,842
6		\$ 2,348,501		\$2,348,501
7		\$ 2,427,746		\$2,427,746
8		\$ 2,509,666		\$2,509,666
9		\$ 2,594,349		\$2,594,349
10		\$ 2,681,891		\$2,681,891
11		\$ 2,772,386		\$2,772,386
12		\$ 2,865,934		\$2,865,934
13		\$ 2,962,640		\$2,962,640
14		\$ 3,062,608		\$3,062,608
15		\$ 3,165,950		\$3,165,950
16		\$ 3,272,779		\$3,272,779
17		\$ 3,383,212		\$3,383,212
18		\$ 3,497,372		\$3,497,372
19		\$ 3,615,384		\$3,615,384
20		\$ 3,737,378		\$3,737,378
21		\$ 3,863,488	\$ 36,704,761	\$40,568,249
22		\$ 3,993,854		\$3,993,854
23		\$ 4,128,619	\$ 3,297,578	\$7,426,197
24		\$ 4,267,931		\$4,267,931
25		\$ 4,411,944		\$4,411,944
26		\$ 4,560,816		\$4,560,816
27		\$ 4,714,712		\$4,714,712
28		\$ 4,873,801		\$4,873,801
29		\$ 5,038,257		\$5,038,257
30		\$ 5,208,264		\$5,208,264

Present value of O&M

\$78,567,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 18,283,440	\$ 42,661,360	\$ 703,006,716	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$9,871,000	\$18,427,000	\$455,475,000	\$483,773,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**701,982,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5C	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Kawaihae Area							
- 1 COH WWTP	Gravity Sewer 8 inch	28,752	LF			\$ 1,600	\$ 46,003,248
- Makai WWTP	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch	5,045	LF			\$ 6,525	\$ 32,920,191
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	22,998	LF			\$ 900	\$ 20,698,587
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	7	EA			\$ 7,000,000	\$ 49,000,000
	Neighborhood PS	3	EA			\$ 1,200,000	\$ 3,600,000
	COH Makai WWTP, level of treatment - R1		LS			\$ 11,523,720	\$ 11,523,720
	Subtotal of Estimated Construction Cost						\$ 163,745,746
	Right of Way	61	Ac			\$ 20,000	\$ 1,226,386
	Contingency	20%					\$ 32,994,426
	Total Estimated Project Cost						\$ 197,966,558
	Project services		20%				\$ 39,593,312
	TOTAL CAPITAL COST						\$ 237,560,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$60,932
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$179,881
Annual O&M					\$240,813

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 248,939		\$248,939
2		\$ 257,339		\$257,339
3		\$ 266,022		\$266,022
4		\$ 274,999		\$274,999
5		\$ 284,278		\$284,278
6		\$ 293,870		\$293,870
7		\$ 303,786		\$303,786
8		\$ 314,037		\$314,037
9		\$ 324,634		\$324,634
10		\$ 335,588		\$335,588
11		\$ 346,911		\$346,911
12		\$ 358,617		\$358,617
13		\$ 370,718		\$370,718
14		\$ 383,227		\$383,227
15		\$ 396,159		\$396,159
16		\$ 409,526		\$409,526
17		\$ 423,345		\$423,345
18		\$ 437,630		\$437,630
19		\$ 452,397		\$452,397
20		\$ 467,662		\$467,662
21		\$ 483,442	\$ 38,619,305	\$39,102,747
22		\$ 499,755		\$499,755
23		\$ 516,618	\$ 473,162	\$989,780
24		\$ 534,051		\$534,051
25		\$ 552,071		\$552,071
26		\$ 570,700		\$570,700
27		\$ 589,957		\$589,957
28		\$ 609,864		\$609,864
29		\$ 630,442		\$630,442
30		\$ 651,715		\$651,715

Present value of O&M \$27,206,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 19,237,116	\$ 44,886,604	\$ 99,622,026	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$10,386,000	\$19,388,000	\$64,545,000	\$94,319,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**170,447,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5C	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Puako Area	Gravity Sewer 8 inch	12,852	LF			\$ 1,600	\$ 20,563,712
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	16,276	LF			\$ 900	\$ 14,648,769
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	2	EA			\$ 7,000,000	\$ 14,000,000
	Neighborhood PS	5	EA			\$ 1,200,000	\$ 6,000,000
			LS			\$ -	
	Subtotal of Estimated Construction Cost						\$ 55,212,481
	Right of Way	30	Ac			\$ 20,000	\$ 607,277
	Contingency	20%					\$ 11,163,952
	Total Estimated Project Cost						\$ 66,983,710
	Project services		20%				\$ 13,396,742
	TOTAL CAPITAL COST						\$ 80,380,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$17,538
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$0
Annual O&M					\$17,538

