KAUA'I WATER USE AND DEVELOPMENT PLAN UPDATE

Hawai'i Water Plan

Prepared for the:

County of Kaua'i
Department of Water

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Final Report

CHAPTERS

APPENDIX

LIST OF ABBREVIATIONS

ADC	Agribusiness Development Corporation
ASEA	Aquifer Sector Area
ASYA	Aquifer System Area
AWUDP	Agricultural Water Use and Development Plan
the Code	The State Water Code
CP	Community Plan
CZO	Comprehensive Zoning Ordinance
CWRM	Commission on Water Resource Management
DAGS	State of Hawai‘i, Department of Accounting and General Services
DBEDT	State of Hawai‘i, Department of Business and Economic Development and Tourism
DHHL	State of Hawai‘i, Department of Hawaiian Home Lands
DLNR	State of Hawai‘i, Department of Land and Natural Resources
DOA	State of Hawai‘i, Department of Agriculture
DOE	State of Hawai‘i, Department of Education
DOFAW	State of Hawaii, Department of Land and Natural Resources, Division of Forestry and Wildlife
DOH	State of Hawai‘i, Department of Health
DOT	State of Hawai‘i, Department of Transportation
DOW	County of Kaua‘i, Department of Water
DPS	State of Hawaii, Department of Public Safety
EKIS	East Kaua‘i Irrigation System
GAL	Gallon
GIS	Geographic Information Systems
GP	County of Kaua‘i, General Plan
GPD	Gallons per day
GPM	Gallons per minute
HAR	Hawai‘i Administrative Rules
HCDC	State of Hawaii, Housing and Community Development Corporation
HRS	Hawai‘i Revised Statutes
HSA	Hawaii Stream Assessment
IAL	Important Agricultural Land
IS	Irrigation System
KAA	Kekaha Agriculture Association
KEDIS	Kekaha Ditch Irrigation System
KISC	Kaua‘i Invasive Species Committee
KIUC	Kaua‘i Island Utility Cooperative
KODIS	Kōke‘e Ditch Irrigation System
KWA	Kaua‘i Watershed Alliance

KWUDP	Kaua'i Water Use and Development Plan
LUC	Land Use Commission
MAV	Moving Average
MG	Million gallons
MGD	Million gallons per day
NAVFAC	Naval Facilities Engineering Command
PMRF	Pacific Missile Range Facility
PRV	Pressure Reducing Valve
PWS	Public Water System
SLH	Session Laws of Hawaii
SLUC	State Land Use Classification
SWPP	State Water Projects Plan
SY	Sustainable Yield
T&C	Traditional and Customary
TBD	To be determined
USGS	United States Geological Survey
WQP	Water Quality Plan
WRPP	Water Resource Protection Plan
WS	Water System
WSS	Water System Standards
WTP	Water Treatment Plant
WUDP	Water Use and Development Plan
WRF	Water Reclamation Facility
WWRF	Wastewater Reclamation Facility
WWTP	Wastewater Treatment Plant

ES EXECUTIVE SUMMARY

ES-1 INTRODUCTION

The 1987 State Legislature enacted into law Hawai'i Revised Statutes, Chapter 174C - State Water Code to protect Hawai'i's surface and ground water resources. The State Water Code (the Code) called for the establishment of a Commission on Water Resource Management (CWRM) to oversee the general administration of the Code. The Code also calls for the preparation of a Hawai'i Water Plan to serve as a dynamic, long-range planning guide for the CWRM.

The Hawai'i Water Plan consists of five parts:

Table ES-1 Hawai'i Water Plan Components

Component	Responsible Agency
Water Resource Protection Plan (WRPP)	State Department of Land and Natural Resources (DLNR), CWRM
Water Quality Plan (WQP)	State Department of Health
State Water Projects Plan (SWPP)	DLNR, Engineering Division
Agricultural Water Use and Development Plan (AWUDP)	State Department of Agriculture
County Water Use and Development Plans (WUDP) [1]	County Department of Water Supply [1]

In compliance with the Code, each of the four Counties is tasked with the development of its own WUDP. The primary objective of the WUDP is to set forth the allocation of water to land use to guide the county in its planning, management, and development of land use and water resource strategies and policies for sustainable development. As stipulated in Hawai'i Administrative Rules §13-170-31, the County WUDP shall include, but not be limited to:

(1) Status of water and related land development including an inventory of existing water uses for domestic, municipal, and industrial users, agriculture, aquaculture, hydropower development, drainage, reuse, reclamation, recharge, and resulting problems and constraints;

(2) Future land uses and related water needs; and

(3) Regional plans for water developments including recommended and alternative plans, costs, adequacy of plans, and relationship to the water resource protection and water quality plans.

The original Kaua'i WUDP was adopted by Kaua'i County ordinance on April 27, 1990. The CWRM conditionally accepted the WUDP on June 27, 1990 for incorporation into the Hawai'i

[1] A separate WUDP is to be prepared by each of the four Counties. The AWUDP was added to the Hawai'i Water Plan by mandate under Act 101, Session Laws of Hawai'i (SLH) 1998, by the State Legislature.

Water Plan. The key condition stipulated that the WUDP was to be reviewed and revised as necessary by the County to coincide with the review process of the Hawai'i Water Plan.

The Statewide Framework for Updating the Hawai'i Water Plan (Framework), dated February 2000, was created by the CWRM to facilitate coordination, integration, and consistency for preparing/ updating of the various components of the Hawai'i Water Plan. In addition, the Framework provides guidelines for the preparation of WUDP updates to ensure its effective implementation by the County and utilization by the CWRM for resource management purposes.

The Framework requires data and analyses to be based on ground water and surface water hydrologic units designated by the CWRM. There are thirteen aquifer system areas (ASYAs) on the island of Kaua'i. **Figure ES-1** shows the ASYAs and indicates the sustainable yield of each ASYA.

As provided for in the Code, sustainable yield (SY) is defined as "the maximum rate at which water may be withdrawn from a water source without impairing the utility or quality of the water source as determined by the commission."

As further defined and described in the WRPP:

> The amount of ground water that can be developed in any Hawai'i aquifer is limited by the amount of natural recharge. Additionally, not all natural recharge an aquifer receives can be developed. Some aquifer outflow or leakage must be maintained to prevent seawater intrusion or to maintain some perennial streamflow. Therefore, the SY of an aquifer normally represents a percentage of the natural recharge.
>
> The estimation of aquifer SYs is not an exact science. Insufficient hydrologic, geologic, and meteorological data require the estimation of critical input parameters in any SY model. Differences in estimates of these input parameters and in how they are incorporated in a model can produce a wide range in predicted SY values for a given aquifer.
>
> Given the range of predicted SYs for each aquifer, and the inherent uncertainty in each prediction, CWRM has applied the precautionary principle in selecting SYs for adoption in the WRPP. As the WRPP is a living document, SYs will be re-estimated continually based on the best information available as new information is acquired with time.

This WUDP presents data and analyses by ASYA, with a chapter dedicated to each ASYA. Since surface water hydrologic units and ground water hydrologic units are well-correlated, surface water data and analyses are also presented based on ASYAs.

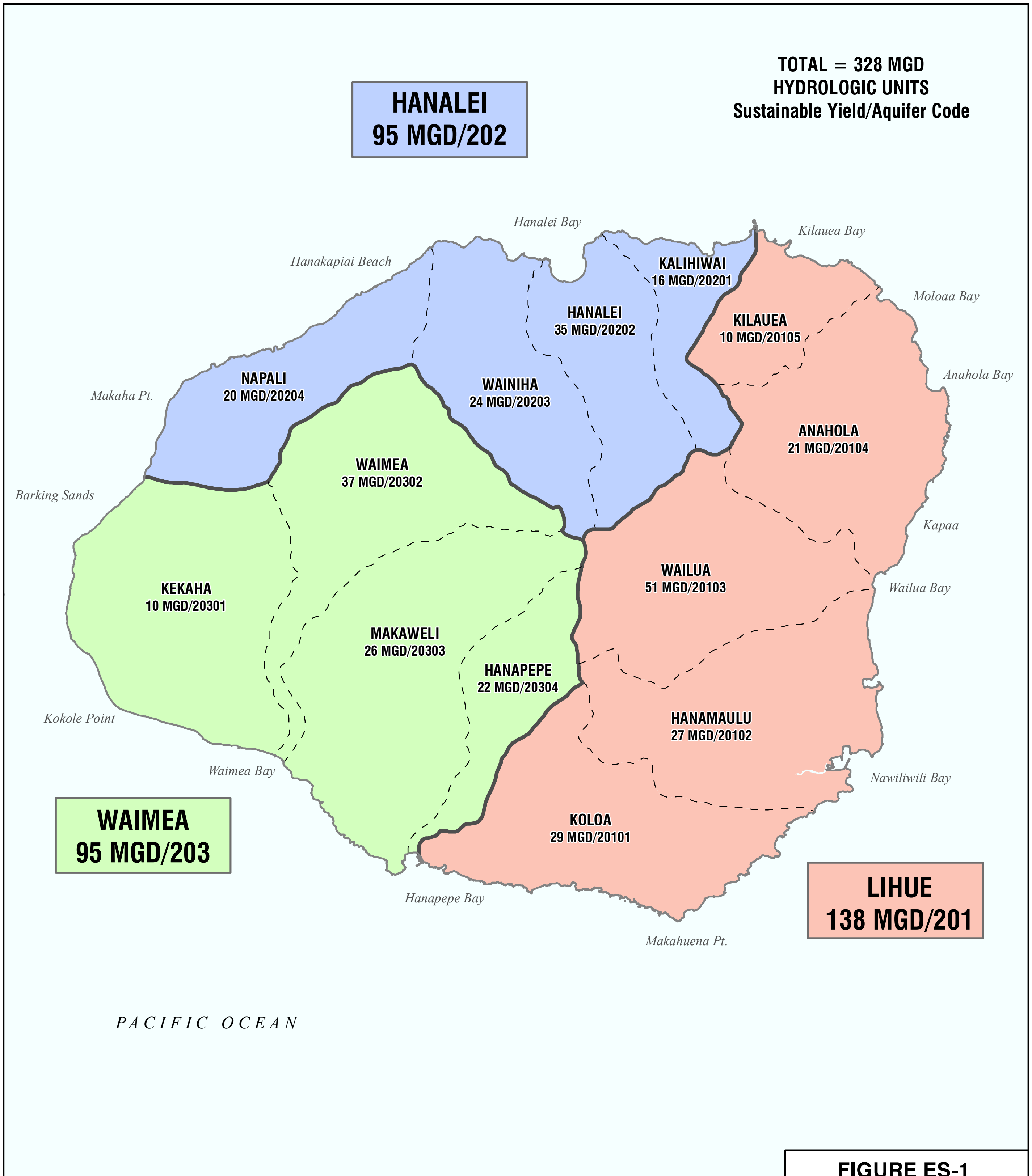
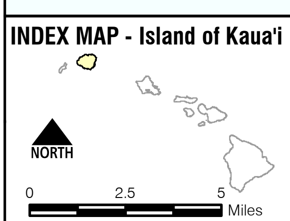


FIGURE ES-1



LEGEND:

Aquifer Sector Areas

Aquifer System Areas

Aquifer System Areas and Sustainable Yields

ES-2 METHODOLOGY

Each ASYA was evaluated using the following methodology.

ES-2.1 Existing Water Resources

Water resources that are currently being utilized and were examined in this report included the following:

- Ground water
- Surface water
- Rainwater catchment
- Recycled water

ES-2.2 Existing Water Use

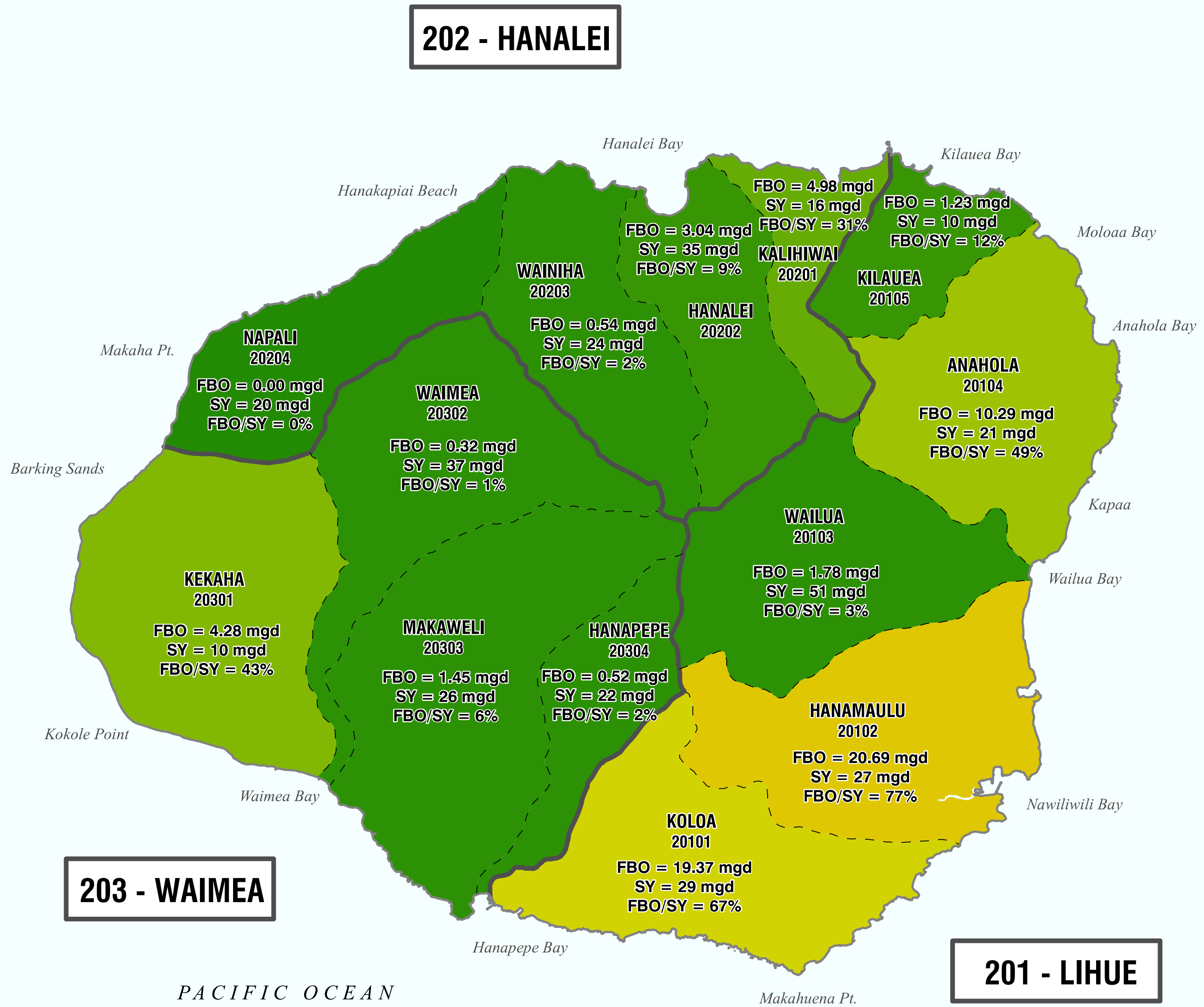
Existing water use for each ASYA was summarized based on information from the CWRM well database, Department of Health (DOH) Sanitary Surveys for Public Water Systems, and DOH estimated recycled water usage data.

ES-2.3 Future Water Use

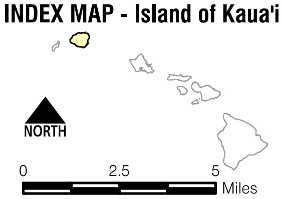
Water resource planning for this Kaua'i WUDP update considers both land use based water demand projections and rate of population growth to develop estimates of future water needs. Land use based evaluations provide full build-out projections, or the ultimate water needs, if the maximum density allowed is developed. When compared to SY, it is possible to assess the sustainability of land use policies in terms of meeting the water needs associated with the potential full build-out development. Incremental water needs for the next 20 years are based on population and growth rate projections. A distinct difference between the scenarios is that the land use based projections are based on planning level standards, while the 20-year projections are based on actual consumption. See **Section 2.2** for more information on the approach to estimating future water use.

ES-2.3.1 Full Build-Out Water Demand Projections

Full build-out water demand projections are land use based and provides an estimate of the maximum water needs anticipated if all land is developed to the highest extent allowed by current land use policies set by the State of Hawai'i and County of Kaua'i. Maximum development, in terms of unit counts and land area, is determined from land use policies. Full build-out demand is determined by multiplying these unit counts and land areas by appropriate water use rates. Comparing these projections to the SYs of each ASYA identifies areas where water resources are more than adequate to support maximum demands, thereby providing guidance for future assessments to focus efforts on the more sensitive areas. It is also noted that the full build-out scenarios are unlikely to occur because it assumes that all land area is developed to the maximum density allowed, including redevelopment of existing developed areas. See **Figure ES-2** and **Figure ES-3** for the general plan and zoning full build-out water demand as compared to the sustainable yield for each ASYA, respectively.



NOTE: The General Plan full build-out demand projections are conservative and are unlikely to be realized as it assumes that all land area is developed to the maximum density allowed. This includes the development of areas that are undevelopable (e.g. due to topography and roads/highways), and the redevelopment of underdeveloped parcels.



LEGEND:

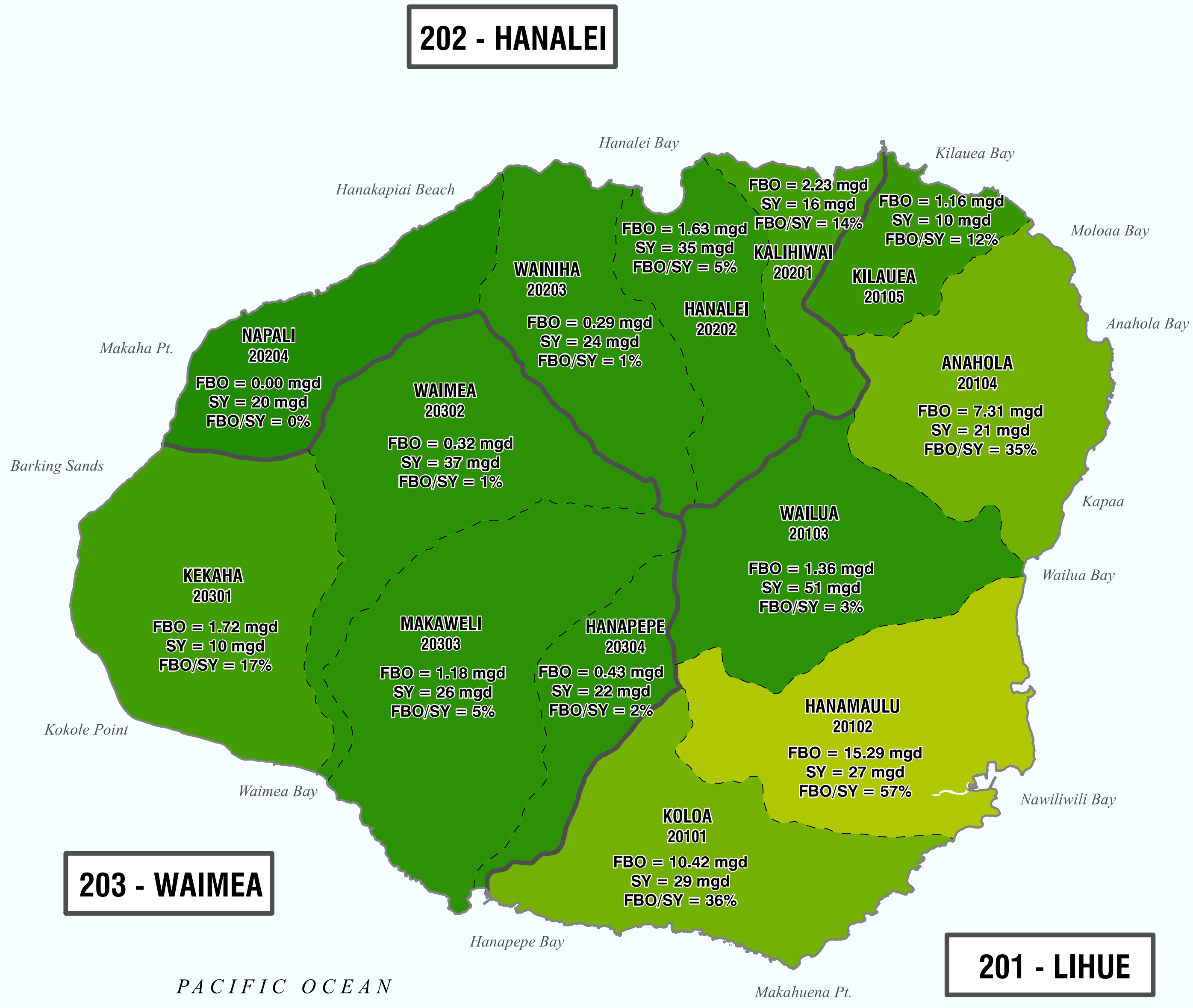
Aquifer Sector Areas

Aquifer System Areas

FBO/SY = 0%-100%

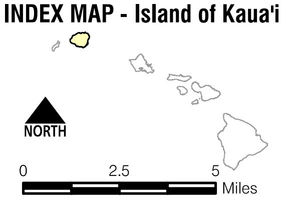
FIGURE ES-2

GENERAL PLAN FULL BUILD OUT VS. SUSTAINABLE YIELD



NOTE: The Zoning full build-out demand projections are conservative and are unlikely to be realized as it assumes that all land area is developed to the maximum density allowed. This includes the development of areas that are undevelopable (e.g. due to topography and roads/highways), and the redevelopment of underdeveloped parcels.

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- FBO/SY = 0%-100%

FIGURE ES-3

ZONING FULL BUILD OUT VS. SUSTAINABLE YIELD

Full build-out water demands were computed based on the County's General Plan, community plans, and Comprehensive Zoning Ordinance (CZO).

The full build-out water demand based on the General Plan is used to determine if there are adequate water resources to sustain the long-range land use vision adopted by the County.

Community development plans establish more detailed policy than the General Plan. Full build-out water demand was calculated for the Līhuʻe Community Plan and the South Kauaʻi Community Plan. The General Plan full build-out water demand projections were refined by these community plan demands where applicable.

The CZO is the County's legal instrument that regulates land development, and implements the General Plan policies; therefore, zoning must be consistent with the General Plan. The full build-out water demand based on County Zoning is used to determine if there are adequate water resource to sustain the level of development that is allowed by law. County Zoning is more detailed and precise than the General Plan.

See **Section 2.2.2** for more information on the approach to full build-out water demand projections.

ES-2.3.2 Water Demand Projections to the Year 2035

Existing water use is the basis of computing the water demand projections to the year 2035. Water demand to the year 2035 is projected by applying the population growth rate to existing water demand. See **Section 2.2.3** for more information on the approach to water demand projections to the year 2035.

ES-2.3.3 Agricultural Water Use

Agricultural water use is difficult to determine due to the lack of available data. The AWUDP, dated December 2003 and revised December 2004, was limited in scope due to time and funding constraints. More recent, comprehensive information on agricultural lands is available in the County of Kauai Important Agricultural Lands Study and is relied on as the best available information for estimating agricultural water use. The study evaluated agricultural lands for eight criteria. This WUDP compares agricultural lands that met all eight criteria to the diversified water use rate of 3,400 gallons per acre per day (gpad) estimated in the AWUDP.

The State of Hawaiʻi, Department of Agriculture (DOA) is currently updating the AWUDP, and its information will supersede the agricultural water use information included in this WUDP when it becomes available.

ES-2.4 Resource and Facility Recommendations

Several water resource enhancement measures were examined to meet the projected water demands. These include conventional supply-side measures (i.e., ground water and surface water development), water conservation, alternative supply-side measures (i.e., rainwater catchment, storm water reuse, recycled water, and desalination), and demand-side management such as development density control (reevaluation of land use policies to ensure that the planned development density can be sustained). The feasibility of these water resource enhancement options was compared to provide a recommended combination of measures.

ES-3 AQUIFER SYSTEM AREA SYNOPSES

A brief synopsis of each ASYA follows; refer to **Figure ES-1** for the ASYA boundaries.

20101 – Kōloa Aquifer System Area

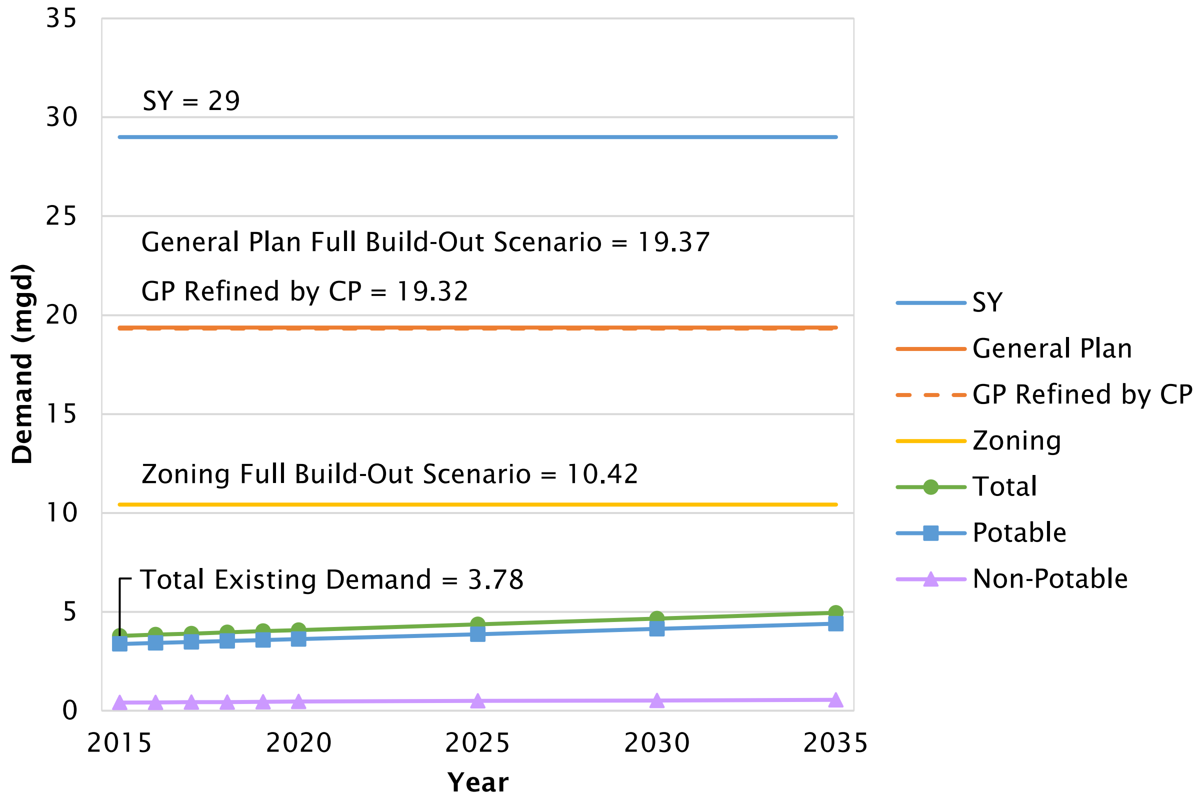
Development to the highest extent allowed by the General Plan and County Zoning within the Kōloa ASYA is sustainable. The 2035 water demand projection for the Kōloa ASYA is also sustainable.

Implementation of conservation measures should continue to be encouraged. See **Section 1.5.7** for conservation measures.

Alternative water sources, such as recycled water generated from wastewater reclamation facilities, should be used where available to reduce demands on both ground and surface water resources and to conserve water resources as a whole. Recycled water is available from the Poʻipū Water Reclamation Facility (WRF) and Grand Hyatt Wastewater Reclamation Facility (WWRF). Ground water resources could continue to be used and developed to meet potable water needs now and into the future and is the primary strategy to serve future potable demands in the Kōloa ASYA. Surface water, where available, should be used to meet non-potable demands in lieu of groundwater.

Demand-side management, such as development density control, is not needed based on the full build-out projections. Although the full build-out projections are sustainable, the County Planning Department will need to consider potential impacts on available water resources when considering any future zoning modifications. Modifications that may result in increased development density within the area will increase demands on water resources.

Medium Growth Rate B Water Demand Projections and Full Build Out – Kōloa ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use. For future agricultural water use analysis, please see Section 20101-4.1.1 County of Kaua'i Important Agricultural Lands Study.

20102 – Hanamāʻulu Aquifer System Area

Development to the highest extent allowed by the General Plan and County Zoning within the Hanamāʻulu ASYA is sustainable. The 2035 water demand projection for the Hanamāʻulu ASYA is also sustainable.

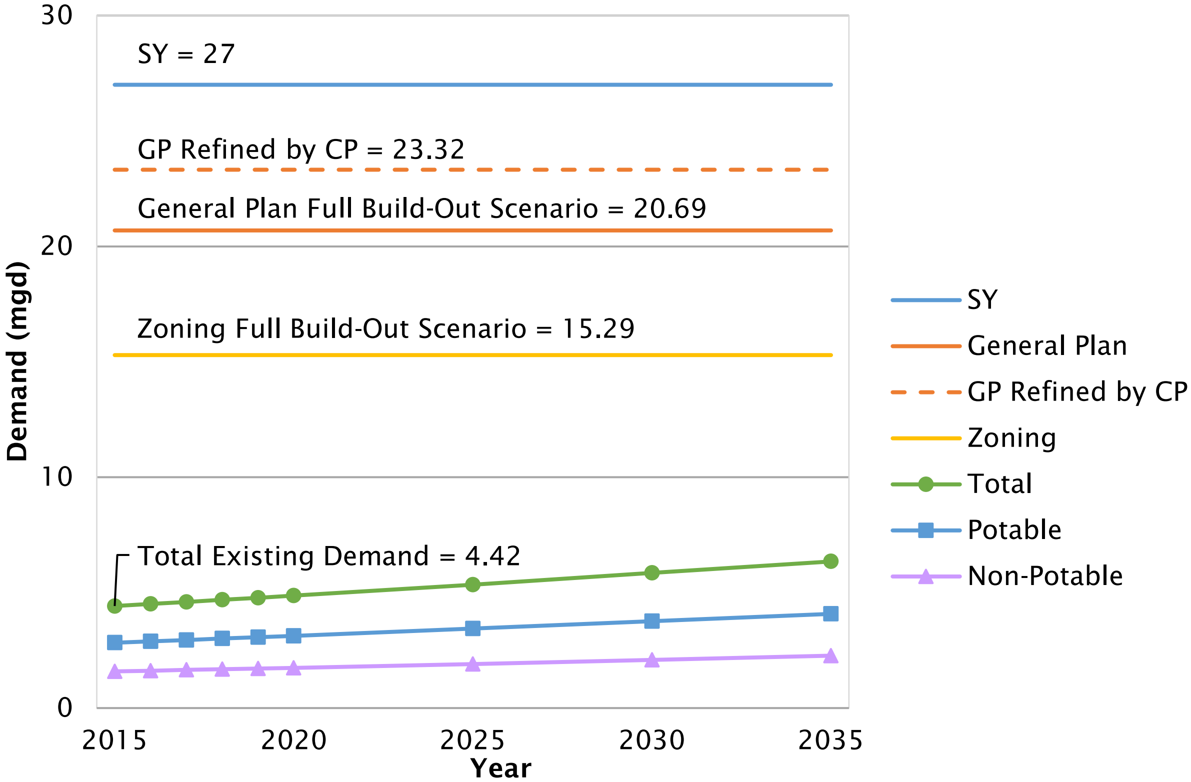
Implementation of conservation measures should continue to be encouraged. See **Section 1.5.7** for conservation measures.

Alternative water sources, such as recycled water generated from wastewater reclamation facilities and storm water reuse, should be used where available to reduce demands on both ground and surface water resources and to conserve water resources as a whole. Recycled water is available from the Līhuʻe Wastewater Reclamation Facility (WWRF), Līhuʻe-Puhi Wastewater Treatment Plant (WWTP), and Wailua WWRF. Two areas within the Hanamāʻulu ASYA were identified in the U.S. Department of the Interior, Bureau of Reclamation's Appraisal of Stormwater Reclamation and Reuse Opportunities in Hawaiʻi Report[2] to have the opportunity to use utilize storm water reclamation and reuse. However, storm water infrastructure would need to be developed to treat and convey the storm water for reuse. Ground water is typically the preferred source for drinking water and for meeting other potable water needs. However, developing ground water in this area has historically been difficult, and there have been concerns about the future reliability of ground water resources. Further study and monitoring could assist in determining if more ground water development is viable. Surface water in the Hanamāʻulu ASYA also serves potable uses due to the difficulties with ground water well production in the area. Expansion of the surface water treatment plant is proposed by Grove Farm to meet the projected demands of its Līhuʻe-Hanamāʻulu Master Planned Community. Surface water, where available, should also be used to meet non-potable demands in lieu of ground water.

Demand-side management, such as development density control, is not needed based on the full build-out projections. Although these projections are sustainable, the County Planning Department should exercise caution and consider potential impacts on available water resources when considering any future zoning modifications. Modifications that may result in increased development density within the area will increase demands on water resources.

[2] https://files.hawaii.gov/dlnr/cwrm/planning/hsrar_element3.pdf (link active as of June 2024)

Medium Growth Rate B Water Demand Projections and Full Build Out – Hanamāʻulu ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use. For future agricultural water use analysis, please see Section 20102-4.1.1 County of Kaua'i Important Agricultural Lands Study.

20103 – Wailua Aquifer System Area

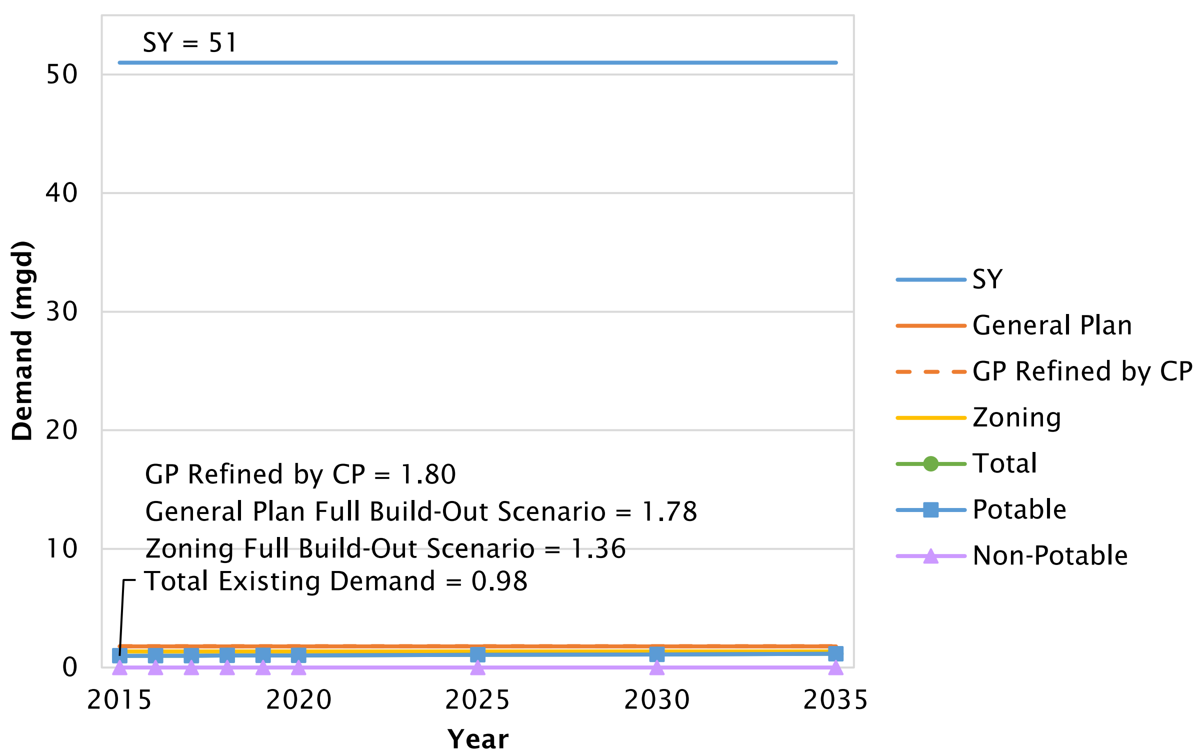
Development to the highest extent allowed by the General Plan and County Zoning within the Wailua ASYA is sustainable. The 2035 water demand projection for the Wailua ASYA is also sustainable.

Implementation of conservation measures should continue to be encouraged. See **Section 1.5.7** for conservation measures.

Use of alternative water sources can reduce demands on both ground water and surface water resources and conserve water resources as a whole. However, aside from rainwater, there are no available alternative water sources in the area. Ground water is typically the preferred source for drinking water and for meeting other potable water needs. However, it is noted that developing ground water in this area has historically been difficult. Further study and monitoring could assist in determining if more ground water development is viable to meet potable water demands. Surface water, where available, should be used to meet non-potable demands in lieu of ground water.

Demand-side management, such as development density control, is not needed based on the full build-out projections. Although the full build-out projections are sustainable, the County Planning Department will need to consider potential impacts on available water resources when considering any future zoning modifications. Modifications that may result in increased development density within the area will increase demands on water resources.

Medium Growth Rate B Water Demand Projections and Full Build Out – Wailua ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use. For future agricultural water use analysis, please see Section 20103-4.1.1 County of Kaua'i Important Agricultural Lands Study.

20104 – Anahola Aquifer System Area

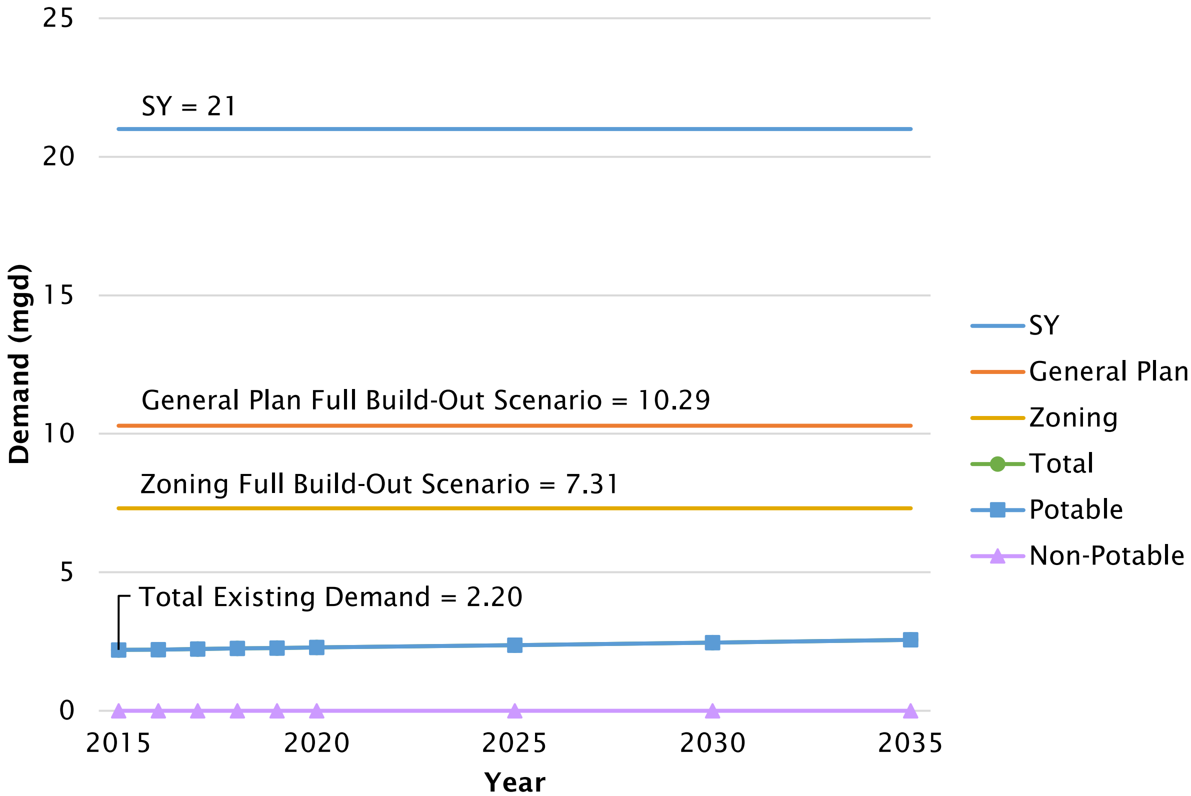
Development to the highest extent allowed by the General Plan and County Zoning within the Anahola ASYA is sustainable. The 2035 water demand projection for the Anahola ASYA is also sustainable.

Implementation of conservation measures should continue to be encouraged. See **Section 1.5.7** for conservation measures.

Use of alternative water sources can reduce demands on both ground water and surface water resources and conserve water resources as a whole. However, aside from rainwater, there are no available alternative water sources in the area. Ground water resources could continue to be used and developed to meet potable water needs now and into the future and is the primary strategy to serve future potable demands in the Anahola ASYA. Surface water, where available, should be used to meet non-potable demands in lieu of ground water.

Demand-side management, such as development density control, is not needed based on the full build-out projections. Although the full build-out projections are sustainable, the County Planning Department will need to consider potential impacts on available water resources when considering any future zoning modifications. Modifications that may result in increased development density within the area will increase demands on water resources.

Medium Growth Rate B Water Demand Projections and Full Build Out – Anahola ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use. For future agricultural water use analysis, please see Section 20104-4.1.1 County of Kaua'i Important Agricultural Lands Study.

20105 – Kīlauea Aquifer System Area

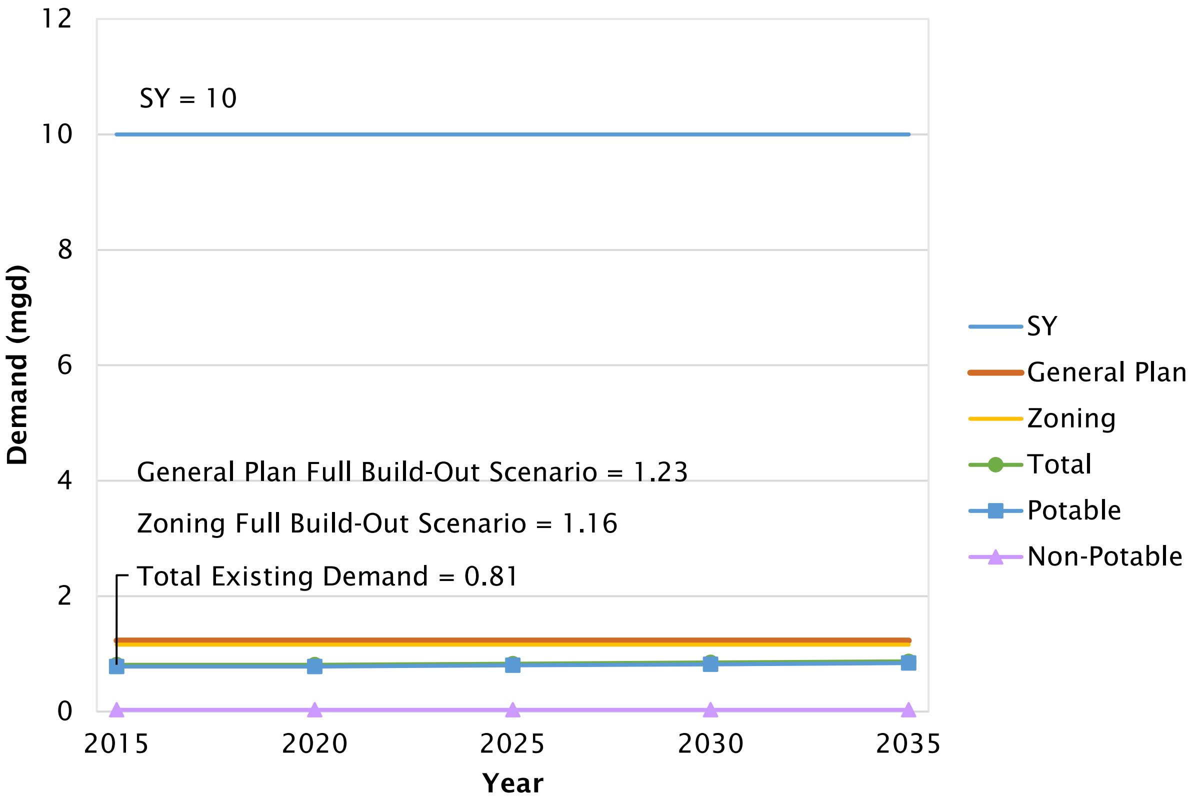
Development to the highest extent allowed by the General Plan and County Zoning within the Kīlauea ASYA is sustainable. The 2035 water demand projection for the Kīlauea ASYA is also sustainable.

Implementation of conservation measures should continue to be encouraged. See **Section 1.5.7** for conservation measures.

Use of alternative water sources can reduce demands on both ground water and surface water resources and conserve water resources as a whole. However, aside from rainwater, there are no available alternative water sources in the area. Ground water resources could continue to be used and developed to meet potable water needs now and into the future and is the primary strategy to serve future potable demands in the Kīlauea ASYA. Ground water is also a significant source of water to meet non-potable agriculture needs in the area. Since the projections of potable water demand are projected to remain low under full build-out conditions, increased used of ground water for agriculture can be accommodated within the sustainable yield. However, it is noted that the sustainable yield of the Kīlauea ASYA is only 10 mgd and caution should be exercised before committing to large quantities of ground water use for agriculture. Further, it is typically recommended that ground water sources be primarily used as potable drinking water for human consumption, and therefore, it is encouraged that other sources of water be explored to meet future agricultural water needs. Surface water, where available, should be used to meet non-potable demands in lieu of ground water.

Demand-side management, such as development density control, is not needed based on the full build-out projections. Although the full build-out projections are sustainable, the County Planning Department will need to consider potential impacts on available water resources when considering any future zoning modifications. Modifications that may result in increased development density within the area will increase demands on water resources.

Medium Growth Rate B Water Demand Projections and Full Build Out – Kīlauea ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use. For future agricultural water use analysis, please see Section 20105-4.1.1 County of Kaua 'i Important Agricultural Lands Study.

20201 – Kalihiwai Aquifer System Area

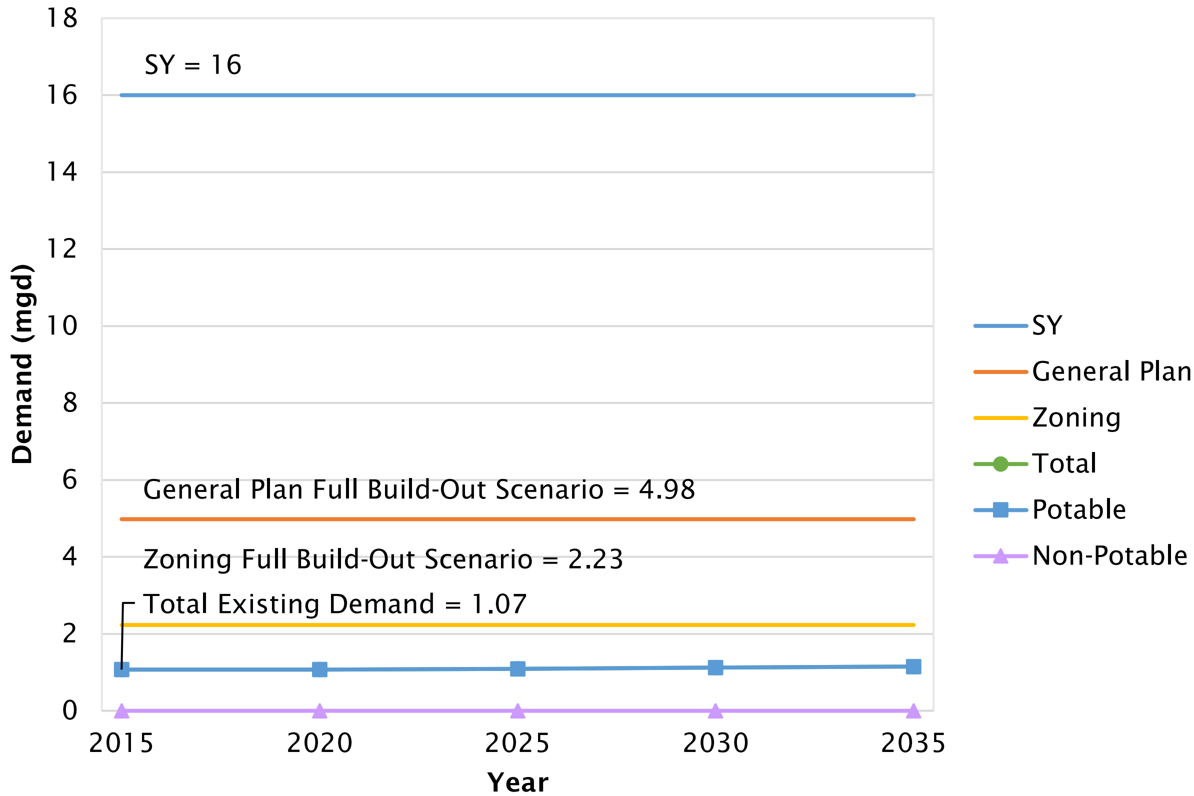
Development to the highest extent allowed by the General Plan and County Zoning within the Kalihiwai ASYA is sustainable. The 2035 water demand projection for the Kalihiwai ASYA is also sustainable.