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 18,130		\$18,130
2		\$ 18,741		\$18,741
3		\$ 19,374		\$19,374
4		\$ 20,027		\$20,027
5		\$ 20,703		\$20,703
6		\$ 21,402		\$21,402
7		\$ 22,124		\$22,124
8		\$ 22,871		\$22,871
9		\$ 23,642		\$23,642
10		\$ 24,440		\$24,440
11		\$ 25,265		\$25,265
12		\$ 26,117		\$26,117
13		\$ 26,998		\$26,998
14		\$ 27,909		\$27,909
15		\$ 28,851		\$28,851
16		\$ 29,825		\$29,825
17		\$ 30,831		\$30,831
18		\$ 31,871		\$31,871
19		\$ 32,947		\$32,947
20		\$ 34,059		\$34,059
21		\$ 35,208	\$ 12,045,248	\$12,080,456
22		\$ 36,396		\$36,396
23		\$ 37,624	\$ 179,932	\$217,556
24		\$ 38,894		\$38,894
25		\$ 40,206		\$40,206
26		\$ 41,563		\$41,563
27		\$ 42,965		\$42,965
28		\$ 44,415		\$44,415
29		\$ 45,914		\$45,914
30		\$ 47,463		\$47,463

Present value of O&M \$6,758,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 6,000,000	\$ 14,000,000	\$ 35,212,481	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$3,239,000	\$6,047,000	\$22,814,000	\$32,100,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

55,038,000

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5C	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikoloa Area							
- 1 COH WWTP							
- West Waikoloa WWTP	Gravity Sewer 8 inch	182,121	LF			\$ 1,600	\$ 291,393,264
	Gravity Sewer 12 inch	6,978	LF			\$ 3,070	\$ 21,422,184
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch	1,444	LF			\$ 900	\$ 1,299,573
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS	-	EA			\$ 7,000,000	\$ -
	Neighborhood PS	1	EA			\$ 1,200,000	\$ 1,200,000
	COH West Waikoloa WWTP, level of treatment - R1		LS			\$ 16,660,800	\$ 16,660,800
	Subtotal of Estimated Construction Cost						\$ 331,975,821
	Right of Way	180	Ac			\$ 20,000	\$ 3,609,737
	Contingency	20%					\$ 67,117,112
	Total Estimated Project Cost						\$ 402,702,669
	Project services		20%				\$ 80,540,534
	TOTAL CAPITAL COST						\$ 483,243,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$80,408
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$774,872
Annual O&M					\$855,280

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 884,140		\$884,140
2		\$ 913,973		\$913,973
3		\$ 944,813		\$944,813
4		\$ 976,694		\$976,694
5		\$ 1,009,651		\$1,009,651
6		\$ 1,043,720		\$1,043,720
7		\$ 1,078,938		\$1,078,938
8		\$ 1,115,344		\$1,115,344
9		\$ 1,152,980		\$1,152,980
10		\$ 1,191,885		\$1,191,885
11		\$ 1,232,102		\$1,232,102
12		\$ 1,273,677		\$1,273,677
13		\$ 1,316,655		\$1,316,655
14		\$ 1,361,083		\$1,361,083
15		\$ 1,407,010		\$1,407,010
16		\$ 1,454,487		\$1,454,487
17		\$ 1,503,565		\$1,503,565
18		\$ 1,554,300		\$1,554,300
19		\$ 1,606,747		\$1,606,747
20		\$ 1,660,964		\$1,660,964
21		\$ 1,717,010	\$ 10,756,888	\$12,473,898
22		\$ 1,774,947		\$1,774,947
23		\$ 1,834,839	\$ 2,647,382	\$4,482,221
24		\$ 1,896,752		\$1,896,752
25		\$ 1,960,754		\$1,960,754
26		\$ 2,026,916		\$2,026,916
27		\$ 2,095,310		\$2,095,310
28		\$ 2,166,012		\$2,166,012
29		\$ 2,239,100		\$2,239,100
30		\$ 2,314,654		\$2,314,654