Implementation of conservation measures should continue to be encouraged. See **Section 1.5.7** for conservation measures.

Use of alternative water sources can reduce demands on both ground water and surface water resources and conserve water resources as a whole. However, aside from rainwater, there are no available alternative water sources in the area. Ground water resources could continue to be used and developed to meet potable water needs now and into the future and is the primary strategy to serve future potable demands in the Kalihiwai ASYA. Surface water, where available, should be used to meet non-potable demands in lieu of ground water.

Demand-side management, such as development density control, is not needed based on the full build-out projections. However, it is noted that the full build-out demand is based on development density of approximately 8 units per acre, and an increase in the average development density will increase demand. Therefore, if an increase in development density is considered, the effect on water demand should be assessed.

Medium Growth Rate B Water Demand Projections and Full Build Out – Kalihiwai ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use. For future agricultural water use analysis, please see Section 20201-4.1.1 County of Kaua'i Important Agricultural Lands Study.

20202 – Hanalei Aquifer System Area

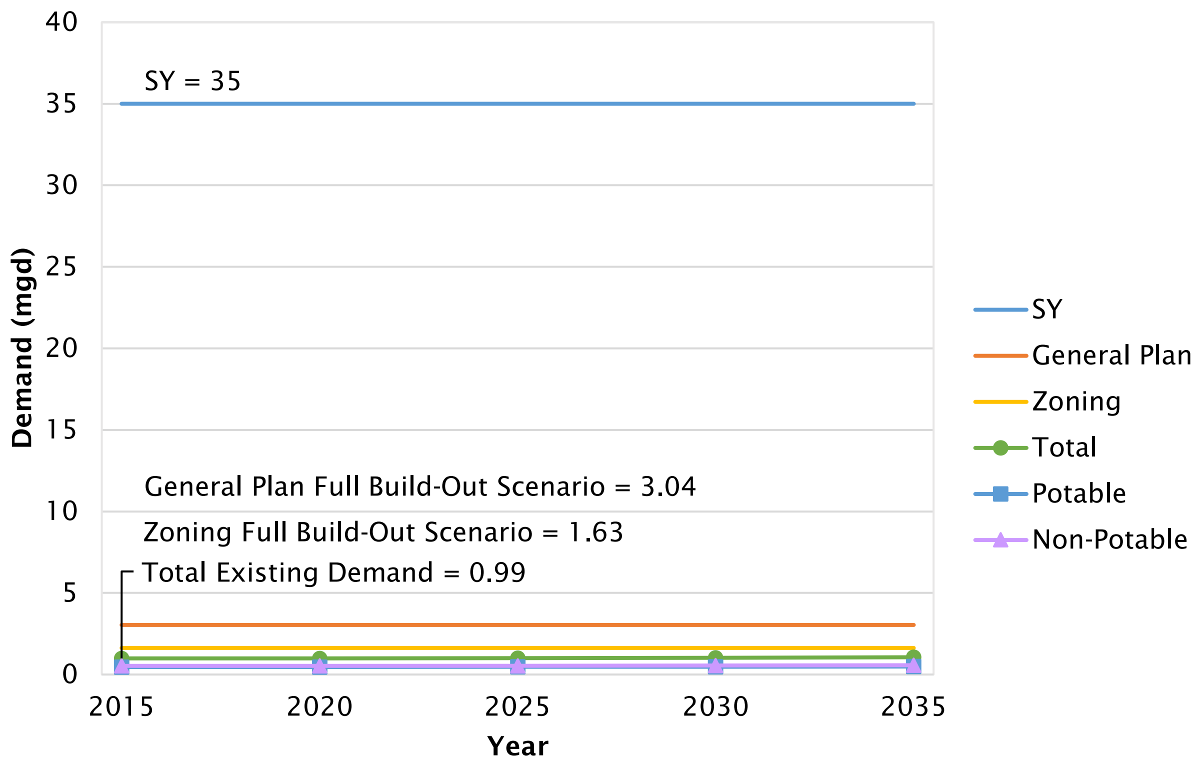
Development to the highest extent allowed by the General Plan and County Zoning within the Hanalei ASYA is sustainable. The 2035 water demand projection for the Hanalei ASYA is also sustainable.

Implementation of conservation measures should continue to be encouraged. See **Section 1.5.7** for conservation measures.

Alternative water sources, such as recycled water generated from wastewater reclamation facilities, should be used where available to reduce demands on both ground and surface water resources and to conserve water resources as a whole. Recycled water is available from the Princeville Wastewater Reclamation Facility (WWRF). Ground water resources could continue to be used and developed to meet potable water needs now and into the future and is the primary strategy to serve future potable demands in the Hanalei ASYA. Surface water, where available, should be used to meet non-potable demands in lieu of ground water.

Demand-side management, such as development density control, is not needed based on the full build-out projections.

Medium Growth Rate B Water Demand Projections and Full Build Out – Hanalei ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use. For future agricultural water use analysis, please see Section 20202-4.1.1 County of Kaua'i Important Agricultural Lands Study.

20203 – Wainiha Aquifer System Area

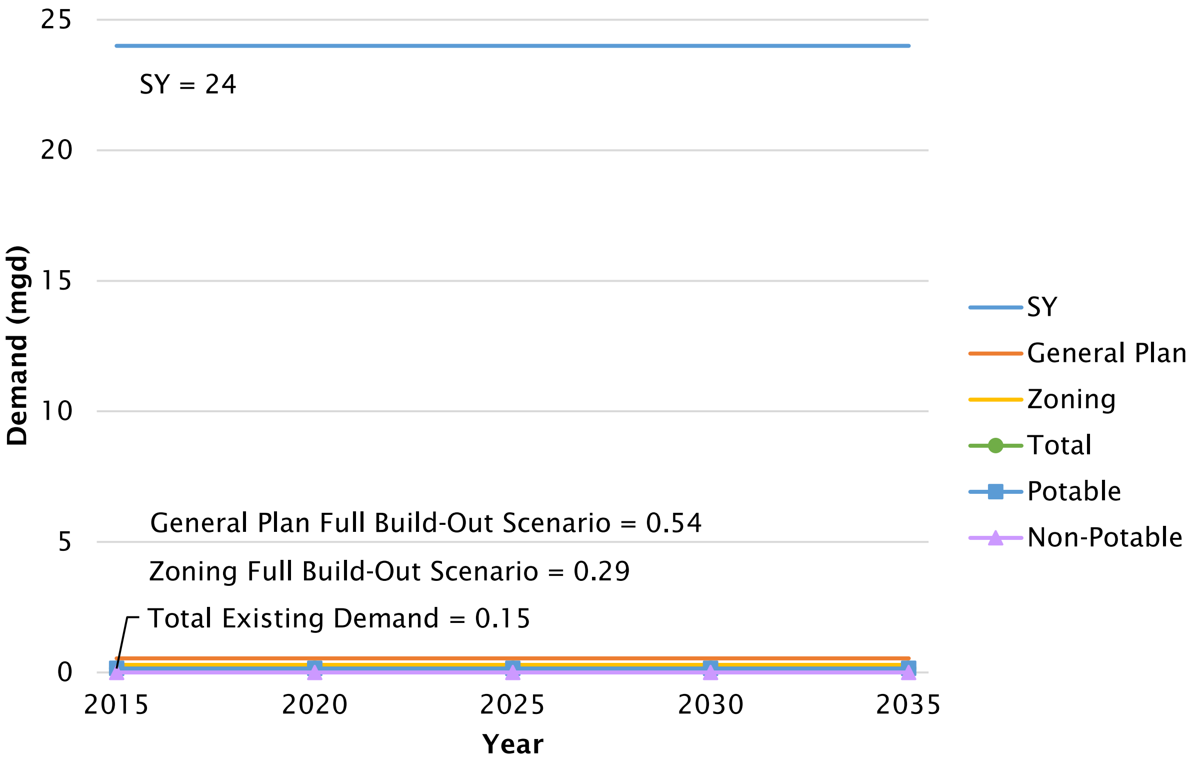
Development to the highest extent allowed by the General Plan and County Zoning within the Wainiha ASYA is sustainable. The 2035 water demand projection for the Wainiha ASYA is also sustainable.

Implementation of conservation measures should continue to be encouraged. See **Section 1.5.7** for conservation measures.

Use of alternative water sources can reduce demands on both ground water and surface water resources and conserve water resources as a whole. However, aside from rainwater, there are no available alternative water sources in the area. Ground water resources could continue to be used and developed to meet potable water needs now and into the future and is the primary strategy to serve future potable demands in the Wainiha ASYA. Surface water, where available, should be used to meet non-potable demands in lieu of ground water.

Demand-side management, such as development density control, is not needed based on the full build-out projections.

Medium Growth Rate B Water Demand Projections and Full Build Out – Wainiha ASYA

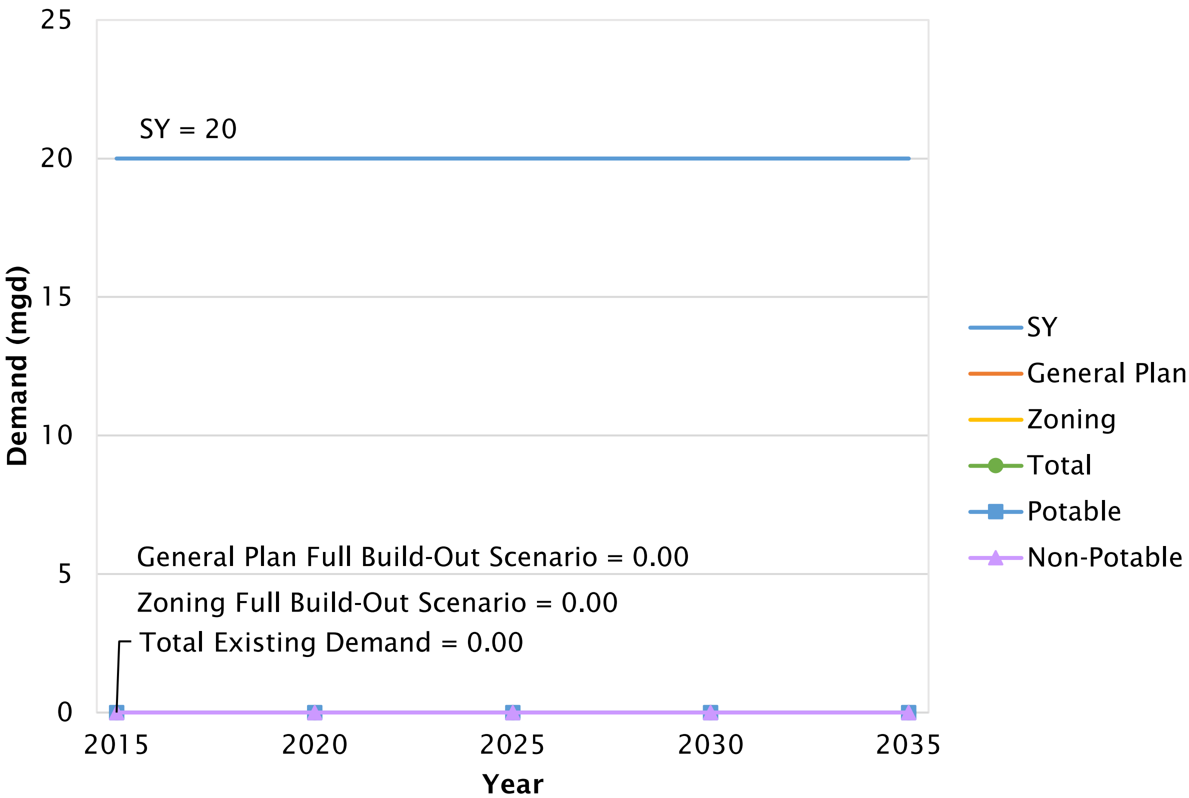


Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use. For future agricultural water use analysis, please see Section 20203-4.1.1 County of Kaua'i Important Agricultural Lands Study.

20204 – Nāpali Aquifer System Area

The Nāpali ASYA is largely uninhabited and undeveloped, and there are no projected water demands to be met. Rainwater catchment is the likely alternative for any remote domestic users in this area.

Medium Growth Rate B Water Demand Projections and Full Build Out – Nāpali ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use.

20301 – Kekaha Aquifer System Area

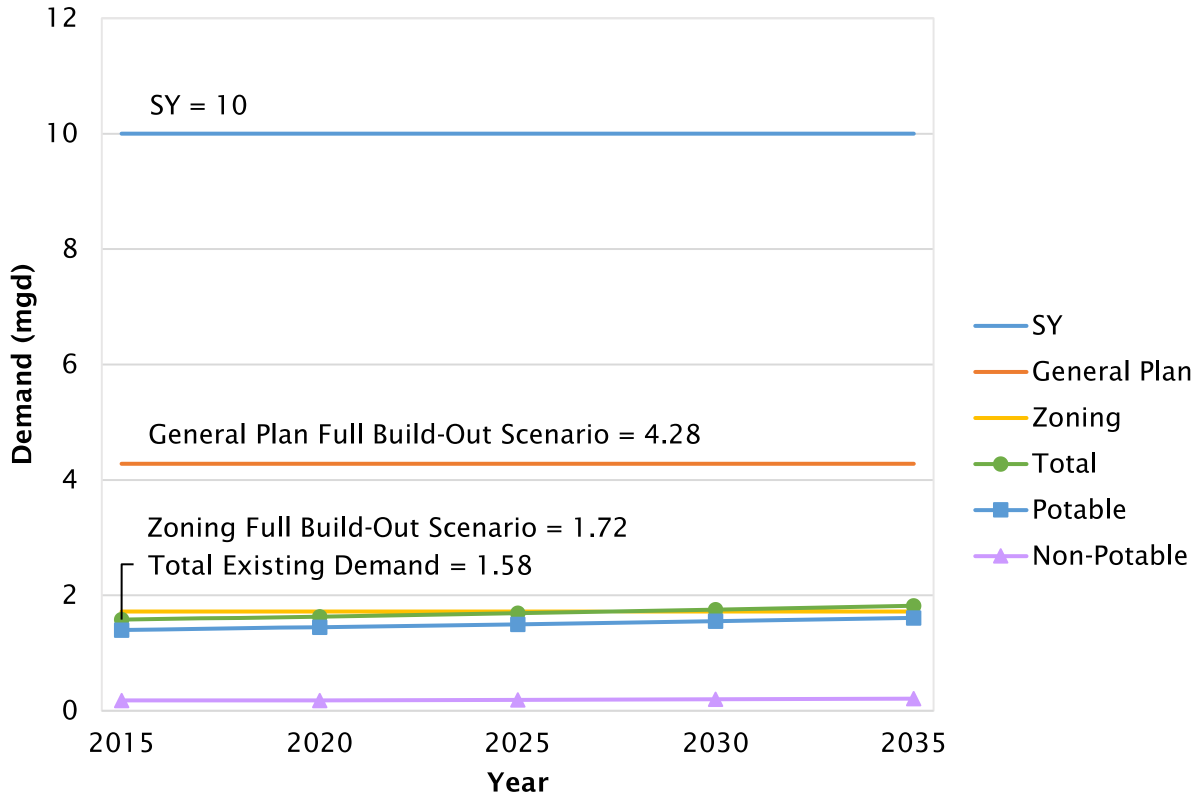
Development to the highest extent allowed by the General Plan and County Zoning within the Kekaha ASYA is sustainable. The 2035 water demand projection for the Kekaha ASYA is also sustainable.

Implementation of conservation measures should continue to be encouraged. See **Section 1.5.7** for conservation measures.

Alternative water sources, such as recycled water generated from wastewater reclamation facilities, should be used where available to reduce demands on both ground and surface water resources and to conserve water resources as a whole. Recycled water is available from the Waimea Wastewater Reclamation Facility (WWRF). Ground water resources could continue to be used and developed to meet potable water needs now and into the future and is the primary strategy to serve future potable demands in the Kekaha ASYA. Surface water, where available, should be used to meet non-potable demands in lieu of ground water. The Waimea Watershed Agreement established interim instream flow standards (IIFS) related to the Kekaha Ditch Irrigation System and Kōkeʻe Ditch Irrigation System to take steps to restore flows in streams, and the agreement notes that diversions must be justified with no more water taken than is needed for other beneficial uses, such as agriculture and renewable energy.

Demand-side management, such as development density control, is not needed based on the full build-out projections.

Medium Growth Rate B Water Demand Projections and Full Build Out – Kekaha ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use. For future agricultural water use analysis, please see Section 20301-4.1.1 County of Kaua'i Important Agricultural Lands Study.

20302 – Waimea Aquifer System Area

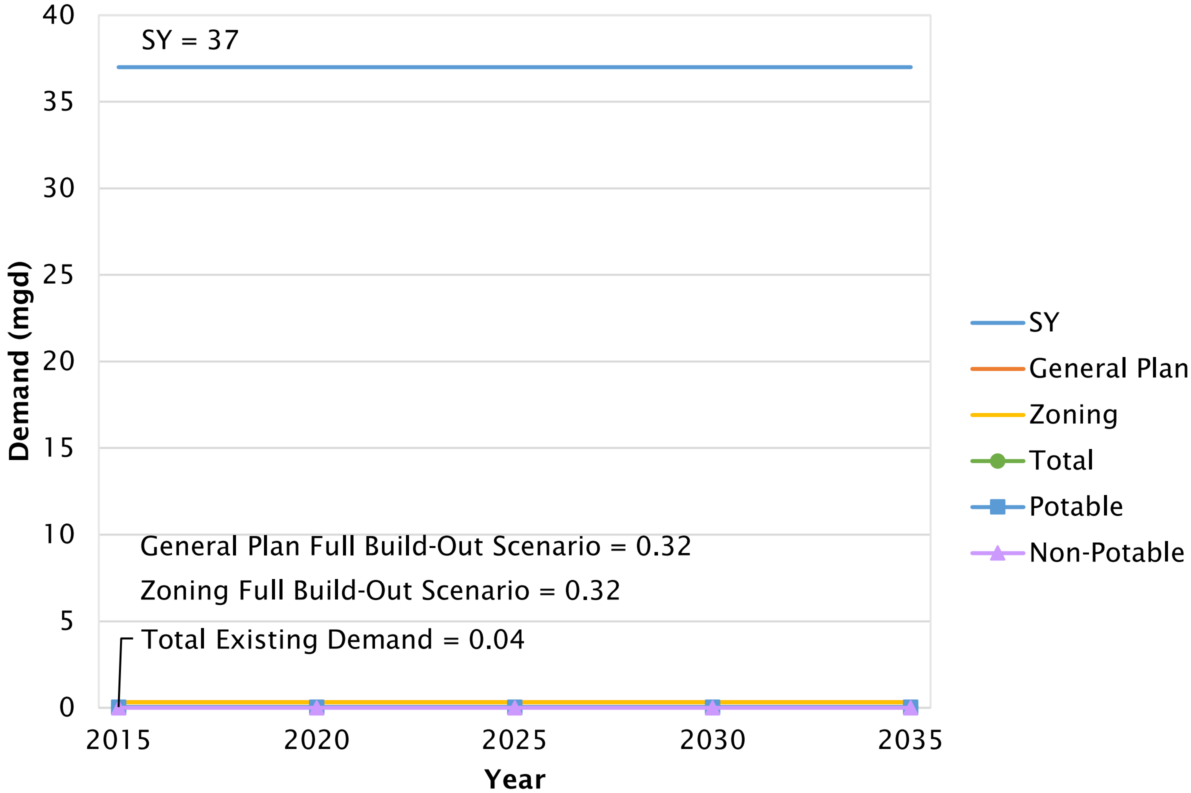
Development to the highest extent allowed by the General Plan and County Zoning within the Waimea ASYA is sustainable. The 2035 water demand projection for the Waimea ASYA is also sustainable.

Implementation of conservation measures should continue to be encouraged. See **Section 1.5.7** for conservation measures.

Use of alternative water sources can reduce demands on both ground water and surface water resources and conserve water resources as a whole. However, aside from rainwater, there are no available alternative water sources in the area. Ground water resources should continue to be used and developed to meet potable water needs now and into the future and is the primary strategy to serve future potable demands in the Waimea ASYA. Surface water, where available, should be used to meet non-potable demands in lieu of ground water. The Waimea Watershed Agreement established IIFS related to the Kekaha Ditch Irrigation System and Kōke'e Ditch Irrigation System to take steps to restore flows in streams, and the agreement notes that diversions must be justified with no more water taken than is needed for other beneficial uses, such as agriculture and renewable energy.

Demand-side management, such as development density control, is not needed based on the full build-out projections.

Medium Growth Rate B Water Demand Projections and Full Build Out – Waimea ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use. For future agricultural water use analysis, please see Section 20302-4.1.1 County of Kaua'i Important Agricultural Lands Study.

20303 – Makaweli Aquifer System Area

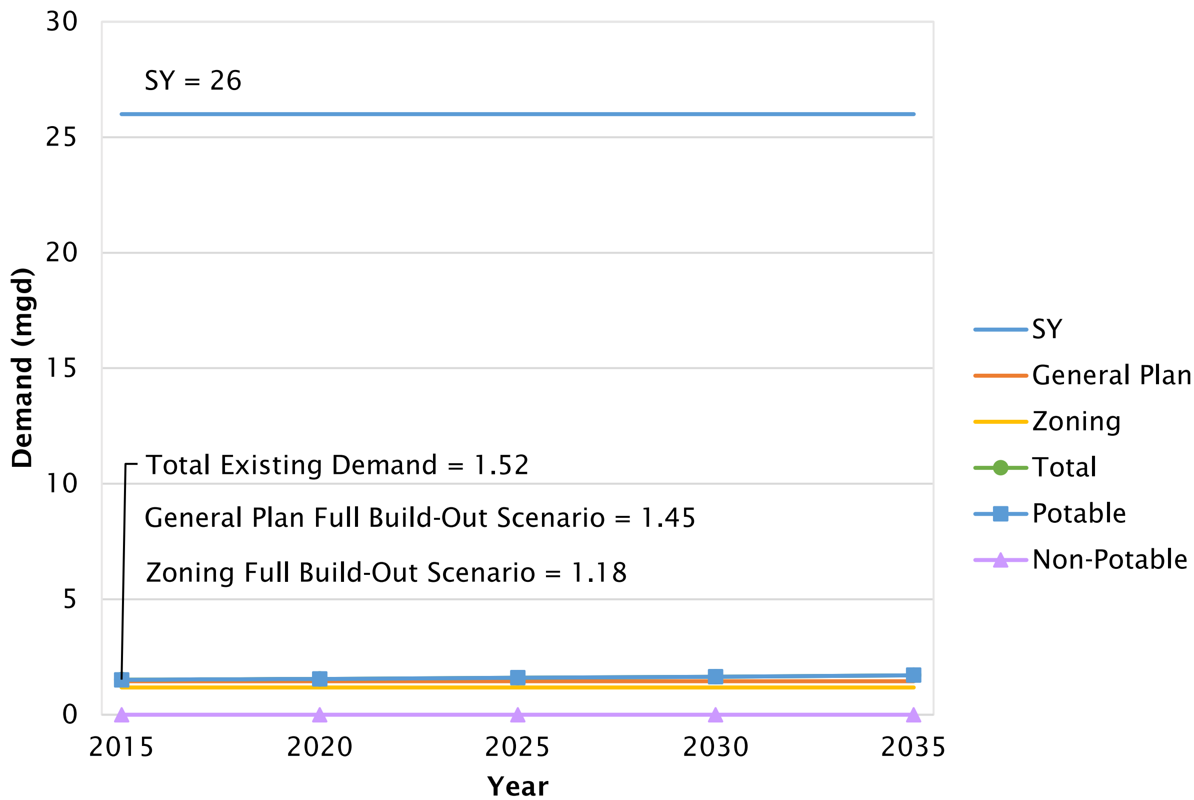
Development to the highest extent allowed by the General Plan and County Zoning within the Makaweli ASYA is sustainable. The 2035 water demand projection for the Makaweli ASYA is also sustainable.

Implementation of conservation measures should continue to be encouraged. See **Section 1.5.7** for conservation measures.

Use of alternative water sources can reduce demands on both ground water and surface water resources and conserve water resources as a whole. However, aside from rainwater, there are no available alternative water sources in the area. Ground water resources should continue to be used and developed to meet potable water needs now and into the future and is the primary strategy to serve future potable demands in the Makaweli ASYA. Surface water, where available, should be used to meet non-potable demands in lieu of ground water.

Demand-side management, such as development density control, is not needed based on the full build-out projections.

Medium Growth Rate B Water Demand Projections and Full Build Out – Makaweli ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use. For future agricultural water use analysis, please see Section 20303-4.1.1 County of Kaua'i Important Agricultural Lands Study.