Present value of O&M

\$32,651,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 5,358,240	\$ 12,502,560	\$ 314,115,021	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$2,893,000	\$5,400,000	\$203,514,000	\$211,807,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)**304,087,000**

JOB #: South Kohala Wastewater Master Plan
 DATE: June 8, 2024
 LOCATION: South Kohala, County of Hawaii
 PREPARED BY: J. Fahmie/T. Huang/A. Fung

AECOM
 Construction Cost Estimate
 Conceptual Level
 Wastewater Master Plan Estimates

Alternative 5C	DESCRIPTION Level of Treatment - R1	QUAN	UN			UNIT COST	TOTAL DIRECT COST
Waikii Area							
- 1 COH WWTP							
- Waikii WWTP	Gravity Sewer 8 inch	46,361	LF			\$ 1,600	\$ 74,178,272
	Gravity Sewer 12 inch		LF			\$ 3,070	\$ -
	Gravity Sewer 16 inch		LF			\$ 5,800	\$ -
	Gravity Sewer 18 inch		LF			\$ 6,525	\$ -
	Gravity Sewer 24 inch		LF			\$ 8,700	\$ -
	Gravity Sewer 30 inch	-	LF			\$ 10,875	\$ -
	Gravity Sewer 36 inch	-	LF			\$ 13,050	\$ -
	Gravity Sewer 42 inch	-	LF			\$ 15,200	\$ -
	Force main 4 inch	-	LF			\$ 600	\$ -
	Force main 6 inch		LF			\$ 900	\$ -
	Force main 8 inch		LF			\$ 1,600	\$ -
	Force main 10 inch		LF			\$ 1,700	\$ -
	Force main 12 inch		LF			\$ 3,070	\$ -
	Force main 14 inch		LF			\$ 4,430	\$ -
	Force main 16 inch	-	LF			\$ 5,800	\$ -
	Force main 18 inch	-	LF			\$ 6,525	\$ -
	Force main 24 inch	-	LF			\$ 8,700	\$ -
	Force main 30 inch	-	LF			\$ 10,875	\$ -
	Force main 36 inch	-	LF			\$ 13,050	\$ -
	Force main 42 inch	-	LF			\$ 15,200	\$ -
	Regional PS		EA			\$ 7,000,000	\$ -
	Neighborhood PS		EA			\$ 1,200,000	\$ -
	COH Waikii WWTP, level of treatment - R1		LS			\$ 8,191,560	\$ 8,191,560
	Subtotal of Estimated Construction Cost						\$ 82,369,832
	Right of Way	47	Ac			\$ 20,000	\$ 931,449
	Contingency	20%					\$ 16,660,256
	Total Estimated Project Cost						\$ 99,961,538
	Project services		20%				\$ 19,992,308
	TOTAL CAPITAL COST						\$ 119,954,000

O&M

	Item	QUAN	UN	Unit cost	Total Annual
	R3 level of treatment annual O&M				\$4,661
	R1 level of treatment additional annual O&M (\$0.137M/mgd/yr)				\$45,662
Annual O&M					\$50,323

Year	Year	Annual \$	Additional Cost	Total
0		\$ -		\$ -
1		\$ 52,021		\$52,021
2		\$ 53,776		\$53,776
3		\$ 55,591		\$55,591
4		\$ 57,466		\$57,466
5		\$ 59,406		\$59,406
6		\$ 61,410		\$61,410
7		\$ 63,482		\$63,482
8		\$ 65,624		\$65,624
9		\$ 67,839		\$67,839
10		\$ 70,128		\$70,128
11		\$ 72,494		\$72,494
12		\$ 74,940		\$74,940
13		\$ 77,469		\$77,469
14		\$ 80,083		\$80,083
15		\$ 82,785		\$82,785
16		\$ 85,579		\$85,579
17		\$ 88,466		\$88,466
18		\$ 91,451		\$91,451
19		\$ 94,537		\$94,537
20		\$ 97,727		\$97,727
21		\$ 101,025	\$ 4,933,469	\$5,034,493
22		\$ 104,434		\$104,434
23		\$ 107,958	\$ 649,060	\$757,018
24		\$ 111,601		\$111,601
25		\$ 115,366		\$115,366
26		\$ 119,259		\$119,259
27		\$ 123,283		\$123,283
28		\$ 127,443		\$127,443
29		\$ 131,744		\$131,744
30		\$ 136,189		\$136,189