20304 – Hanapēpē Aquifer System Area

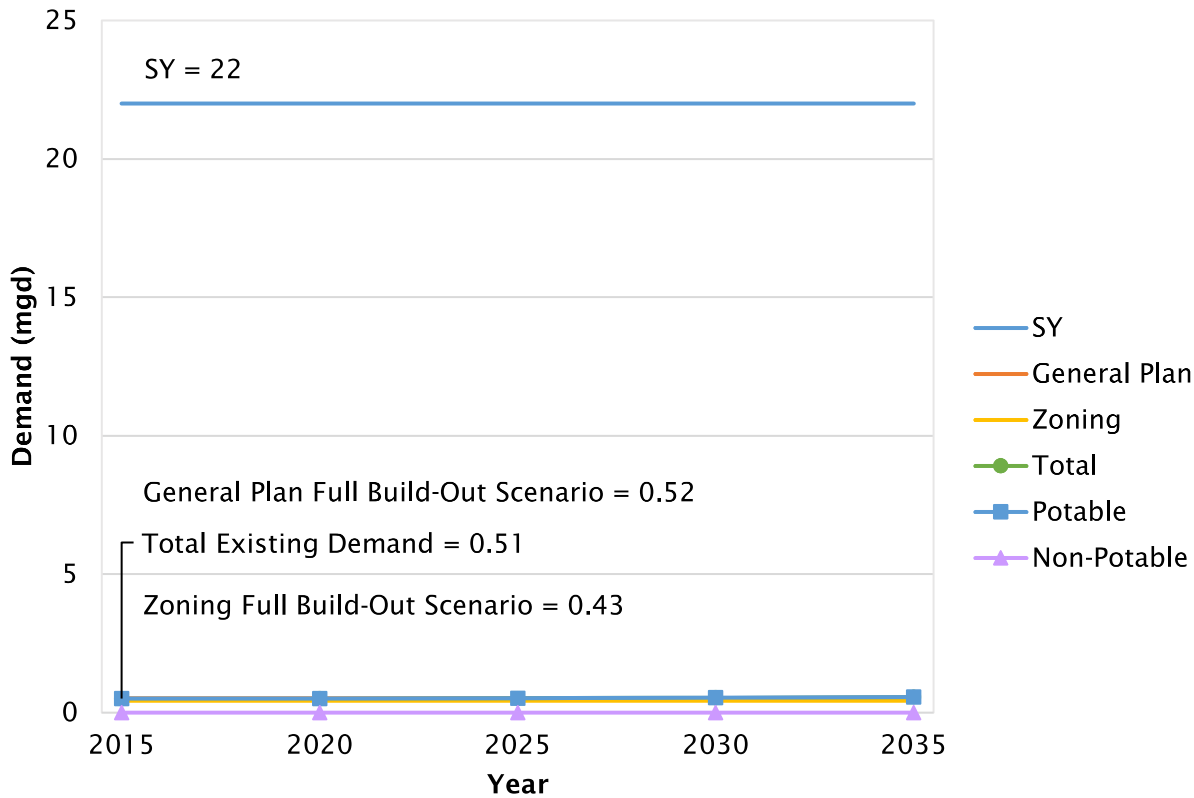
Development to the highest extent allowed by the General Plan and County Zoning within the Hanapēpē ASYA is sustainable. The 2035 water demand projection for the Hanapēpē ASYA is also sustainable.

Implementation of conservation measures should continue to be encouraged. See **Section 1.5.7** for conservation measures.

Use of alternative water sources can reduce demands on both ground water and surface water resources and conserve water resources as a whole. However, aside from rainwater, there are no available alternative water sources in the area. Ground water resources should continue to be used and developed to meet potable water needs now and into the future and is the primary strategy to serve future potable demands in the Hanapēpē ASYA. Surface water, where available, should be used to meet non-potable demands in lieu of ground water.

Demand-side management, such as development density control, is not needed based on the full build-out projections.

Medium Growth Rate B Water Demand Projections and Full Build Out – Hanapēpē ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use. For future agricultural water use analysis, please see Section 20304-4.1.1 County of Kaua'i Important Agricultural Lands Study.

ES-4 SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

To optimize appropriate use of water resources, the quality of the water source should be matched to the quality of water required. The recommendations for each ASYA were made with this and the following contributing themes in mind.

- Prioritize and protect public trust uses of water
- Public Trust Doctrine: the State serves as the primary steward of the water resources public trust. As trustee, the State is responsible for the management and protection of Hawai‘i's water resources for the benefit of the people of the State
- Reserve the highest quality of water for the most valued end use
- Promote water conservation
- Meet future demands at a reasonable cost

Potable water is considered the highest quality water, and the sustenance of life is considered the most valued end use. Recycled water, brackish ground water, untreated surface water, and other lower quality water sources should be used for landscaping and agriculture, thereby reserving potable water for human consumption. Further, if there is a practical alternative water source available, such as recycled water, that alternative source should be used in lieu of ground water or surface water.

Water resources are a finite resource that should be managed and used wisely. It should be conserved and not wasted. Implementation of conservation measures and watershed management should continue to be encouraged.

Chapter 1

Introduction

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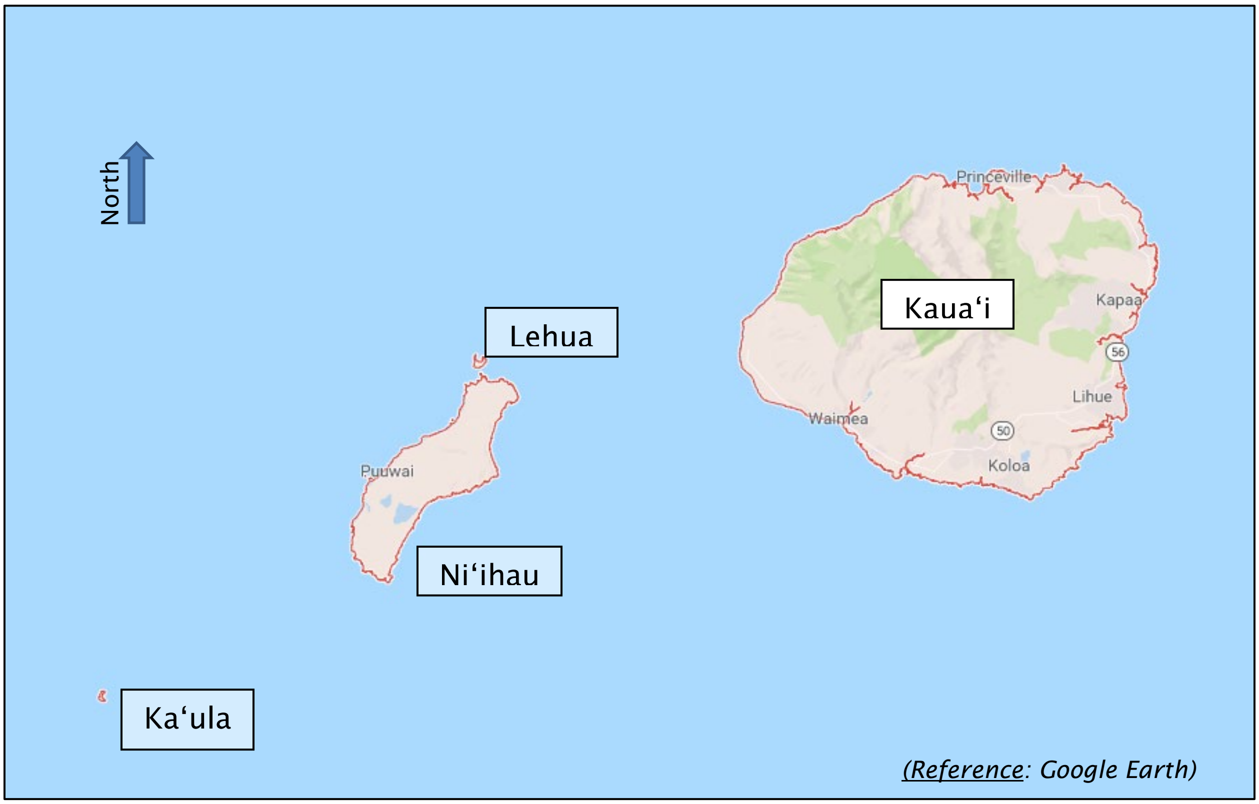
1 INTRODUCTION

1.1 BACKGROUND

Kauaʻi County includes the islands of Kauaʻi, Niʻihau, Lehua, and Kaʻula, see **Figure 1-1**. The latter two islands, Lehua and Kaʻula, are small uninhabited islands. The island of Niʻihau is privately owned by the Robinson family and public access to the island is only allowed with permission of the owners. For the purposes of this report, the focus will be limited to the island of Kauaʻi itself.

Figure 1-1 County of Kauaʻi Maps



1.1.1 State Water Code

In 1978, the Hawaiʻi State Constitutional Convention recognized the State's obligation to "protect, control, and regulate the use of Hawaiʻi's water resources for the benefit of its people."[1] This obligation is now called the public trust. The State Constitution, Article XI, §7 also provided for an agency to set overall water management policies and protection of Hawaiʻi's limited water resources. This set the foundation for the State Water Code and the establishment of the Commission on Water Resource Management.

[1] Constitution of the State of Hawaii, Article XI, §7.

The 1987 State Legislature enacted into law Hawaiʻi Revised Statutes, Chapter 174C - State Water Code[2] to protect Hawaiʻi's surface and ground water resources. The waters of the State are held in public trust and cannot be owned privately. The Public Trust Doctrine is a policy of the State Water Code and is stated as follows:

> *It is recognized that the waters of the State are held for the benefit of the citizens of the State. It is declared that the people of the State are beneficiaries and have a right to have the waters protected for their use. (HRS §174C-2(a)).*

The State recognizes four public trust purposes as established by the Hawai'i Supreme Court:

" a. Maintenance of waters in their natural state;
b. Domestic water use of the general public, particularly drinking water;
c. The exercise of Native Hawaiian traditional and customary rights; and
d. Reservations of water for Hawaiian Home Lands"[3]

The State Water Code (the Code) called for the establishment of a Commission on Water Resource Management (CWRM) to oversee the general administration of the Code. The Code also calls for the preparation of a Hawaiʻi Water Plan to serve as a dynamic, long-range planning guide for the CWRM. The definition of the terms, procedures, content, etc. for the Hawaiʻi Water Plan are spelled out in Hawaiʻi Administrative Rules Chapter 13-170, Hawaiʻi Water Plan[4].

The objectives of the Hawaiʻi Water Plan are as follows:

- Proper conservation and water development
- Reasonable and beneficial use of water
- Control of water for public purposes
- Attainment of adequate water quality
- Protection of public trust uses of water
- Implementation of water resource policies
- Utilization of reclaimed water for uses other than drinking and potable water needs in 100% of state and county facilities by December 31, 2045
- Linkage between land use and water by County "home rule"

[2] https://www.capitol.hawaii.gov/hrscurrent/vol03_ch0121-0200d/HRS0174C/HRS_0174C-.htm (link current as of June 2024)
[3] 2019 Water Resource Protection Plan, 2019, page 12.
[4] https://files.hawaii.gov/dlnr/cwrm/regulations/13-170.pdf (link current as of June 2024)

The Hawai'i Water Plan consists of five parts:

Table 1-1 Hawai'i Water Plan Components

Component	Responsible Agency
Water Resource Protection Plan (WRPP)	State Department of Land and Natural Resources (DLNR), CWRM
Water Quality Plan (WQP)	State Department of Health
State Water Projects Plan (SWPP)	DLNR, Engineering Division
Agricultural Water Use and Development Plan (AWUDP)[5]	State Department of Agriculture
County Water Use and Development Plans (WUDP) [6]	County Department of Water Supply

The initial Hawai'i Water Plan was completed and adopted by the CWRM in July 1990. As called for in the Code, all elements of the Hawai'i Water Plan are to be updated regularly to reflect the current needs of the State. Each of the Counties is responsible to update their respective WUDP as required. Updates of the various elements except the WQP and AWUDP were drafted in 1992, but were not officially adopted by the CWRM. Since then, various elements have been updated or are in the process of being updated. See **Section 1.1.4** for the update status of the Hawai'i Water Plan.

1.1.2 History and Objective of the Kaua'i Water Use and Development Plan

In compliance with the State Water Code, each of the four Counties is tasked with the development of its own WUDP. The primary objective of the WUDP is to set forth the allocation of water to land use to guide the county in its planning, management, and development of land use and water resource strategies and policies for sustainable development. As stipulated in Hawai'i Administrative Rules §13-170-31, the County WUDP shall include, but not be limited to:

(1) Status of water and related land development including an inventory of existing water uses for domestic, municipal, and industrial users, agriculture, aquaculture, hydropower development, drainage, reuse, reclamation, recharge, and resulting problems and constraints;

(2) Future land uses and related water needs; and

(3) Regional plans for water developments including recommended and alternative plans, costs, adequacy of plans, and relationship to the water resource protection and water quality plans.

The original Kaua'i WUDP was prepared by the County of Kaua'i Department of Water (DOW). The Kaua'i WUDP was adopted by Kaua'i County ordinance and endorsed by Mayor JoAnn Yukimura on April 27, 1990. The CWRM conditionally accepted the WUDP, on June 27, 1990, for incorporation into the Hawai'i Water Plan. The key condition stipulated that the WUDP was to be

[5] The AWUDP was added to the Hawai'i Water Plan by mandate under Act 101, Session Laws of Hawai'i (SLH) 1998, by the State Legislature.

[6] A separate WUDP is to be prepared by each of the four Counties.

reviewed and revised as necessary by the County to coincide with the review process of the Hawai‘i Water Plan.

The “Kaua‘i Water Use and Development Plan”, dated February 1990, was adopted by County of Kaua‘i Ordinance No. 568. The Ordinance stipulates that the DOW shall be responsible for the preparation and maintenance of the WUDP. It further stipulates that the “Board of Water and the DOW shall have the authority to amend the WUDP to reflect changes in the hydrologic or other scientific information and land use.”

1.1.3 Statewide Framework for the Update of the Hawai‘i Water Plan

The Statewide Framework for Updating the Hawai‘i Water Plan (Framework), dated February 2000, was created by the CWRM to facilitate coordination, integration, and consistency for preparing/ updating of the various components of the Hawai‘i Water Plan. In addition, the Framework provides guidelines for the preparation of WUDP updates to ensure its effective implementation by the County and utilization by the CWRM for resource management purposes.

The Framework requires data and analyses to be based on ground water and surface water hydrologic units designated by the CWRM.

1.1.3.1 Ground Water Hydrologic Units

An aquifer is generally described as a water bearing stratum of permeable rock, sand or gravel and constitutes a source of ground water. The CWRM, as part of its Water Resource Protection Plan (WRPP), has established an aquifer classification and coding system to describe and identify aquifers in the State of Hawai‘i. Under the aquifer coding system, each island is identified as the largest component in the coding hierarchy, followed by Aquifer Sector Areas (ASEA), and Aquifer System Areas (ASYA), respectively.

The ASEA reflects an area with broad hydrogeological (subsurface) similarities while maintaining traditional hydrographic (surface), topographic and historical boundaries where possible. The ASYA is an area within an ASEA and more specifically defined by hydrogeologic continuity among aquifers in the ASEA. Aquifer boundary lines should be recognized as management lines and not strict hydrologic boundaries that ground water flow does not cross. This classification scheme updates the hydrographic areas initially established for each island in 1959[7].

The ground water hydrologic unit code begins with the U.S. Geological Service identification number for each island (Island code): 1-Ni‘ihau, 2-Kaua‘i, 3-O‘ahu, 4-Moloka‘i, 5-Lāna‘i, 6-Maui, 7-Kaho‘olawe, and 8-Hawai‘i. A two-digit Sector number and a two-digit System number, respectively, follow the Island code. The Sector Areas and System Areas are also assigned geographic names.

[7] Hawai‘i Authority, 1959. Water Resources in Hawai‘i: Hawai‘i Division of Water and Land Development. Bulletin B14.

##

Island Code Component

Aquifer Sector Area (ASEA) Code Component

Aquifer System Area (ASYA) Code Component

Three ASEAs and thirteen ASYAs have been identified for the island of Kaua'i and are listed in **Table 1-2**. See **Figure 1-2** for locations. A description of each ASYA may be found in the WRPP component of the Hawai'i Water Plan.

Table 1-2 Kaua'i Ground Water Hydrologic Units

Aquifer Sector Area (ASEA)		Aquifer System Area (AYSA)	
Code	**Name**	**Code**	**Name**
201	**LĪHU'E**	20101	Kōloa
		20102	Hanamā'ulu
		20103	Wailua
		20104	Anahola
		20105	Kīlauea
202	**HANALEI**	20201	Kalihiwai
		20202	Hanalei
		20203	Wainiha
		20204	Nāpali
203	**WAIMEA**	20301	Kekaha
		20302	Waimea
		20303	Makaweli
		20304	Hanapēpē

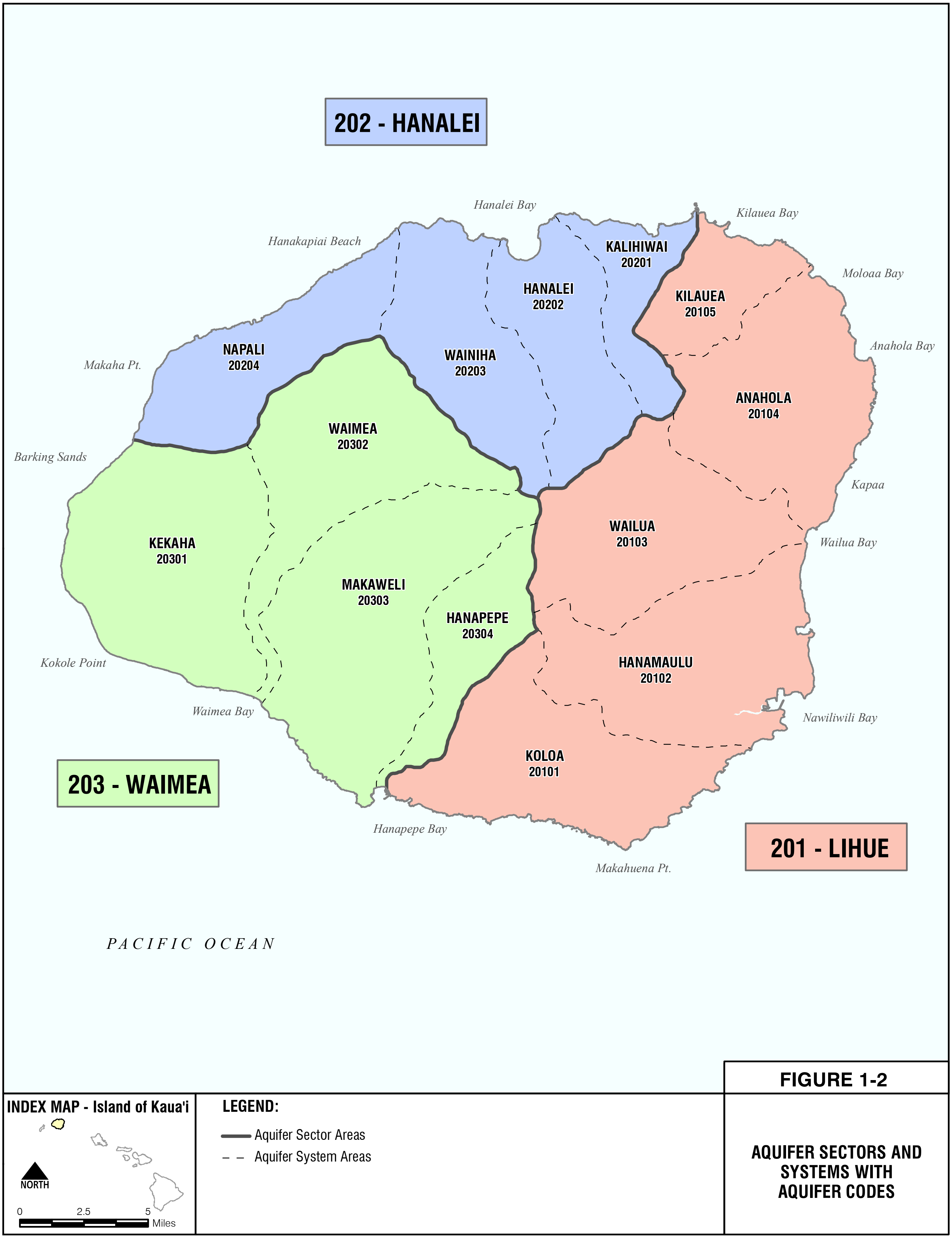


FIGURE 1-2

AQUIFER SECTORS AND SYSTEMS WITH AQUIFER CODES

1.1.3.1.1 Sustainable Yield

As provided for in the Code, Sustainable Yield (SY) is defined as "the maximum rate at which water may be withdrawn from a water source without impairing the utility or quality of the water source as determined by the commission."

As further defined and described in the WRPP:

> The amount of ground water that can be developed in any Hawai'i aquifer is limited by the amount of natural recharge. Additionally, not all natural recharge an aquifer receives can be developed. Some aquifer outflow or leakage must be maintained to prevent seawater intrusion or to maintain some perennial streamflow. Therefore, the SY of an aquifer normally represents a percentage of the natural recharge.
>
> The estimation of aquifer SYs is not an exact science. Insufficient hydrologic, geologic, and meteorological data require the estimation of critical input parameters in any SY model. Differences in estimates of these input parameters and in how they are incorporated in a model can produce a wide range in predicted SY values for a given aquifer.
>
> Given the range of predicted SYs for each aquifer, and the inherent uncertainty in each prediction, CWRM has applied the precautionary principle in selecting SYs for adoption in the WRPP. As the WRPP is a living document, SYs will be re-estimated continually based on the best information available as new information is acquired with time.

These SY estimates do not consider the feasibility of developing the ground water and should not be equated to available developable ground water. It is noted that in many regions, taking advantage of a high SY estimate would not necessarily be economically feasible. Additionally, SY represents the total water withdrawal rate, inclusive of both potable and non-potable ground water. It is stressed that the predicted SY estimates reflect the average daily pumpage over an entire AYSA (assuming wells are spaced optimally). Further, it was determined without consideration to the feasibility of developing the ground water; nor whether the ground water is potable or brackish. Therefore, caution should be exercised in comparing the Sustainable Yield to projected water demands. Estimates of the Sustainable Yield are treated as definitive constraints by CWRM in allocation decisions.

Table 1-3 lists the geographical area of coverage and estimated sustainable yield in million gallons per day (mgd), as published in the WRPP, for the three ASEA on the island of Kaua'i. **Figure 1-3** graphically shows sustainable yields for each of the island's thirteen AYSAs.

Table 1-3 Sustainable Yield by Aquifer Sector Areas

Sector Area Code	Sector Area Name	Area (Acres)	Sustainable Yield (mgd)
201	Līhu'e	145,276	138
202	Hanalei	79,765	95
203	Waimea	129,980	95
	Total for Island	**355,021**	**328**

Reference: 2019 State Water Resource Protection Plan Update

1.1.3.2 Surface Water Hydrologic Units

As part of the 2008 WRPP update, the CWRM established surface water hydrologic units and an associated coding system in its publication, "Surface-Water Hydrologic Units: A Management Tool for Instream Flow Standards, PR-2005-01", dated June 2005. Key objectives of the CWRM Surface Water Hydrologic Units include the following:

"1) Define and delineate unique units that can accommodate the relational requirements in a database environment, while providing a system that can be easily understood by the general public.

2) Develop an information management system which utilizes the coding system to relate surface-water permits and other resource information to a given unit.

3) Define hydrologic units to be considered in the analysis and development of instream flow standards.

4) Provide a reference system that promotes better information management of other resource inventories.

5) Promote the sharing and collection of surface-water resource data between government agencies, the public, private entities, and community organizations.

6) Improve the overall coordination of monitoring, data collection, and field investigation efforts.

The CWRM Surface Water Hydrologic Units provides a practical approach to managing surface water information maintained by the CWRM, thereby allowing additional efforts to easily build upon or refer to this system. Through this effort, Commission staff will be able to better coordinate and improve surface water data collection and utilization between agencies and stakeholders, leading to better statewide resource management measures."