Present value of O&M \$4,350,000

Residual Value

Item Description	Electrical/ Motorized Equipment	Pipes, valves, hydraulic structure, etc	Gravity Sewer/New Force Main	
Present Cost	\$ 2,457,468	\$ 5,734,092	\$ 74,178,272	
Design Life (Years)	20	50	75	
Residual Value at End of Design Life	\$0	\$0	\$0	
Effective Interest Rate	-0.26%	-0.26%	-0.26%	
Planning Cycle (Years)	30	30	30	
Remaining Life	10	20	45	
Present Value of Residual Value	\$1,327,000	\$2,477,000	\$48,060,000	\$51,864,000

NET PRESENT Value (Total Capital Cost + Net Present Value of O&M - Residual Value)

72,440,000

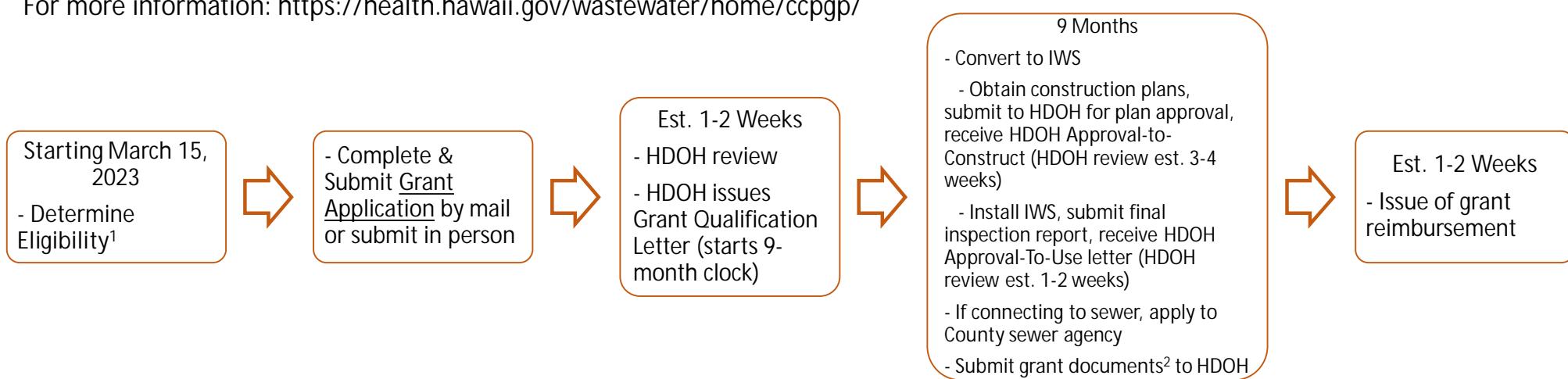
Appendix H:
Overview of State of Hawaii
Department of Health Cesspool Pilot
Grant Program

Appendix H

Overview of State of Hawaii Department of Health Cesspool Pilot Grant Program

Overview: HDOH Cesspool Pilot Grant Program

- Up to \$20,000 in reimbursements per applicant
- First-come, first-served basis
- Note: 9 months requirement to complete conversion or connection (based on expiration of funds that HDOH receives)
- For more information: <https://health.hawaii.gov/wastewater/home/ccpgp/>



¹ Eligibility Requirements

- a) Applicant must be owner of real property or DHHL lessee.
- b) Cesspool must be in Priority Level 1 or 2 (see Slide 2).
- c) Household income for most recent closed taxable year must be less than 140% of the area median income (see Slide 3).
- d) Cesspools upgraded/converted with Approval-To-Use date or connected to sewer before 7/1/2022 are *not* eligible.