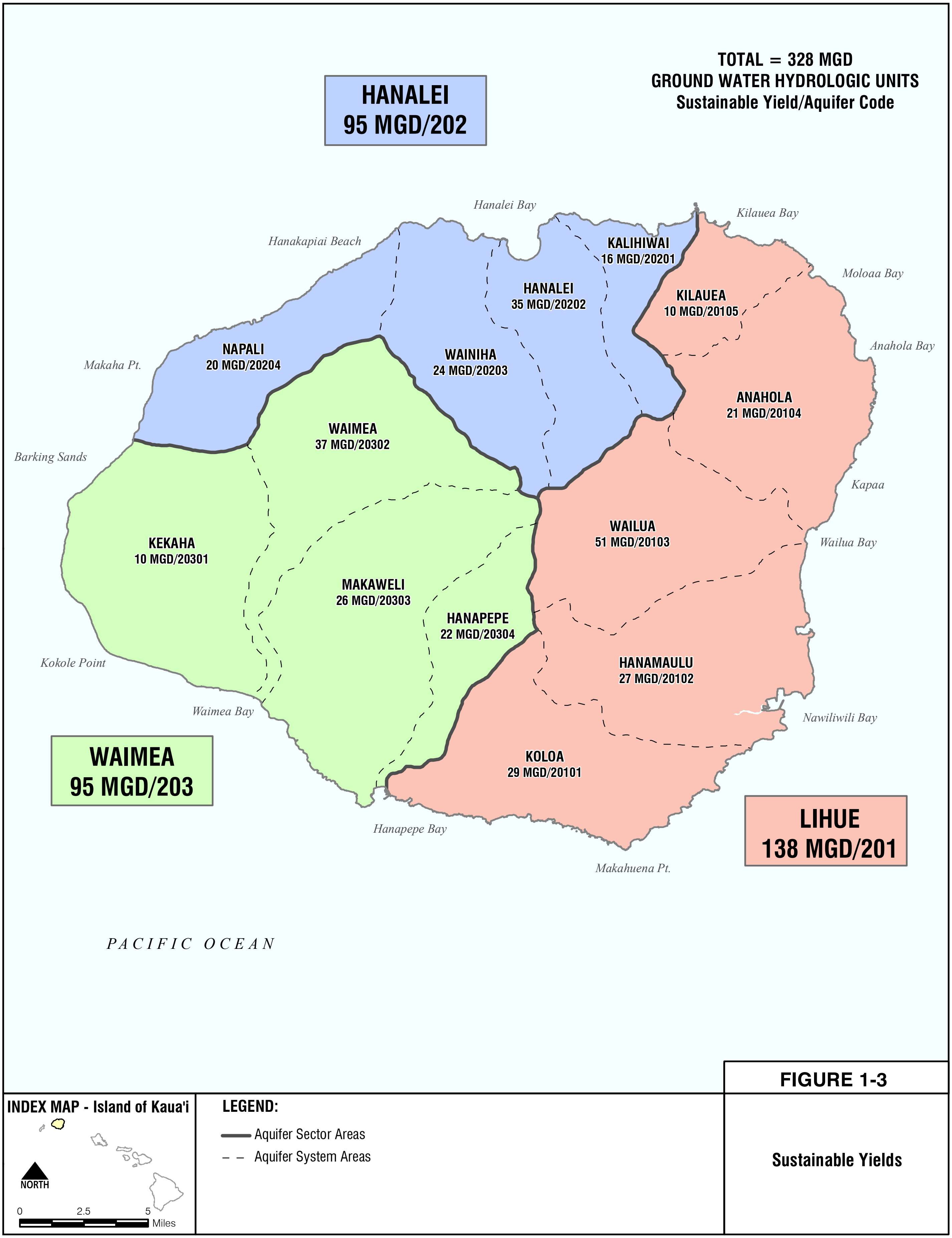


FIGURE 1-3

Sustainable Yields

A hydrologic unit, as defined by the Code, is "a surface drainage area or a ground water basin or a combination of the two." The majority of surface water hydrologic units have boundaries that closely match the drainage basins or watershed units. The CWRM defines a watershed unit in accordance with the State Definition and Delineation of Watersheds report as follows:

> "A watershed unit is comprised of a drainage basin (or basins) which include both stream and overland flow, whose runoff either enters the ocean along an identified segment of coastline (coastal segment) or enters an internal, landlocked drainage basin. The watershed units for an island are defined so that all segments of coastline are assigned to a unique watershed unit and so that all areas of an island are assigned to one, and only one, watershed unit."

Similar to the coding system for ground water hydrologic units, the surface water hydrologic unit code begins with the U.S. Geological Service identification number for each island (Island code): 1-Niʻihau, 2-Kauaʻi, 3-Oʻahu, 4-Molokaʻi, 5-Lānaʻi, 6-Maui, 7-Kahoʻolawe, and 8-Hawaiʻi. A three-digit surface water hydrologic unit number is added, following the Island code. The surface water hydrologic units are also assigned geographic names.

###

Island Code Component

Surface Water Hydrologic Unit Code Component

Figure 1-4 shows the boundaries of the 74 Kauaʻi surface water hydrologic units. Evaluation of the surface water hydrologic units indicate that their boundaries are generally very similar to those for the ground water hydrologic units.

It is noted that available historical data for each surface water hydrologic unit is extremely limited. The coding system is therefore provided as the first-step towards improving the organization and management of surface water information that CWRM collects and maintains.

Figure 1-5 presents an overlay of the surface water hydrologic units with the ground water hydrologic unit boundaries. Since the surface water hydrologic units and ground water hydrologic units are well-correlated, surface water data and analyses will be presented based on the ground water hydrologic units or aquifer systems.

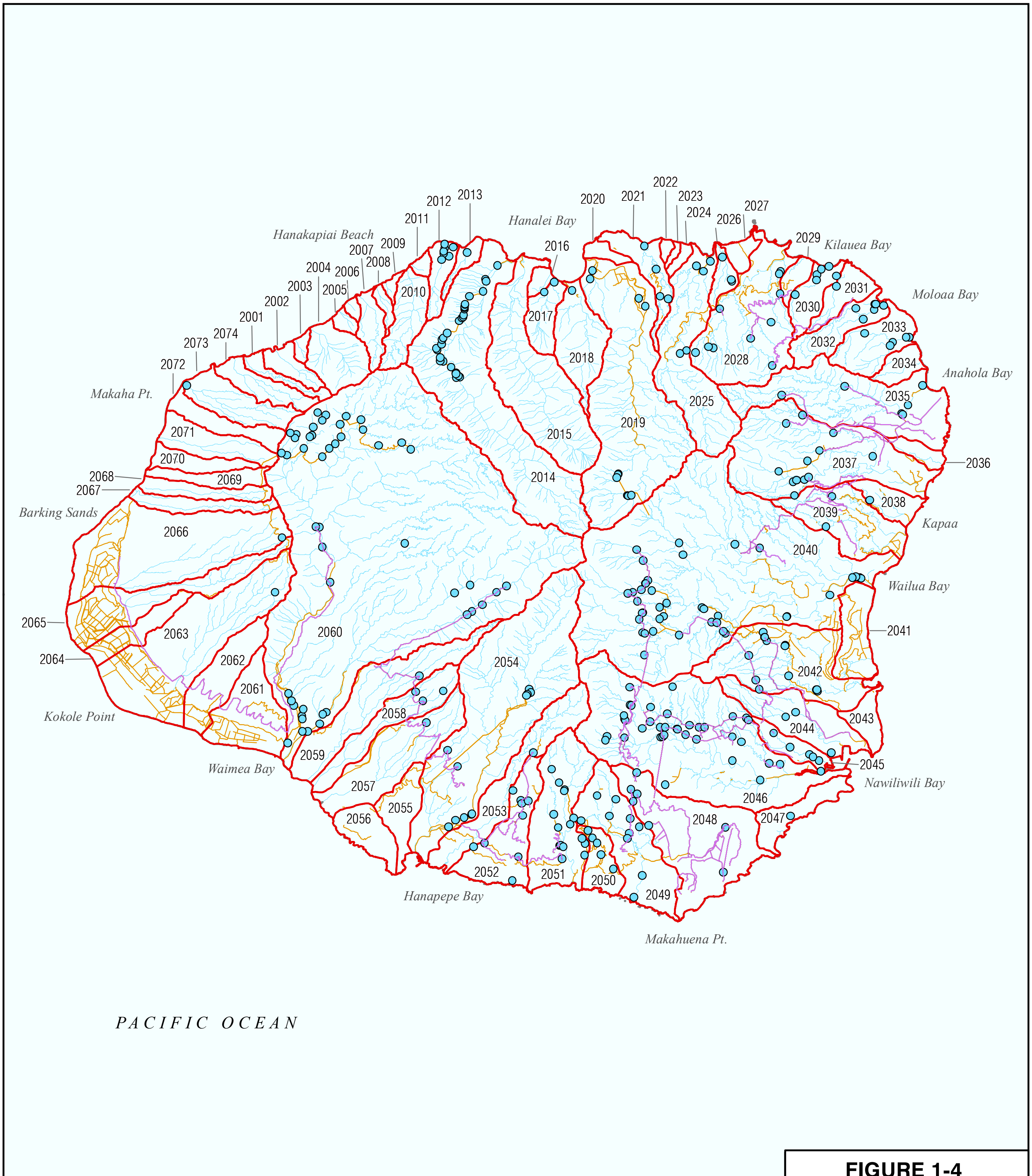
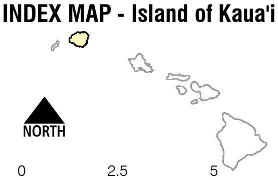


FIGURE 1-4

INDEX MAP - Island of Kaua'i



LEGEND:

- Diversions
- Ditches
- Irrigation Line
- Perennial Streams
- Hydrologic Units

SURFACE WATER HYDROLOGIC UNITS

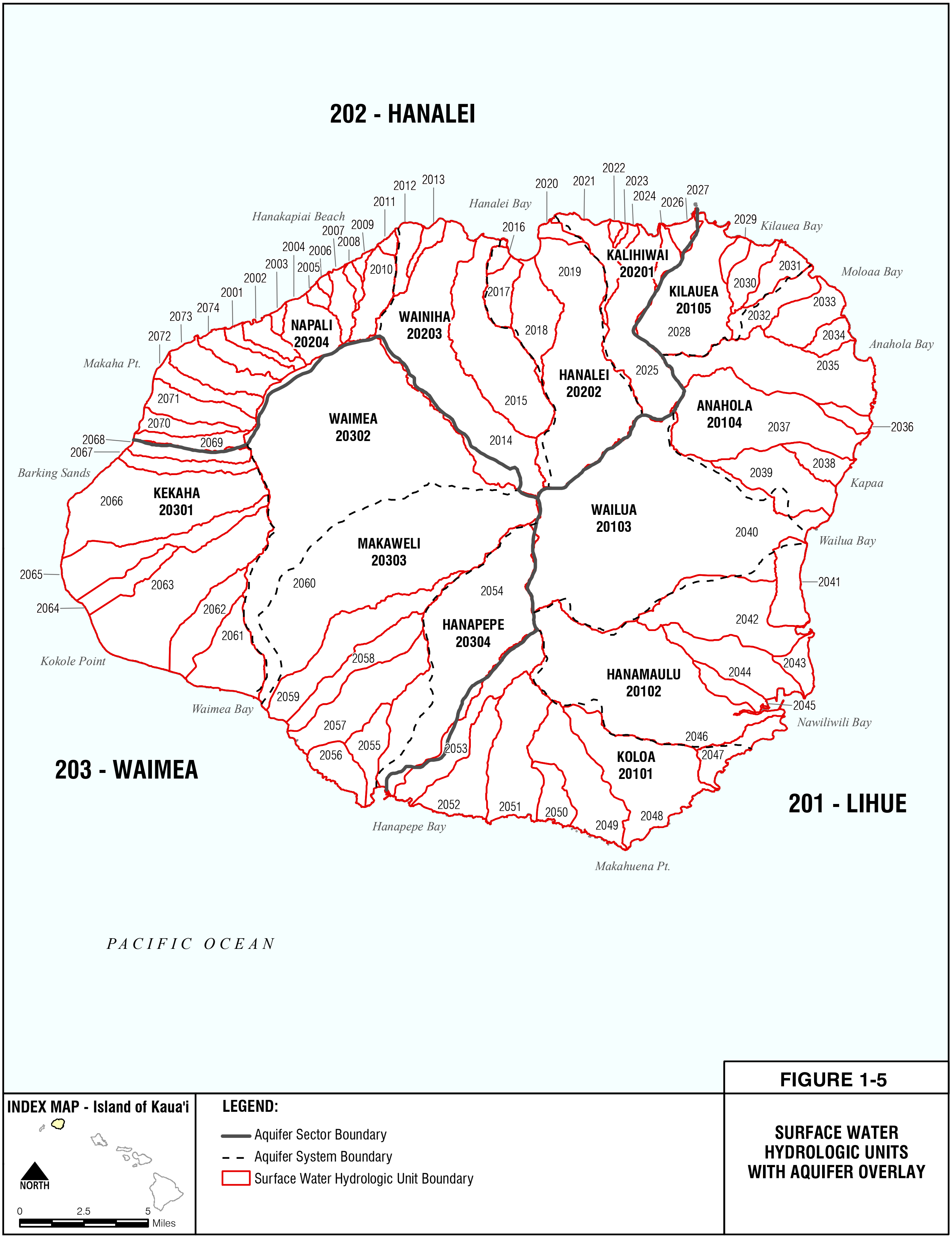


FIGURE 1-5

SURFACE WATER HYDROLOGIC UNITS WITH AQUIFER OVERLAY

1.1.4 The Hawaiʻi Water Plan Update Status

The Code requires that the Hawaiʻi Water Plan, inclusive of all its elements, be updated regularly to reflect the current needs of the State[8]. **Table 1-4** summarizes the update status for all elements of the Hawaiʻi Water Plan.

Table 1-4 Status of Hawaiʻi Water Plan Updates

PLAN ELEMENT	RESPONSIBLE AGENCY	STATUS
Water Resource Protection Plan	State of Hawaiʻi, Department of Land and Natural Resources, CWRM	First update completed in 2008 Second update completed in 2019
Water Quality Plan	State of Hawaiʻi, Department of Health	First update completed in 2019
State Water Projects Plan	State of Hawaiʻi, Department of Land and Natural Resources, Engineering Division	First update completed in 2003 Second update completed in 2017 (limited to Department of Hawaiian Home Lands) Third update completed in 2021 (State-wide)
Agricultural WUDP[9]	State of Hawaiʻi, Department of Agriculture	First update completed in 2003 and revised in 2004 Second update in progress
Kauaʻi WUDP	County of Kauaʻi	First update in progress
Maui WUDPs	County of Maui	Maui: first update in completed in 2023 Lānaʻi: first update completed in 2011 Molokaʻi: first update in progress
Hawaiʻi WUDP	County of Hawaiʻi	First update completed in 2011. Partial update in progress
Oʻahu WUDP	City and County of Honolulu	First update in progress (4 Watershed Management Plans completed, 2 in progress)

[8] See https://dlnr.hawaii.gov/cwrm/planning/hiwaterplan/ for links to the current Hawaiʻi Water Plan reports.

[9] Act 101, SLH 1998 requires that the AWUDP provide a master inventory of irrigation systems, identify the extent of repair and rehabilitation that would be required over a 5-year period, and provide a long-range management plan. The Framework further expands the scope to provide for the development of agricultural water demand projections, which is essential for WUDP updates. The AWUDP, dated December 2003, and revised in December 2004, was prepared to meet the mandate of Act 101, and to review and discuss the potential for transitioning from monocrop corporate farming into diversified crop farming, along with the potential opportunities available in the new diversified farming. However, due to funding and time constraints, a comprehensive plan has not yet been completed.

1.2 PHYSICAL SETTING

1.2.1 Location and Size

Kaua'i is the northwestern most island and geologically the oldest of the eight major islands in the Hawaiian archipelago. The total area of the island is approximately 552 square miles[10] - comprising less than 10 percent of the total land area of the State of Hawai'i.

It is known as the "Garden Isle" because of its lush greenery. The central portion of the island is mountainous and largely uninhabited. The islands' populated areas and roadways are generally along the coast and extend into the valleys. The developed areas of the island are generally comprised of small towns and agricultural lands.

The island is divided into five judicial districts as shown on **Figure 1-6**. With respect to water resources, the island is divided into three aquifer sector areas and thirteen ground water hydrologic units, as previously shown on **Figure 1-2**. The 2010 U.S. Census reports the island's resident population at 66,921 residents.

1.2.2 Climate

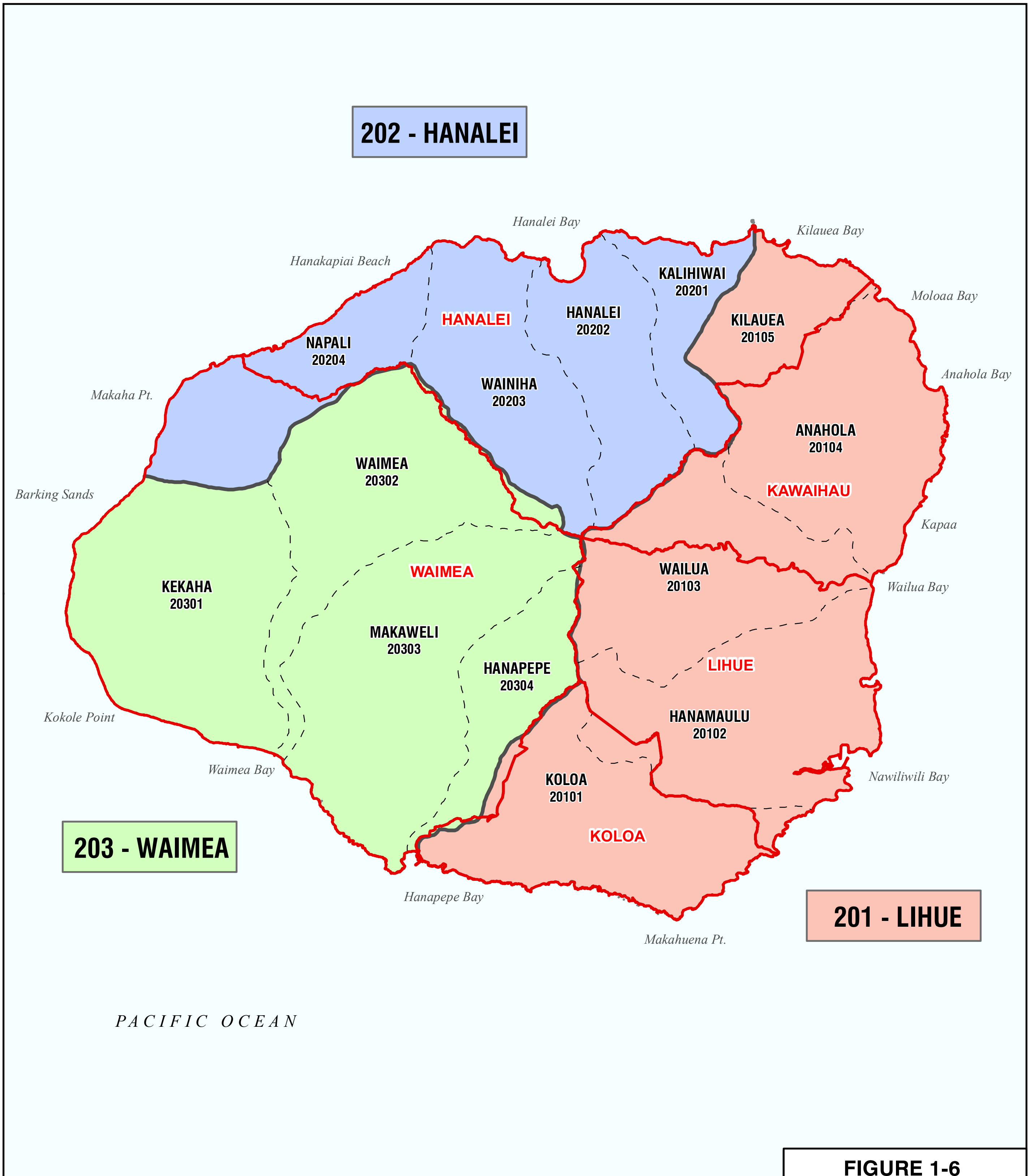
The climate of Kaua'i is typically mild and equitable throughout the year due to the island's location on the northern fringe of the tropics and within the belt of cooling northeasterly trade winds. Humidity is generally within the 60 to 80 percent range.

The average temperature in the lowlands is 75˚ F, decreasing 4˚ F with each 1,000 feet increase in elevation. February is typically the coldest month, averaging about 73˚F. The warmest is typically August, with temperatures averaging about 80˚F. Maximum temperatures rarely exceed 90˚F, and minimum temperatures hover around 50˚F.

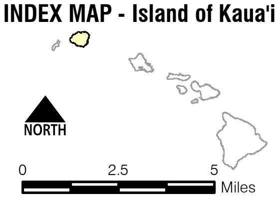
Annual average rainfall on Kaua'i ranges from about 20 inches on the leeward coast to over 400 inches near Mount Wai'ale'ale. The mountains intercept prevailing trade winds, the moisture carried by these winds is lifted, cooled and thereby condensed into rain. Rainfall is heaviest on Mount Wai'ale'ale and decreased in the lower elevations and on the leeward side of the island.

Trade winds prevail throughout the year, but are least continuous from October through April, Hawai'i's winter season. During these months, tropical storms occasionally bring heavy rains.

[10] 2017 State of Hawai'i Data Book.



INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- Judicial Districts

FIGURE 1-6

JUDICIAL DISTRICTS
VS.
AQUIFER AREAS

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Kaua'i County - Department of Water

KAUA'I WATER USE AND DEVELOPMENT PLAN

1.2.3 Geology

The Hawaiian Islands are part of a chain of islands that extend approximately 1,500 miles in a southeasterly direction from the Aleutian Islands and rising about 20,000 feet from the sea floor below. The islands are located approximately in the center of the Pacific (tectonic) plate. The chain of islands was developed as the Pacific Plate slowly moved in a northwest direction over a hotspot in the earth's mantle. The oldest islands are therefore located at the northwestern end of the archipelago and the younger, larger main islands, on the southeastern end of the archipelago.

Due to its longer exposure to erosion, the majority of the islands along the northwest end of the Hawaiian archipelago have disappeared or only small portions of land (atolls) rise above the sea. These islands are called the Leeward Islands, or the Northwestern Hawaiian Islands, and include Midway Island, Kure Atoll and French Frigate Shoals. Eight of the youngest islands are of sufficient elevation to intercept trade wind moisture and large enough to permit settlement. These islands are located along the southwest end of the archipelago.

The island of Kaua'i is over 5 million years old and is the fourth largest island of the eight major islands in the Hawaiian Archipelago. This island consists essentially of a single dome. Lava flows spread outward in all directions from the principal volcanic center near Mount Wai'ale'ale. The dome is slightly elongated in the northeast to southwest direction, and a slight bulge was produced on the southeastern slope of the dome by another eruptive center of Hā'upu. The smooth profile of the dome was also marred by the depression of the summit caldera; the smaller Hā'upu caldera (the Makaweli depression) and a circular basin, the Līhu'e depression, on the east side. Within the main caldera, eruptions built a small constructional dome, similar to the major dome but with gentler slopes.

Figure 1-7 shows a geologic map of Kaua'i Island[11]. Accompanying the geologic map is **Table 1-5** showing the stratigraphic sequence of the volcanic rock units on Kaua'i Island[12].

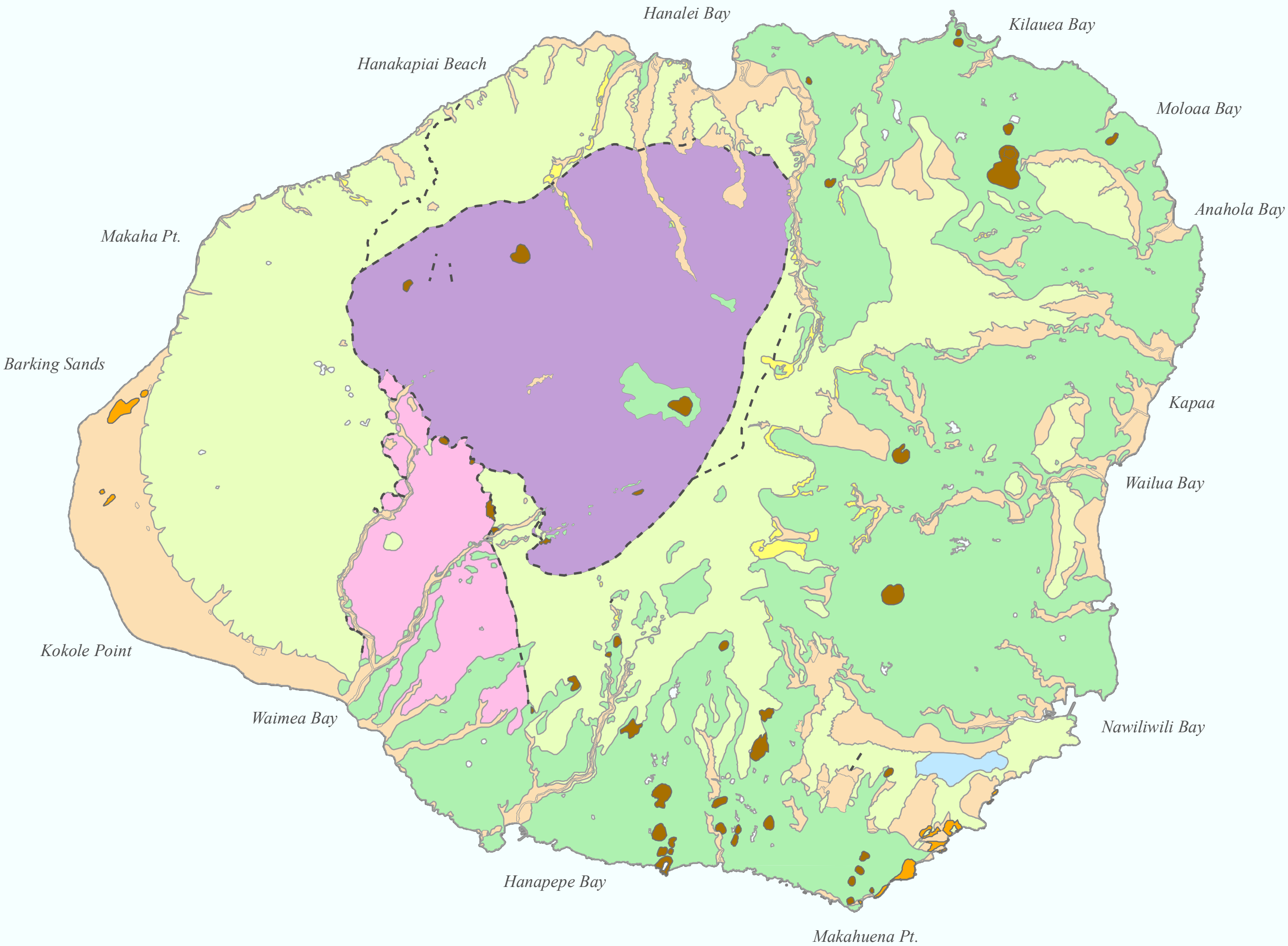
1.2.4 Hydrology

Hawai'i's water resources vary greatly between islands as well as within each island. There are perennial streams and ephemeral streams, rainforests and desert areas. There are ground water tunnels high in the mountains and low near sea level.

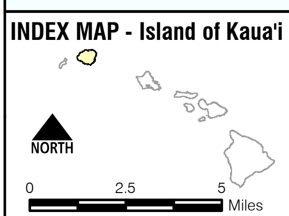
Key to the water supply for small oceanic islands like the Hawaiian islands is the hydrologic cycle or water cycle. As illustrated in **Figure 1-8**, this is the cyclical movement of water between air, land and sea. The water cycle includes evaporation of water from the ocean which then returns to the ground as precipitation (rain). Some of the precipitation may re-enter the atmosphere through evapotranspiration; some may become surface runoff or runoff into streams and empty into the ocean; and some may infiltrate the ground to become soil moisture or collect as ground water and eventually escape to the sea.

---

[11] G.A. MacDonald, D.A. Davis and D.C. Cox, 1960. Bulletin 13 - Geology and Ground-Water Resources of the Island of Kaua'i, Hawai'i, p. 18.
[12] Ibid. p. 20.



Reference: McDonald, G.A., Davis, D.A., and Cox, D.C., 1960. Geology and Ground-Water Resources of the Island of Kauai, Hawaii: Hawaii Division of Hydrography Bulletin 13, 212 p.



LEGEND:

- Alluvium beach and dune sand, lagoonal clays and marls
- Lithified calcareous dune sand
- Breccia and conglomerate of Palikea formation
- Lavas of Koloa volcanic series
- Lavas of Makaweli formation
- Lavas of Olokele formation
- Lavas of Haupu formation
- Lavas of Napali formation
- Vents of Koloa and Waimea Canyon volcanic series
- Buried Fault Scarp

FIGURE 1-7

GEOLOGIC MAP

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KAUA'I WATER USE AND DEVELOPMENT PLAN

Table 1-5 Stratigraphic Units on the Island of Kauaʻi

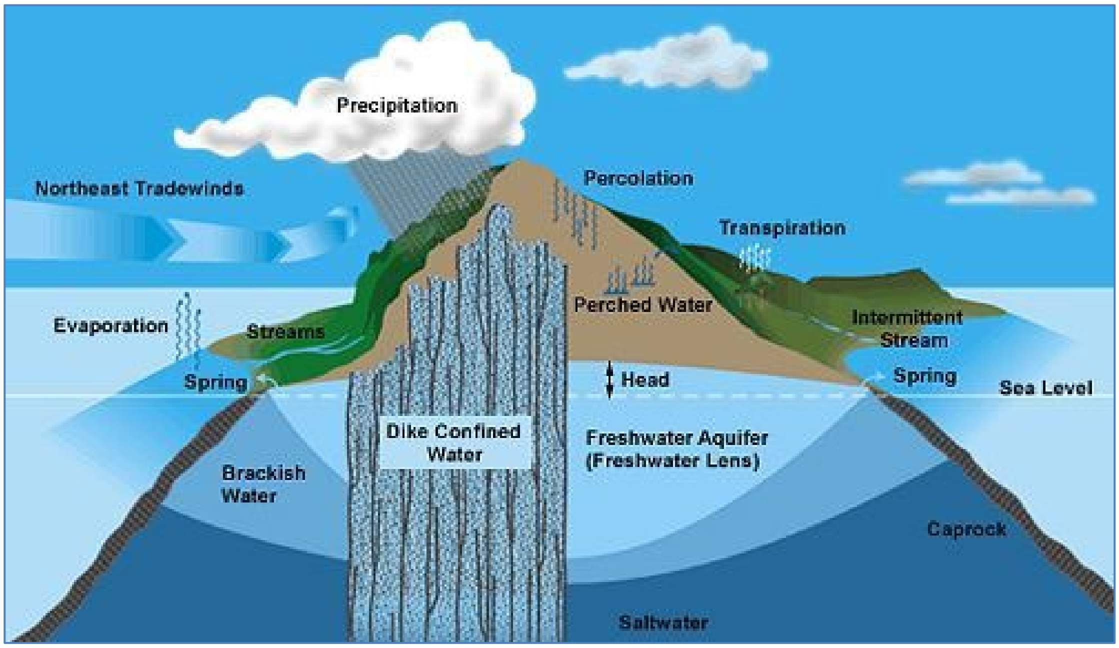
Major Geologic Unit			Rock Assemblage	Thickness (feet)	Symbol on Figure 1-7	General Character	Water-Bearing Properties
Recent	Sedimentary Deposits		Beach sand	5±	Rb	Loose sand, composed chiefly of fragments of calcareous algae, coral, mollusk shells, and skeletons of Foraminifera.	Very permeable; carries brackish or saline water at sea level.
Recent	Sedimentary Deposits		Unconsolidated calcareous dunes	10-100	Rd	Loose cream-colored crossbedded sand blow inland from the beaches and composed of the same materials.	Very permeable, but almost entirely above water table.
Recent	Sedimentary Deposits		Younger alluvium	5-200	Ra	Unconsolidated earthy deposits consisting of loose, poorly to moderately well sorted stream-laid gravel, sand and silt.	Poorly permeable, but contains small amounts of fresh or brackish water.
Local erosional uniformity							
Sedimentary deposits	Noncalcareous sediments		Lagoon deposits of Mana plain	…….	Pl	Poorly consolidated earthy and marly sediments accumulated in a lagoon between the volcanic rocks and the beach ridge.	Poorly permeable, but yield brackish water to wells.
Sedimentary deposits	Noncalcareous sediments		Older alluvium	100±	Pa	Poorly to well consolidated earthy deposits consisting of stream-laid gravel, sand, and silt.	Poorly permeable, but locally carries small amounts of fresh or brackish water.
Sedimentary deposits			Consolidated calcareous dune sand	10-100	Pd	Moderately to well cemented crossbedded calcareous sand blown inland from beaches during former lower stands of the sea.	Permeable; contains brackish water at sea level.
Local erosional unconformity							
Pleistocene	Volcanic rocks and associated sedimentary rocks	Koloa volcanic series	Tuff cone at Kilauea Bay	350±	Pkt	Moderately to well indurated palagonite tuff containing fragments of basaltic rocks and calcareous reed rock.	Poorly permeable; fractures yield small amounts our fresh water.
Pleistocene	Volcanic rocks and associated sedimentary rocks	Koloa volcanic series	Ash and tuffaceou s soil beds	1-10	Pka	Fresh to highly decomposed ash and cinder intercalated with lava flows of the Koloa volcanic series.	Locally highly permeable and yield water freely, but mostly poorly permeable and locally perch small bodies of fresh water.
Pleistocene	Volcanic rocks and associated sedimentary rocks	Koloa volcanic series	Cinder cones	25-250	Pkv	Heaps of fresh to highly decomposed cinders at vents of lava flows of the Koloa volcanic series.	Moderately to highly permeable, but too small to be important aquifers.
Pleistocene	Volcanic rocks and associated sedimentary rocks	Koloa volcanic series	Palikea formation	2-700	Pkp	Masses of poorly sorted breccia and beds of poorly to moderately well sorted conglomerate at the base of, or intercalated with, rocks of the Koloa volcanic series.	Poorly permeable; locally perches small bodies of fresh water.
Pleistocene	Volcanic rocks and associated sedimentary rocks	Koloa volcanic series	Lava flows	1,000±	Pkl	Aa and pahoehoe lava flows of nepheline basalt, melilitenepheline basalt, picrate-basalt, olivine basalt, and basanite.	Poorly to moderately permeable; carry fresh or brackish water at sea level but generally yield it slowly to well; locally contain small bodies of perched fresh water.

Table 1-5 Stratigraphic Units on the Island of Kauaʻi (Continued)

Major Geologic Unit		Rock Assemblage		Thickness (feet)	Symbol on Figure 1-7	General Character	Water-Bearing Properties
MAJOR EROSIONAL UNCONFORMITY							
Pliocene	Volcanic rocks and associated sedimentary rocks	Waimea Canyon volcanic series	Makaweli formation, including Mokuone member	1,500+ (Makaweli fm. Proper); 0-1,000 (Mokuone member)	Twm (Makaweli fm. Proper); Twmm, Mokuone member	Aa and pahoehoe lava flows of olivine basalt, basalt, and picrate-basalt accumulated in a graben on the southwest side of the major Kauaʻi shield volcano. Mokuone member, masses of poorly sorted breccia along the contact of lavas of the Makaweli formation with the older rocks, and beds of moderately well sorted conglomerate intercalated with lavas of the Makaweli formation	Moderately to poorly permeable; carry fresh or brackish water at sea level but generally yield its less readily to wells than the lavas of the Nāpali formation. Mokuone member, poorly permeable; carries no water.
			Hāʻupu formation	1,850+	Twh	Massive flows of olivine basalt and picrate-basalt accumulated in a small caldera on the southeast slow of the major Kauaʻi shield volcano.	Moderately to poorly permeable; may carry fresh water at sea level but would not yield readily to wells.
			Olokele formation	2,600+	Two	Thick, massive flows of olivine basalt, ballast, and the picrate-basalt accumulated in a broad caldera at the summit of the Kauaʻi shield volcano.	Moderately to poorly permeable; lavas probably carry fresh water at sea level, but would not yield it readily to wells. Locally ash beds perch small bodies of fresh water at high levels.
			Nāpali formation	2,700+	Twn	Thin flows of olivine basalt, basalt, and picrate-basalt accumulated on the flanks of the Kauaʻi shield volcano.	Highly permeable; carries fresh water at sea level over much of island, and yields it freely to wells; may contain water confined at high levels between dikes in some areas.

Reference: Macdonald, G.A., Davis, D.A., and Cox, D.C., 1960, Geology and ground-water resources of the island of Kauaʻi, Hawaiʻi: Hawaiʻi Division of Hydrography Bulletin 13, 212 p.

Figure 1-8 The Water Cycle



Reference: https://www.boardofwatersupply.com/water-resources/the-water-cycle

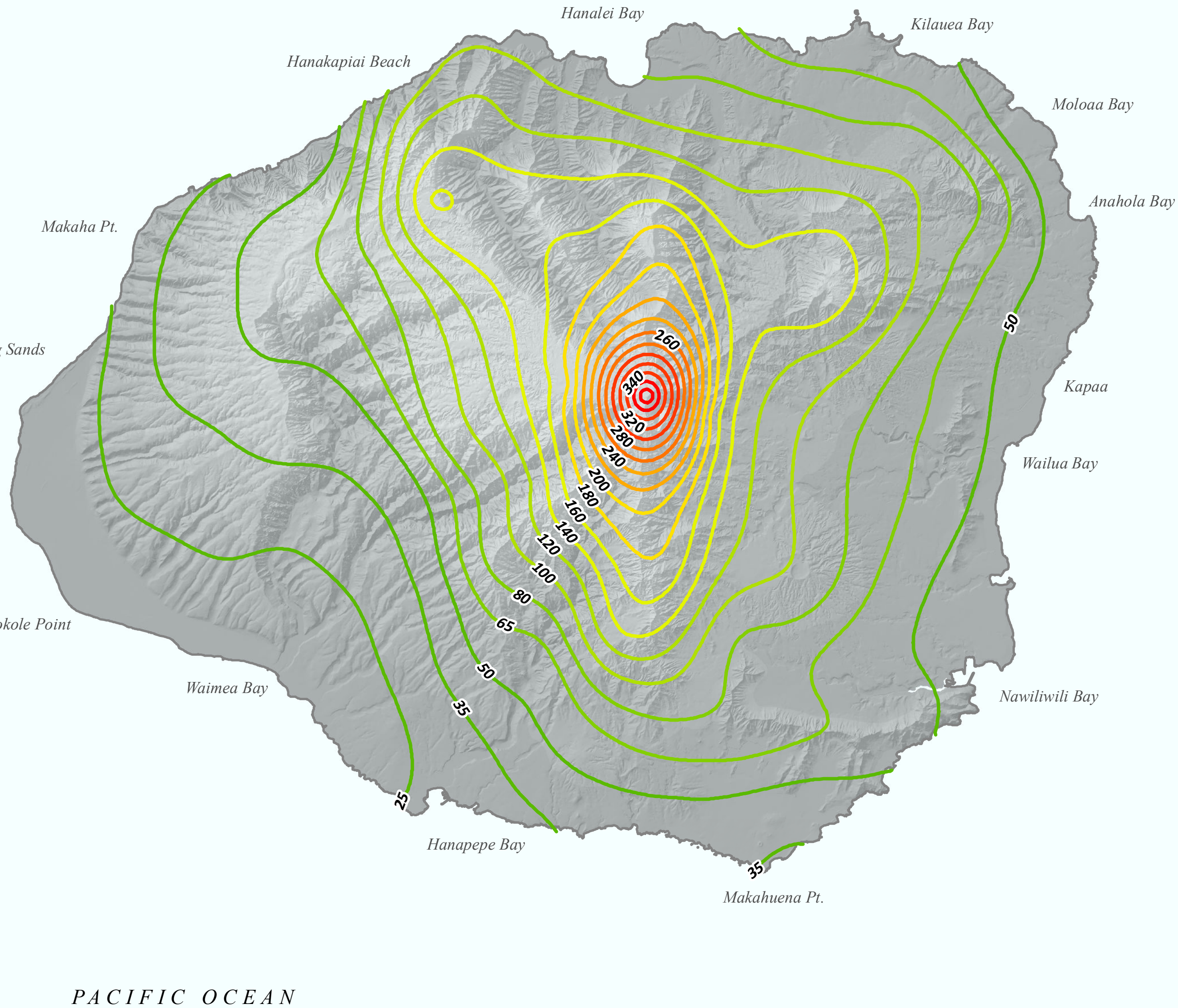
The island's water cycle may be altered as a result of various types of human activities. Human activities such as urban development have the potential to modify vegetative cover over the soil, impacting evapotranspiration and runoff patterns. Other activities such as the diversion of surface water for irrigation, ground water pumping, and disposal of wastewater effluent in the ocean also affect the island's water cycle.

Rainfall is the source of all fresh water in Kaua'i. The prevailing northeast trade winds over the island creates an orographic rainfall pattern[13]. This results in the heaviest rainfall occurring on the eastern or windward side of the island. The western (or leeward) side of the island typically receives little of the orographic trade wind rains. Rainfall on the leeward side of the island generally results from convective-type showers.

Average annual rainfall totals on the island can vary significantly within a relatively short distance – over 400 inches at the peak of the island, on Mount Wai'ale'ale, to only about 20 inches less than 20 miles to the southwest of the peak. (Refer to **Figure 1-9** for island rainfall isohyet map.) The island averages about 80-inches of rainfall annually. Distributed over the land area of the island, this equates to about 2.1 billion gallons of water per day. Annual rainfall totals can fluctuate from year to year.

The island's underlying volcanic rock and their residual soils have a very great capacity to absorb and percolate water. Much of the rainfall therefore infiltrates into the ground, creating the large groundwater bodies on which Kaua'i depends for its potable water supply. Runoff that is not absorbed into the soil flows overland into surface water streams and rivers to the sea.

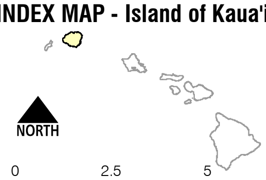
[13] Orographic precipitation is produced when moist air is lifted as it moves over a mountain range. As the air rises and cools, clouds form over the mountainous areas and serve as the source of the precipitation, most of which falls upwind of the mountain ridge.



Reference: 2011 Rainfall Atlas of Hawaii, Department of Geography, University of Hawaii at Manoa

FIGURE 1-9

INDEX MAP - Island of Kaua'i



LEGEND:

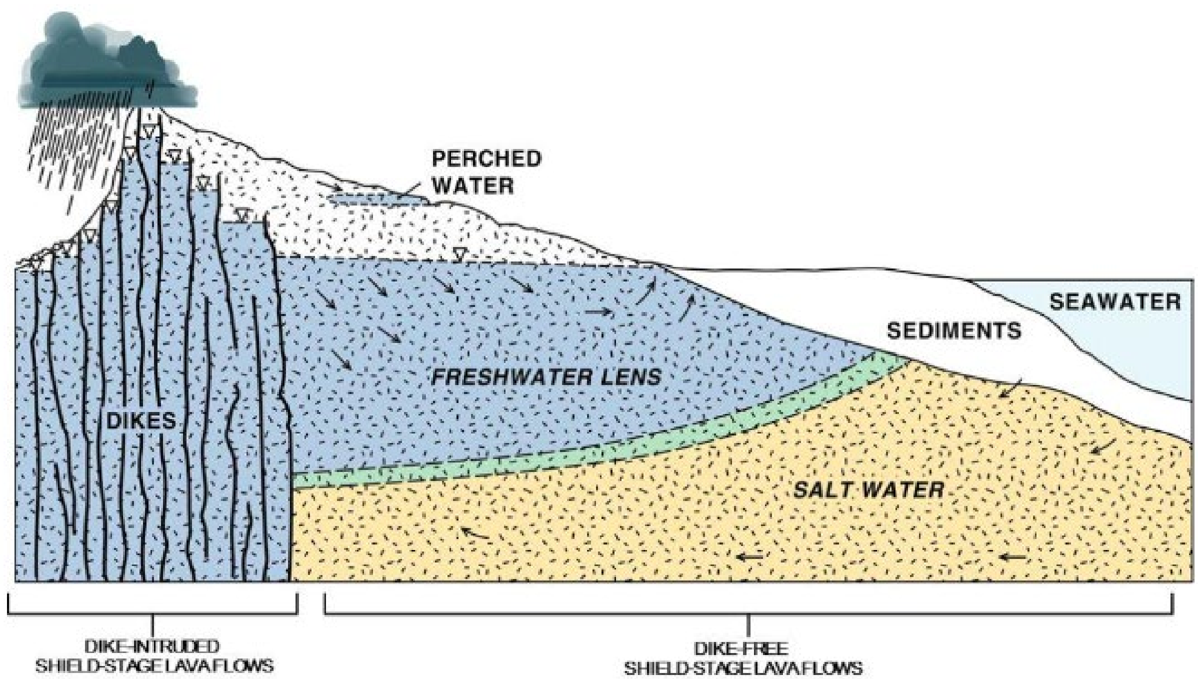
50 Isohyets in Inches

MEAN ANNUAL RAINFALL

Ground water resources are less susceptible to droughts and seasonal changes than surface water, and therefore is a more dependable water source. There are several types of general ground water bodies on Kaua'i. The most extensive is the "basal fresh water lens" that floats on seawater under much of the island[14], caprock sources are also found. Less widespread, but of singular importance in some areas, is ground water restrained between impermeable vertical rock structures called "dikes". The third type of minor significance is groundwater held up, or "perched", on horizontal impermeable beds such as volcanic ash (see **Figure 1-10**).

Of lesser importance to Kaua'i's drinking water resources, but very significant to agricultural pursuits, is stream flow from perennial and intermittent streams. Perennial streams flowing to the sea are found in almost all areas of Kaua'i. In comparison with the other main Hawaiian islands, the major streams on island are large and have relatively uniform flow. Stream flow is fed from direct runoff from rainfall in the mountains and have a perennial component fed by instream discharge water from high-level springs and seeps.

Figure 1-10 Ground Water Resources



Reference: https://hi.water.usgs.gov/studies/GWRP/hydrogeology.html

Smaller streams are very flashy in nature due to their steep profiles and small drainage areas. These streams are also affected by intense tropical storms. Stream flows, especially those on the windward side of the island, can rapidly reach peak rates within a matter of hours and return to normal just as quickly.

[14] This phenomenon is known as the Ghyben-Herzberg principle. Due to the difference in specific gravity of sea water and fresh water, theoretically for every foot of fresh water above sea level 40 feet of fresh water extend below sea level to maintain the equilibrium. However, in actuality, there is a zone of mixture (brackish water) or transition zone from sea water to fresh water.

Surface waters were extensively developed in the past by ancient Hawaiians to irrigate and grow taro, and later were further developed for use in the cultivation of sugarcane. Primarily to support the growth of sugarcane cultivation on drier lands, surface water irrigation systems were constructed to divert water from perennial streams and transport it over long distances. This involved the development of a complex system of ditches and included a number of small storage reservoirs to provide short-term storage of irrigation water.

With the conversion to drip irrigation of the sugarcane fields in the 1970s and the closure of the sugar plantations at the end of the twentieth century, the need for this level of extensive irrigation has changed. The need for and/or adaptation of the existing irrigation system infrastructure for the conversion of many agricultural lands to support diversified agriculture continues to be discussed and evaluated.

1.2.4.1 Climate Change

Climate change refers to long-term shifts in temperatures and weather patterns. These shifts can be natural or as a result of human activity. Climate change has been observed and is predicted to continue. Air and sea surface temperatures are increasing. An overall decline in rainfall has been observed in Hawai‘i, and it is projected that Hawai‘i will see more drought and heavy rains causing more flash flooding. Climate change models predict declining annual rainfall and wet season rainfall for all of Kaua‘i. The climate change models predict dry season rainfall to decrease for the leeward side of Kaua‘i and to increase for the windward side[15].

Per the WRPP, climate change is expected to result in many water resource changes, including intensified flooding and drought. Studies have found that decreases in rainfall have caused a decrease in stream base flows. This long-term base flow decline indicates a decrease in groundwater discharge to streams, which implies a decline in groundwater recharge and storage. Elevation of basal aquifers is expected to change due to sea level rise. Increase in water demand may result from increases in air temperature, increases in evapotranspiration, and longer and more frequent droughts.

The future impact of climate change on water resources is still being studied. This uncertainty requires a precautionary and adaptive approach to water management to ensure the long-term protection of our water resources. The impact of climate change on water resource availability, including sustainable yield, shall be considered in future updates of the WRPP.