² Grant Documents

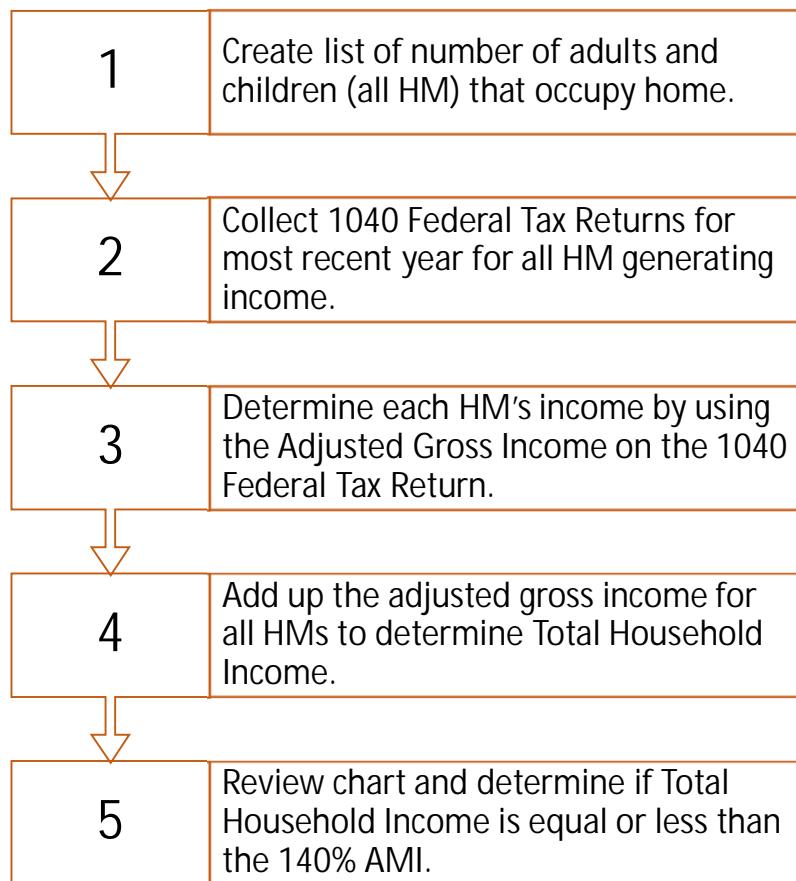
- a) Design plans prepared by HI-licensed engineer (must comply with HAR 11-62 or utility standards for sewer connection) and approved by HDOH
- b) Engineer's final construction inspection report w/photos, as-builts, certifications
- c) Copy of Approval-To-Use letter from HDOH
- d) Receipts of payment made to engineer and contractor

Step B of Eligibility Criteria: Determine Cesspool Priority

- Areas shaded in red are Priority 1 or 2
- <https://histategis.maps.arcgis.com/apps/webappviewer/index.html?id=8708c5c6d0404d299de2139348442a3a>
- Can also look up by TMK
- https://health.hawaii.gov/wastewater/files/2023/02/EligibleTMKList_Hawaii.pdf



Step C of Eligibility Criteria: Determine Area Median Income



HM: household member

2021 - 140% Area Median Income (AMI)								
	Family Size (# of Persons)							
	1	2	3	4	5	6	7	8
Hawaii County	\$84,000	\$95,900	\$107,940	\$119,840	\$129,500	\$139,020	\$148,680	\$158,200
Maui County	\$101,360	\$115,780	\$130,200	\$144,620	\$156,240	\$167,860	\$179,340	\$190,960
Kauai County	\$99,960	\$106,080	\$119,340	\$132,470	\$143,130	\$153,790	\$164,320	\$174,980
City & County of Honolulu	\$118,440	\$135,380	\$152,320	\$169,120	\$182,700	\$196,280	\$209,720	\$223,300

2022 - 140% Area Median Income (AMI)								
	Family Size (# of Persons)							
	1	2	3	4	5	6	7	8
Hawaii County	\$93,380	\$106,680	\$119,980	\$133,280	\$144,060	\$154,700	\$165,340	\$175,980
Maui County	\$111,860	\$127,820	\$143,780	\$159,740	\$172,620	\$185,360	\$198,100	\$210,980
Kauai County	\$111,720	\$127,680	\$143,340	\$159,600	\$172,480	\$185,220	\$197,960	\$210,700
City & County of Honolulu	\$128,100	\$146,300	\$164,640	\$182,840	\$197,540	\$212,000	\$226,800	\$241,360