[15] https://www.hawaii.edu/climate-data-portal/data-portal/ (link current as of June 2024)

1.3 ECONOMY AND POPULATION

1.3.1 Economy

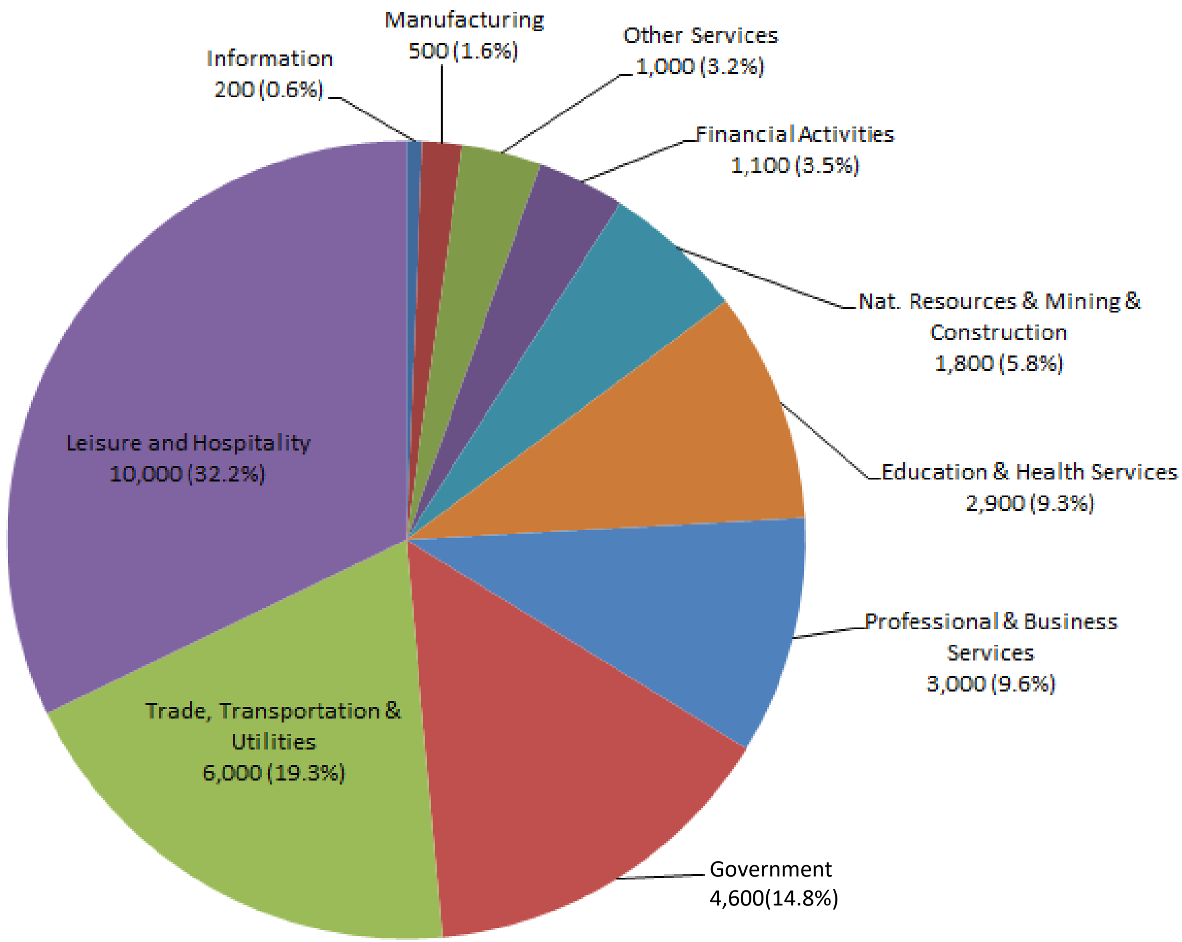
Based on information provided in second quarter 2018 economic outlook summary[16], economic expansion on Kaua'i is anticipated to continue. With the resulting tight job market, further moderate increases in income are also projected through the end of the decade.

The tourism industry is the largest industry on the island of Kaua'i. New resort development and renovations to existing visitor accommodations are currently underway and/or will be under construction over the coming years. Tourism growth and increasing population on the island puts additional pressures on existing public facilities, such as parks and roads, and additional demands on other utilities, such as water, wastewater, solid waste disposal, and energy resources. Increases in island population also will drive the need for additional affordable housing units.

As summarized on **Figure 1-11**, tourism currently accounts for about 30% of the island's non-farm jobs market. Trade, transportation and utilities and Government (State, County and Federal) comprise the next two largest non-farm employment sectors on the island at about 20 and 15 percent respectively.

[16] The Economic Research Organization at the University of Hawai'i, June 6, 2018. Kaua'i Economic Outlook Summary, prepared for the County of Kaua'i.

Figure 1-11 Non-Farm Jobs Summary (2017)



Reference: State of Hawai'i Department of Labor and Industrial Relations, Kaua'i County, 2017 Jobs Count by Industry

Based on data from the Bureau of Economic Analysis, US Department of Commerce, since the closure of the Gay and Robinson sugar mill in 2010, full and part-time farm related employment has averaged about 1025 jobs or about 2.4 percent of the island's jobs total. Refer to **Table 1-6** for summary of farm related employment data.

Table 1-6 Farm Employment Data

Major Sugar Still in Production				Post Sugar Mill Closure	
Year	**Jobs**	**Year**	**Jobs**	**Year**	**Jobs**
1969	2,404	1990	1,655	2010	987
1970	2,373	1991	1,546	2011	1,021
1971	2,286	1992	1,213	2012	987
1972	2,194	1993	1,669	2013	998
1973	2,202	1994	1,593	2014	1,101
1974	2,248	1995	1,457	2015	1,065
1975	2,305	1996	1,493	2016	1,018
1976	2,448	1997	1,363	**Average**	**1,025**
1977	2,375	1998	1,578		
1978	2,560	1999	1,560		
1979	2,307	2000	1,614		
1980	2,406	2001	1,325		
1981	2,079	2002	1,327		
1982	1,889	2003	1,303		
1983	2,000	2004	1,254		
1984	1,799	2005	1,247		
1985	1,844	2006	1,187		
1986	1,669	2007	1,085		
1987	1,753	2008	1,015		
1988	1,640	2009	1,039		
1989	1,520	**Average**	**1,752**		

Reference: Bureau of Economic Analysis, U.S. Department of Commerce website: https://www.bea.gov.data, Total Full-time and Part-Time Employment by Industry.

Based on economic value, Kaua'i's largest agricultural crop currently is seed corn. Other crops of importance include coffee, guava and taro. Refer to **Figure 1-12** for island jobs distribution inclusive of farm sector jobs.

The island of Kaua'i is divided into six planning districts. (Refer to **Figure 1-13** for planning districts map.) The Līhu'e District is projected to continue as the main jobs center on Kaua'i. Although, island-wide, tourism comprises the larger employment component, Līhu'e District has fewer of these jobs than the rest of the county (20 percent vs. 22 percent in 2010). Līhu'e District has the larger share of non-visitor jobs such as retail and trade, warehousing and utilities, finance, insurance and real estate, public administration wholesale trade, and information industry. Refer to **Table 1-7** for summary of County Jobs by Planning District.

Figure 1-12 Jobs Summary (Inclusive of Farm Sector Jobs)

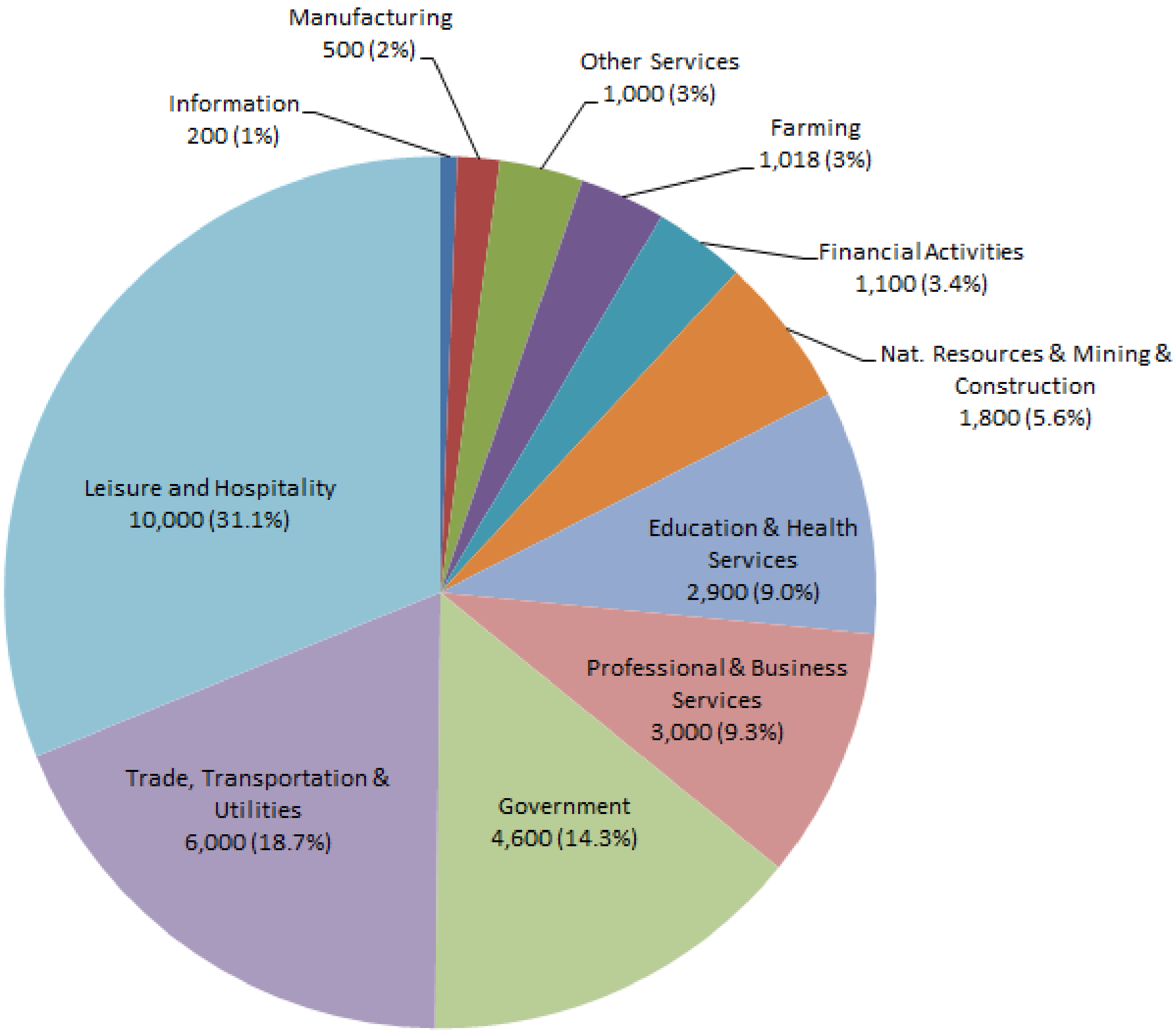
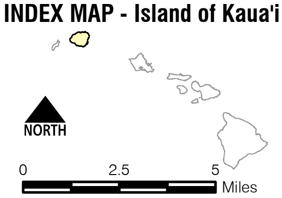


Table 1-7 Kaua'i County Jobs by Planning District (1990-2030)

District	Year				
	1990	**2000**	**2010**	**2020**	**2030**
Līhu'e	12,473	12,554	14,519	15,820	16,403
South Kaua'i	5,299	2,027	5,317	5,892	6,003
Hanapēpē – 'Ele'ele	999	695	779	821	838
Waimea - Kekaha	1,888	1,791	1,989	3,064	2,094
North Shore	4,143	3,513	3,802	3,839	3,838
East Kaua'i	5,548	4,570	5,199	5,565	5,724
Total	**20,350**	**28,150**	**31,900**	**34,000**	**34,900**

Reference: Kaua'i Kākou – Kaua'i County General Plan (2018), Appendix C, Table 3.

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- Planning Districts

FIGURE 1-13

PLANNING AREAS MAP

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Consulting Engineers

Kaua'i County - Department of Water
KAUA'I WATER USE AND DEVELOPMENT PLAN

1.3.2 Population

Between the years 2000 and 2010, the population in the State of Hawai'i grew by about 12 percent. In comparison, the population in the County of Kaua'i grew by about 15 percent for the same time. Refer to **Table 1-8**. The County General Plan population projections for the island to the year 2035, as listed in **Table 1-9**.

Table 1-8 Historical Population by Planning District – 2000 to 2010

District	Population by Year		Percent Change
	2000	2010	
Līhu'e	12,507	14,683	17.4
Kōloa – Po'ipū - Kalāheo	10,545	11,696	10.9
Hanapēpē – 'Ele'ele	4,362	6,157	41.2
Waimea	5,660	5,561	-1.7
Hanalei (North Shore)	6,605	8,002	21.2
Kawaihau – Kapa'a (East Kaua'i)	18,784	20,992	11.8
Total	**58,463**	**67,091**	**14.8**

Reference: Kaua'i Kākou – Kaua'i County General Plan (2018), Appendices. (Year 2000 and 2010 data extracted from Appendix C, Table 2.)

Table 1-9 Population Projections by Planning District – Year 2020 to 2035

District	Population by Year			
	2010	2020	2030	2035
Līhu'e	14,683	18,017	21,595	23,456
Kōloa – Po'ipū - Kalāheo	11,696	13,623	15,737	16,855
Hanapēpē – 'Ele'ele	6,157	6,463	6,860	7,094
Waimea	5,561	5,901	6,323	6,566
Hanalei (North Shore)	8,002	8,286	8,686	8,933
Kawaihau – Kapa'a (East Kaua'i)	20,992	22,403	24,128	25,110
Total	**67,091**	**74,693**	**83,328**	**88,013**
Average Annual Growth Rate	-	**1.08%**	**1.10%**	**1.10%**

Reference: Kaua'i Kākou – Kaua'i General Plan (2018), Appendix C, Table 2.

Through the year 2035, it is expected that the Līhu'e District will absorb about half of the projected island population growth. This is in line with the County's policy designating Līhu'e as the island's center of population and employment.

The Socioeconomic Analysis and Forecasts, dated February 2014, was prepared for the General Plan update to provide the basis for growth projections in population, housing, employment, and other demographic and socioeconomic characteristics. The forecasting model generated for the report looked at three population projections: a moderate or baseline estimate of 1.1 percent average annual rate of change; a high estimate of 1.15 percent average annual rate of change; and a low estimate of 0.08 percent average annual rate of change. **Table 1-10** shows the three population projections.

Table 1-10 Population Projection

Growth Rate	Population by Year					
	2010	2015	2020	2025	2030	2035
A - Low	67,091	70,090	72,938	75,903	78,988	82,199
B – Medium (Baseline)	67,091	70,717	74,693	78,893	83,328	88,013
C – High	67,091	70,822	74,989	79,401	84,073	89,020

Reference: Socioeconomic Analysis and Forecasts, February 2014.

1.4 LAND USE

1.4.1 State Land Use

Prior to the adoption of the State Land Use Law (HRS Chapter 205) by the State Legislature in 1961, the development of Hawai‘i’s lands was many times driven by the few to reap short-term gains while resulting in adverse long-term loss to the State’s economy - losses in income and future growth potential. The State Land Use Law was adopted with the intent to preserve and protect Hawai‘i’s limited and valuable lands and encourage uses to which lands are best suited.

The State Land Use Law called for the establishment of a Land Use Commission (LUC) within the State’s Department of Business and Economic Development and Tourism (DBEDT). The LUC is responsible for classifying lands into one of the following four land use districts:

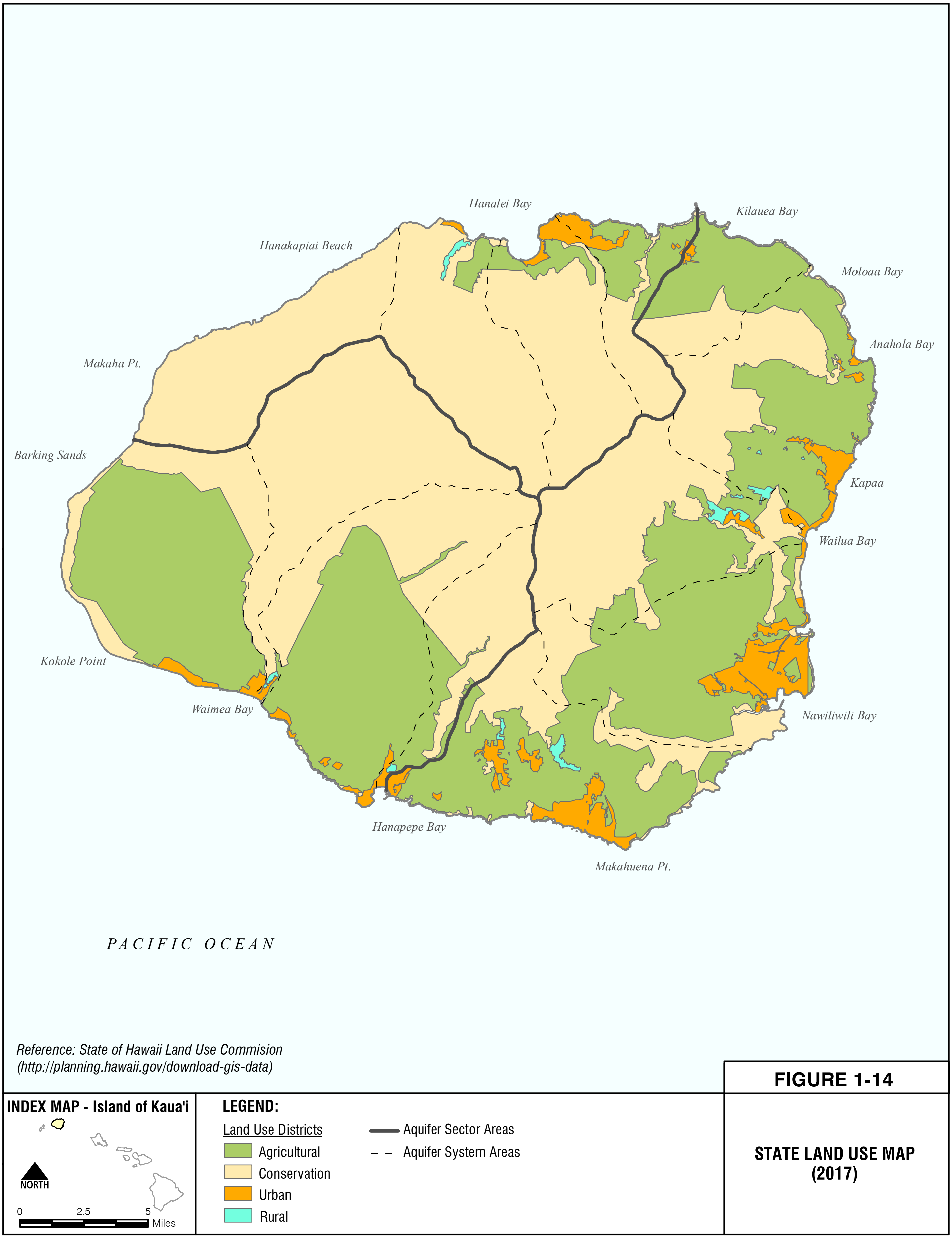
- Urban: Administered by the Counties
- Conservation: Administered by the State of Hawai‘i Board of Land and Natural Resources
- Rural: Shared jurisdiction (Land Use Commission and the Counties)
- Agricultural: County jurisdiction

HRS Section 205-2 designates, in general terms, the types of uses permitted in the four districts. **Table 1-11** summarizes Kaua‘i County State Land Use acreage by classification and shown graphically in **Figure 1-14**.

Table 1-11 Kaua‘i County – State Land Use Classifications Summary by Acreage

State Land Use Classification	Acreage	Percent of Total
Urban	14,834	4.2%
Conservation	198,769	56.2%
Agricultural	139,044	39.3%
Rural	1,253	0.4%
TOTAL	**353,900**	**100.0%**

Reference: DEBEDT, 2017. State Data Book, Table 6.04



Reference: State of Hawaii Land Use Commision (http://planning.hawaii.gov/download-gis-data)

FIGURE 1-14

STATE LAND USE MAP (2017)

1.4.2 County General Plan

The General Plan for the County of Kauaʻi is a direction-setting policy document that is intended to serve as a guide to help plan and improve the physical environment and quality of life for the people of Kauaʻi and to address the overall development of the island. It states the County's vision for Kauaʻi and establishes supportive objectives and actions. The General Plan is not a regulatory document but is intended to guide County decision making by establishing priorities for managing growth and community development in the County over a 20-year planning timeframe.

The first General Plan was adopted in 1971 and updates to the plan were made 1982 and 2000. Updates to the General Plan were intended to occur every ten years, subject to funding availability. The current version of the County of Kauaʻi General Plan was adopted by the Council of the County of Kauaʻi on February 7, 2018 and was signed and approved by Mayor Bernard Carvalho, Jr. on March 15, 2018.

The 2018 Kauaʻi County General Plan (herein to be referred to as the "General Plan") was developed in compliance with 2013 Hawaiʻi Revised Statues (HRS), Title 13 - Planning and Economic Development, Section 226-8 – County General Plans, which required that "The county general plans and development plans shall be formulated with input from the state and county agencies as well and the public." As called for in Section 226-58, "County general plans or development plans shall indicate desired population and physical development patterns for each county and regions within each county."

The General Plan provides the County with direction for desired future growth through a set of written policies, while special policies are as depicted on the Future Land Use Map and other associated maps. The General Plan covers the six planning districts on the island of Kauaʻi, as previously shown on **Figure 1-13**. The island of Niʻihau, although part of the County of Kauaʻi, is not included since it is predominantly privately owned and managed.

In the process of developing the General Plan, the various communities involved concurred that the overall vision in the 2000 General Plan was still relevant; however, the accomplishments achieved over the subsequent years fell short of the vision. The process was found to be in need of fixing. With this in mind, the current General Plan was developed to provide clear policy, measures of progress, and a system for evaluation and accountability. The General Plan therefore identifies nineteen key policies "to guide growth and includes a discussion of each policy's rationale and intended outcomes." See **Figure 1-15** for the nineteen key policies, as provided in the General Plan.

The General Plan also identifies ten sectors which represent the areas that must be considered in policy implementation. Each sector is composed of several subsections, and each subsection has an objective and actions. The two sectors that are most closely related to water resources are the watershed and critical infrastructure.

Figure 1-15 General Plan – Policies to Guide Growth

Reference: Kaua'i Kākou – Kaua'i County General Plan (2018).

- One of the subsections of the watershed is kahawai – middle watershed, drainage, and freshwater resources. Its objective is "1) To protect, restore and enhance freshwater resources to support aquatic, environmental, and cultural resources; and, 2) to recognize and mitigate impacts from the built environment to the mid-watershed area." The subsection addresses the topics of understanding our reliance on aquifers and streams, protecting drainage systems and water quality, protecting perennial streams and instream flow, and utilizing community partnerships in water management.
- One of the subsections of critical infrastructure is domestic water. Its objective is "To ensure water for Kaua'i's water needs under the Public Trust Doctrine and integrate traditional ahupua'a methods of preserving water for future generations – not taking more than is needed and leaving enough for everyone." The subsection addresses the topics of reconciling water supply and infrastructure, improving system reliability and addressing growth, and enhancing water conservation.

The policies developed in the General Plan are implemented spatially through the Land Use Map (see **Figure 1-16**). It serves as the "backbone of the General Plan and is a critical element in the State and County's land use and regulatory planning system." A summary of associated acreage for each General Plan Land Use designation is provided in **Table 1-12**.

Table 1-12 County General Plan Land Use Designations

General Plan Land Use Designation	Acreage	Percent of Total
Agricultural	76,037	21.5
Military	2,032	0.6
Open	239,250	67.6
Park	1,008	0.3
Residential Community	9,208	2.6
Resort	2,229	0.6
Transportation	957	0.3
Urban Center	2,613	0.7
DHHL	20,350	5.8
TOTAL	**353,685**	**100.0**

Reference: County of Kaua'i Planning Department, GIS Data

The Department of Hawaiian Home Lands (DHHL) is exempt from State and County land use classifications and determines the land use classifications for its land.

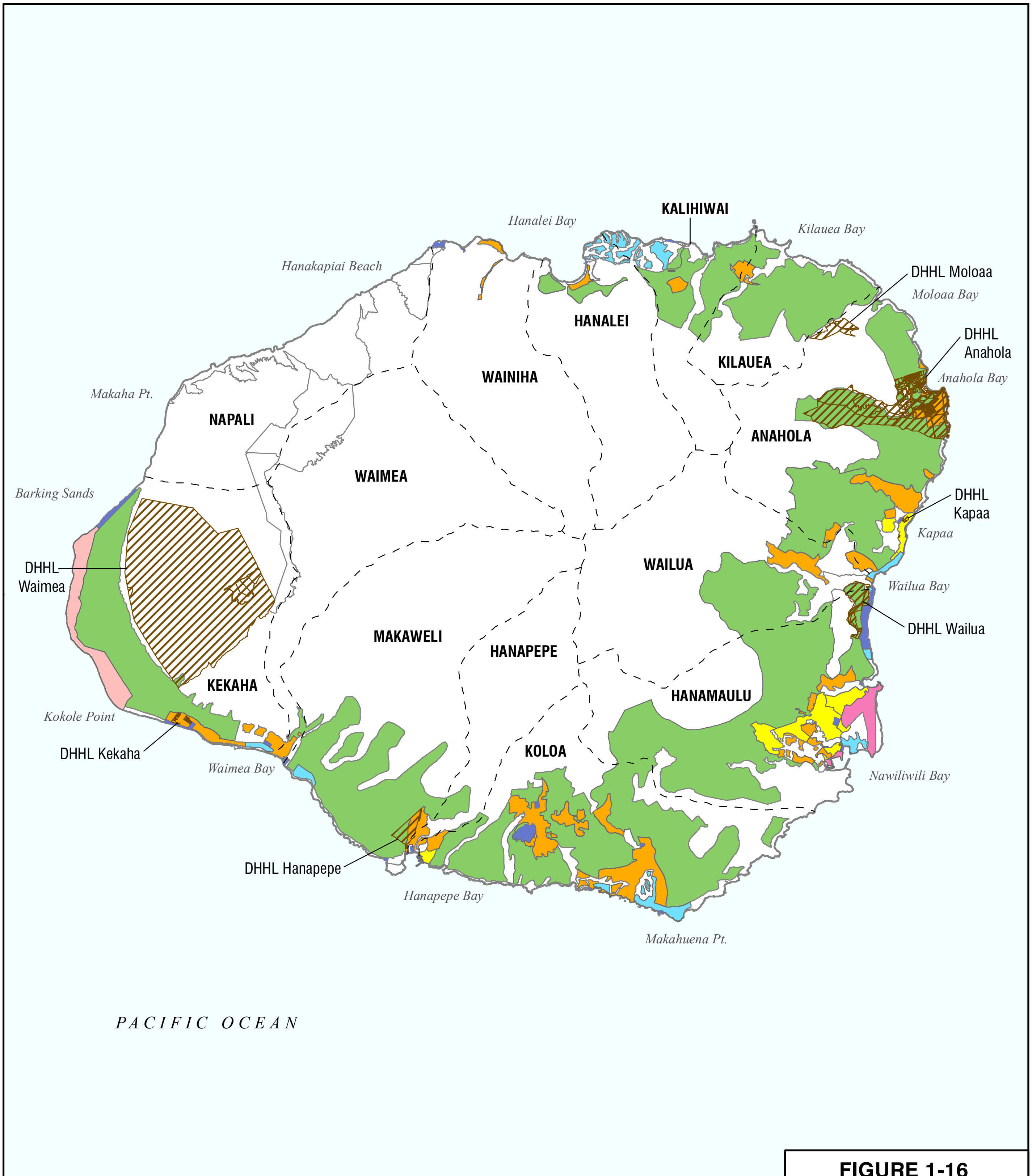
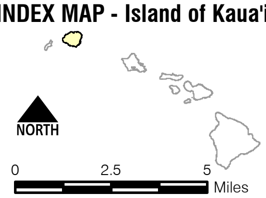


FIGURE 1-16

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer System Areas
- Hawaiian Home Lands

Land Use Allocation Guide

- Agricultural
- Military
- Open
- Park
- Residential Community
- Resort
- Transportation
- Urban Center

COUNTY GENERAL PLAN LAND USE MAP

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Consulting Engineers

Kaua'i County - Department of Water

KAUA'I WATER USE AND DEVELOPMENT PLAN

Projections identified in the General Plan with regards to the island's population, housing units, jobs growth, and visitor arrivals are summarized in **Tables 1-13 through 1-16**, respectively.

Table 1-13 Kauaʻi County Population, Island Wide and by District (2010-2035)

Planning District	Census Year			
	2010	2020	2030	2035
Līhuʻe	14,683	18,017	21,595	23,456
South Kauaʻi	11,696	13,623	15,767	16,855
Hanapēpē-ʻEleʻele	6,157	6,463	6,860	7,094
Waimea-Kekaha	5,561	5,901	6,323	6,566
North Shore	8,002	8,286	8,686	8,933
East Kauaʻi	20,992	22,403	24,128	25,110
TOTAL	**67,091**	**74,693**	**83,328**	**88,013**

Table 1-14 Housing Unit Demand, Forecast to 2040

	Census Year			
	2010	2020	2030	2040
County of Kauaʻi, Unit Total	29,793	33,553	37,519	39,676
County of Kauaʻi Available Units	24,915	28,085	31,379	33,169
County of Kauaʻi, Occupied Units	23,240	25,902	28,788	30,349
Average Annual Growth Rate	-	1.3%	1.2%	1.1%

Table 1-15 Job Growth, Forecast to 2040

	Census Year			
	2010	2020	2030	2040
County of Kauaʻi	23,550	31,900	34,000	34,900
Average Annual Growth Rate		1.33%	0.66%	0.53%

Table 1-16 Visitor Arrivals, Forecast to 2040

	Year			
	2010	2020	2030	2040
County of Kauaʻi (x1000)	955	1,302	1,418	1,480
Change this Decade	-11.2%	26.7%	8.1%	4.2%
Average Annual Rate of Change	-1.2%	2.7%	0.8%	0.4%

1.4.3 Community Development Plans

A development plan is "intended to direct physical development and public improvements within a specific geographic area of the County within the framework of the General Plan." Development plans establish more detailed policy than the General Plan. Not every community needs or desires a development plan since some communities may not require more specific, detailed policy than what is established in the General Plan.

The County has completed and adopted the Community Plans for South Kaua'i, Līhu'e, and West Kaua'i in 2014, 2015, and 2020 respectively. The development of an East Kaua'i Community Plan for is presently underway.

The development plans summarize the vision for future land use, growth and development specific to each of the districts identified. These plans were developed with input from members of the community in each of the respective districts. Highlights specific to the each of these communities, particularly those that impact water resources and infrastructure, are provided in respective sections of this report.

1.4.4 County Zoning

The County of Kaua'i adopted the Comprehensive Zoning Ordinance on September 1, 1972. Since its adoption, several amendments to specific provisions have been approved. The CZO has not been updated in a comprehensive manner since its adoption. The County Planning Department is in the process of updating the CZO and has divided the project into two phases:

- Phase 1: Focus on organizational and format changes
- Phase 2: Provision of more substantive changes

On December 3, 2012, Phase 1 of the CZO update was approved through the adoption of County Ordinance 935. This adopted Phase 1 update of the CZO and will serve as the official zoning code until Phase 2 of the project is completed.

The CZO is the County's legal instrument to regulate land development in accordance with adopted land use policies, including the General Plan and Development plans.

The CZO provides more specific designations than in the General Plan. Zoning designations have been established for almost all parcels on the island. The CZO also provides more detailed information regarding development and design standards for the location, height and size of structures, yard areas, off-street parking facilities, and open spaces, and the use of structures and open areas, and the use of structures and land for agriculture, industry, business, residences or other purposes.

Refer to **Figure 1-17** for County Zoning Map. **Table 1-17** provides a summary by County zoning classifications and associated acreages.

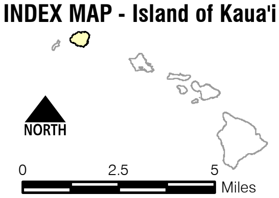
Table 1-17 County Zoning

Zoning Class	Zoning Designation	Acreage	Percent of Total
Agriculture	A	87,322	24.6
Commercial	C		
General Commercial	CG	586	0.2
Neighborhood Commercial	CN	124	0.0
Conservation	CON	193,207	54.4
Industrial	I		
General Industrial	IG	1,183	0.3
Limited Industrial	IL	217	0.1
NO ZONING		1,491	0.4
Open	O	42,287	11.9
Project Development	P	38	0.0
Residential	R	7,473	2.1
Resort	RR	625	0.2
Special Planning Area	SPA-A	26	0.0
Special Treatment	ST	168	0.0
DHHL	DHHL	20,428	5.8
	TOTAL	**355,174**	**100.0**

Source: County of Kaua‘i Planning Department, GIS Data

FIGURE 1-17

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer System Areas
- Hawaiian Home Lands

Zoning Designations:

- Agriculture
- Commercial - General
- Commercial - Neighborhood
- Conservation
- Industrial - General
- Industrial - Limited
- No Zoning
- Open
- Residential
- Resort
- Special District

COUNTY ZONING MAP

1.5 EXISTING WATER RESOURCES

1.5.1 General

Naturally occurring water resources on the island of Kaua'i include ground water, surface water, and rainwater catchment. Conservation is vital to preservation of these valuable water resources. Water supply can be further augmented by wastewater reclamation, desalination, and storm water reuse. Water quality varies with the source, and depending on the proposed use, treatment requirements also vary. Water quality protection is covered under the WQP. The WQP describes programs under the Department of Health and other programs that protect existing and potential sources of drinking water. It is noted that only limited information is available for water resources, and only very limited records related to individual catchment systems are available.

1.5.2 Ground Water

Ground water is the primary water source for many users on the island. As previously discussed, the SY for the island of Kaua'i is 328 mgd.

1.5.2.1 Wells

As defined in the State Water Code, a well is "an artificial excavation or opening into the ground, or an artificial enlargement of a natural opening by which ground water is drawn or is or may be used or can be made to be usable to supply reasonable and beneficial uses within the State." The inventory of wells was obtained from the CWRM database. The CWRM database on wells was developed from information gathered through the Well Registration program, and since 1988, supplemented with information gathered through the well construction/pump installation permitting process. Refer to **Appendix A** for this database.

The database provides the best available information on wells and was used to evaluate existing ground water resources. However, for some wells, the database is missing information that is pertinent to the WUDP, such as installed pump capacity and chloride concentrations. Installed pump capacity indicates the rate at which the installed pump is capable of withdrawing water. Data related to chloride concentrations provides important information regarding the potablility of the water being pumped from the well. Caprock and saltwater withdrawals do not count against the sustainable yield.

Current State Water Code and Administrative Rules do not require well owners in non-designated water management areas to report changes in well ownership or use category; however, these changes are updated by the CWRM when it these types of changes become known. As of July 1995, certification of well construction and pump installation completion was begun by the CWRM. The certificate requires that landowners notify the CWRM of changes in the well operator and landowner changes.

Based on the CWRM well database and limited additional update information, the island of Kaua'i has 284 production wells, which are shown on **Figure 1-18.** According to the WRPP, production wells are all wells that are not classified as abandoned, observation, or unused. The number of wells by CWRM category are shown in **Table 1-18**. There are also 83 wells classified as "unused".

Table 1-18 Summary of Installed Pumps in Existing Well Sources

Category	Number of Wells	Capacity* (mgd)	Percent of Total Capacity
Agriculture	50	119.6	55.2
Domestic	117	5.1	2.3
Industrial	8	21.7	10.0
Irrigation	29	13.6	6.3
Military	3	3.2	1.5
Municipal	70	53.3	24.7
Other	7	0.0	0.0
Total	284	216.5	100.0

* Capacity based on available installed pump capacity data from CWRM; many well pump capacities are not listed in the database. It is also noted that the potability of the water being pumped from some of the wells is not known.

Reference: CWRM Well Database (2017)

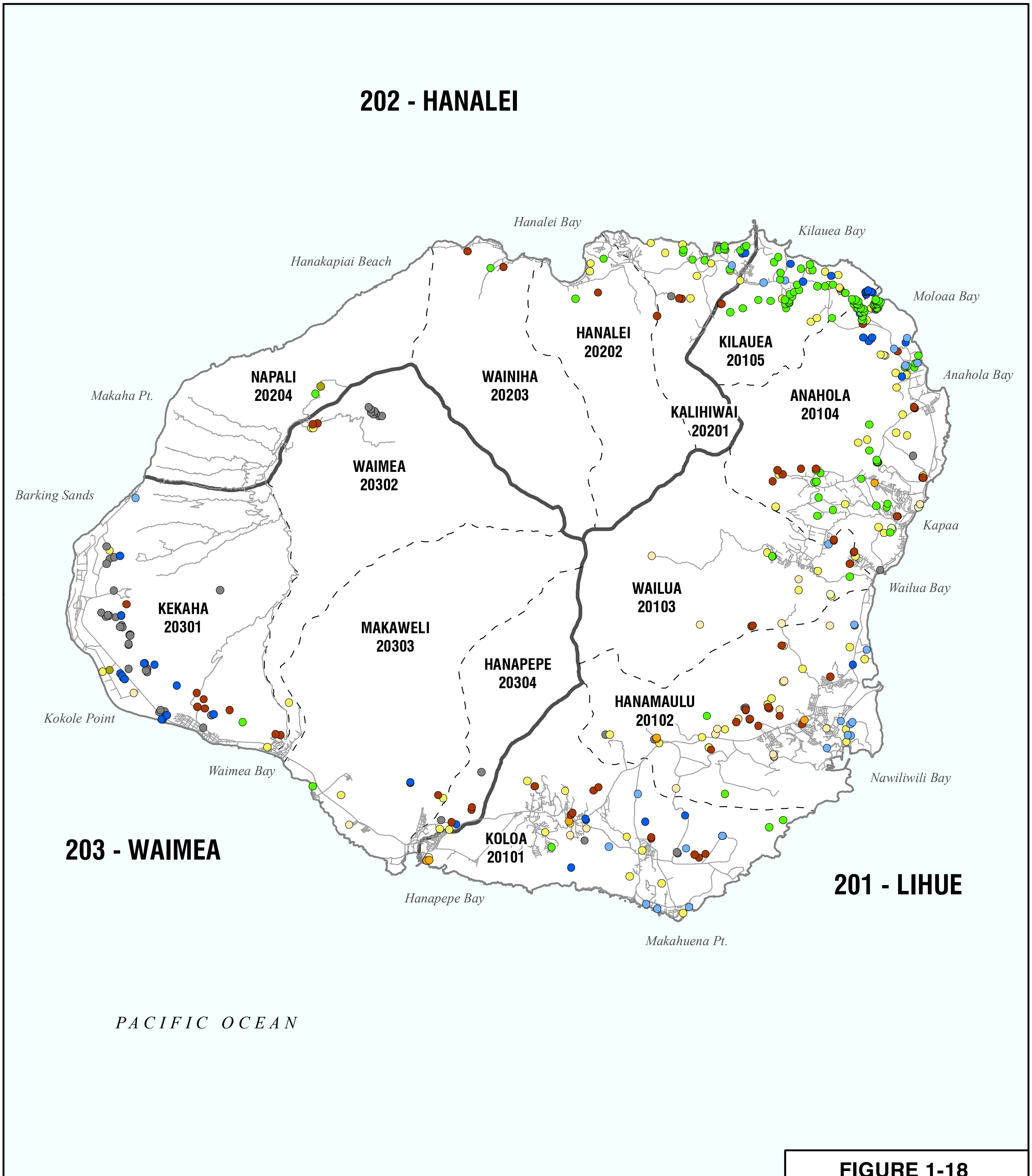
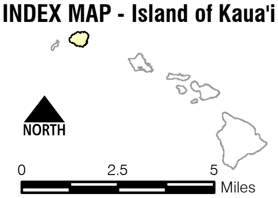


FIGURE 1-18

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- State Highway/ County Roads

Well Use Types

- Abandoned
- Agriculture
- Domestic
- Industrial
- Irrigation
- Military
- Municipal
- Observation
- Other
- Unused

REGISTERED WELLS

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Kaua'i County - Department of Water

KAUA'I WATER USE AND DEVELOPMENT PLAN

1.5.3 Surface Water

The annual rainfall on the island of Kauaʻi generally tends to be greater than the rest of the major Hawaiian Islands, with Mount Waiʻaleʻale reputed to be one of the world's wettest spot with annual rainfall of 450 inches per year. The island's wet climate has provided substantial surface water sources, which supported major agricultural production (primarily sugarcane) in the past.

Of the 376 perennial streams identified in the Hawaiʻi Stream Assessment[17] (HSA), 61 are located on the island of Kauaʻi. As noted in the HSA, on the island of Kauaʻi, perennial streams are evenly distributed across the island. A list of available USGS stream gaging records from the HSA on the island of Kauaʻi is summarized in **Table 1-19**.

The CWRM also manages a database of gage data. See **Table 1-20** for a summary of the active gages on the island of Kauaʻi as of 2024.

In accordance with the Code, instream flow standards (IFS) must be established and administered by the CWRM on a stream-by-stream basis as necessary to protect public interests. An IFS is defined as:

> "a quantity or flow of water or depth of water which is required to be present at a specific location in a stream system at certain specified times of the year to protect fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses."

Instream use is defined by the Code as "beneficial uses of stream water for significant purposes which are located in the stream and which are achieved by leaving the water in the stream. Instream uses include, but are not limited to:

- Maintenance of fish and wildlife habitats
- Outdoor recreational activities
- Maintenance of estuarine, wetland, and stream ecosystem
- Aesthetic values such as waterfalls and scenic waterways
- Navigation
- Instream hydropower generation
- Maintenance of water quality
- The conveyance of irrigation and domestic water supplies to downstream points of diversion; and
- The protection of traditional and customary Hawaiian rights."

The CWRM recognizes that considerably more research and study is needed to accumulate adequate data and gain a better perspective to develop meaningful IFS. Accomplishing this work is highly dependent on policy and program direction, availability of funding, and staffing. Until permanent IFS are established, interim IFS have been adopted. Interim IFS for Kauaʻi (HAR §13-169-45) were adopted on June 15, 1988 and have been in effect as of October 10, 1988. The interim IFS for Kauaʻi are listed in **Table 1-21**.

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[17] Hawaiʻi Cooperative Park Service Unit, 1990. Hawaiʻi Stream Assessment: A Preliminary Appraisal Of Hawaiʻi's Stream Resources. State of Hawaiʻi, Department of Land and Natural Resources, Commission on Water Resource Management, Report R84, 294 p

Table 1-19 USGS Gaging Records

CODE:	Gage is associated with stream with this HSA code	QUAL DATA	USGS assessment of quality of records
NAME	USGS Station Name	DRAIN	Drainage area above gage (square miles, sq. mi.)
GAGE #	USGS number of gage station. If all zeros, median and average are calculated flows	DIV Y N D	Diversion per USGS Diversion is present above gage No diversion is present above gage Gage is on a ditch
ACTIVE	A – Active in January, 1991		
MEDIAN	Flow at gaging station exceeded 50% of time in cubic feet per second (cfs)	TYPE DATA C E C-E L P	Type of data collected Continuous record Extreme flows only, low and/or peak Converted from continuous to extreme Low flow Peak Flow
AVERAGE	Average of yearly mean flow in cubic feet per second (cfs) at gaging station		
YRS REC	Years of record 19.. – 19..		

Note: cfs x 0.642 = MGD

CODE	NAME	GAGE #	AC-TIVE	MED-IAN	AVE-RAGE	YRS REC	QUAL DATA	DRAIN	DIV	TYPE DATA
2-1-04	Kalalau Str. nr Hanalei	117000		5.2	6.89	31-55			N	C
2-1-07	Nanakoa Str. nr Hanalei	116000		1.8	5.51	31-52			N	C
2-1-10	Hanakapiai Strn nr Hanalei	115000		8.4	16.90	31-52			N	C
2-1-14	Wainiha R. nr Hanalei	108000	A	79.0	138.00	52-	G	10.20	N	C
2-1-14	Wainiha Canal at intake nr Wainiha	110000				10-16				E
2-1-14	Wainiha R. nr Wainiha	113000				12-16			N	E
2-1-15	Lumahaʻi R. nr Hanalei	106000		67.0	117.00	14-33		7.50	N	C
2-1-18	Waiʻoli Str. nr Hanalei	105000		20.0	31.60	14-33			N	C
2-1-19	Hanalei Ditch Kīlauea	099500				56-62			D	C
2-1-19	Hanalei Tunnel outlet nr Līhuʻe	100000		28.0	27.30	32-85	G		D	C
2-1-19	Hanalei at alt 625 ft nr Hanalei	101000		49.0	83.40	14-55			Y	C
2-1-19	Combined records if stations 1600000, 16101000	101003		68.0		32-55			N	C
2-1-19	China Ditch nr Hanalei	102000		29.0	27.20	11-80			D	C-L
2-1-19	Hanalei R. nr Hanalei	103000	A	130.0	212.00	12-	G	19.10	Y	C
2-1-19	Kuna Ditch nr. Hanalei	104000				12-19			D	E
2-1-19	Hanalei R. at Hwy 56 Bridge nr Hanalei	104200	A			62-			Y	P

Table 1-19 USGS Gaging Records (Continued)

CODE	NAME	GAGE #	AC-TIVE	MED-IAN	AVE-RAGE	YRS REC	QUAL DATA	DRAIN	DIV	TYPE DATA
2-1-25	Kalihiwai R. nr Hanalei	098000		32.0	47.70	14-23			N	C
2-1-26	Puʻukumu Str. nr Kīlauea	097900	A			64-			N	P
2-1-28	Puʻu Ka Ele Ditch nr Kīlauea	095000		3.4		32-67			D	C
2-1-28	Ross Ditch nr Kīlauea	095200		3.1		56-67			D	C
2-1-28	Kalihiwai Ditch above wasteway nr Kīlauea	095900		4.3		60-68			D	C
2-1-28	Kīlauea	096000		2.8		34-67			D	C
2-1-28	Pōhakuhonu Str. nr Kīlauea	097000		3.5	8.21	34-67	G	1.80	Y	C
2-1-28	Hālaulani Str. nr Kīlauea	097300		2.7		57-72			N	C
2-1-28	Hālaulani Str. at alt 400 ft nr Kīlauea	097500	A	7.2	11.50	57-	G	1.90	N	C
2-2-01	Anahola Str. nr Keālia	089000		9.7	22.40	10-85	P	4.27	N	C
2-2-01	Anahola Str. at Anahola	093200		15.0	34.20	62-82	F	9.24	Y	C
2-2-04	Combined records of 16079000, 16080000	080001		13.0		36-85			N	C
2-2-04	Kapaʻa str. nr Keālia	078000		27.0	36.10	10-20			Y	C
2-2-04	Kapaʻa str. at Kapahi Ditch intake nr Kapaʻa	080000	A	5.9	21.50	36-			Y	C-E
2-2-04	Kapaʻa Str. at old Hwy crossing nr Keālia	084500	A			62-			N	P
2-2-04	Kapahi Ditch nr Keālia	079000	A	4.5	6.16	09-	G		D	C
2-2-04	Kaneha Ditch nr Keālia	081200	A			64-			Y	P
2-2-06	Konohiki Str. nr Kapaʻa	073500	A			64-			Y	P
2-2-08g	Wailua R. System	000000		110.0	238.56					
2-2-08	Wailua R. nr Kapaʻa	071800	A			62-				P
2-2-08.01	Left branch Opaekaʻa nr Kapaʻa	071500	A	1.8	2.56	60-	G	0.65	N	C
2-2-08.02	N. Fork Wailua R. at alt 650 ft nr Līhuʻe	063000		50.0	73.10	14-85	G	5.29	Y	C
2-2-08.02	E. branch of N. Fork Wailua R. nr Līhuʻe	068000	A	32.0	48.00	12-	G	6.27	N	C
2-2-08.02	N. Fork Wailua R. nr Līhuʻe	068700		0.0		10-14			Y	E
2-2-08.02	N. Fork Wailua R. nr Kapaa	071000	A	73.0	122.00	52-	G	17.90	Y	C
2-2-08.03	S. Fork Wailua R. Līhuʻe	060000	A	36.0	114.00	11-	G	22.40	Y	C
2-2-08.03	S. Fork Wailua R. nr rock quarry nr Līhuʻe	058500				74-			Y	L
2-2-15	Huleʻia Str. nr Līhuʻe	055000	A	10.0	28.00	12-	G	17.60	Y	C-P
2-2-15	Kamoʻoloa Str. nr Puhi	053800		0.6	17.00	63-71	G	5.94	Y	C
2-2-15	Kuia Str. nr Puhi	054500		3.5		63-66			Y	C
2-2-15	Kamoʻoloa Str. nr Puhi	053800		0.6	17.00	63-71	G	5.94	Y	
2-3-04	Lāwai Str. nr Kōloa	052500	A	3.0		49-			Y	C-P
2-3-04	Hanapēpē R. at Hanapēpē	052000	A			49-			Y	P
2-3-07	E Fork Kōʻula R. nr. ʻEleʻele	041000				11-15			Y	E
2-3-07	Kōʻula R. at Kula nr ʻEleʻele	047000		34.0	74.30	10-16			Y	C

Table 1-19 USGS Gaging Records (Continued)

CODE	NAME	GAGE #	AC-TIVE	MED-IAN	AVE-RAGE	YRS REC	QUAL DATA	DRAIN	DIV	TYPE DATA
2-3-07	Hanapēpē R. below Manuahi Str. nr ‘Ele‘ele	049000	A	32.0	84.70	17-	G	18.50	Y	C
2-3-07	Hanapēpē Ditch at Hanapepe Falls nr ‘Ele‘ele	042000				11-15			D	E
2-3-07	Hanapēpē Ditch below intake nr ‘Ele‘ele	043000			42.50	30-38			D	C
2-3-07	Hanapēpē Ditch at Kō‘ula nr ‘Ele‘ele	044000			38.50	10-49			D	C
2-4-04g	Waimea R. System	000000		63.0	253.00					
2-2-04	Waiakoali Str. nr Waimea	011000		3.5	8.88	09-80			N	C-L
2-2-04	Kōke‘e Ditch nr Waimea	014000		20.0	24.20	26-82	G		D	C
2-2-04	Kauaikinana Str nr Waimea	012000		2.2	6.24	19-80			N	C-L
2-2-04	Waimea R. at alt 3,420 ft nr Waimea	016000		19.0	44.90	16-68			Y	C
2-2-04	Waialae Str at alt 800 ft nr Waimea	019000	A	6.7	21.80	20-	G	1.79	N	C
2-2-04	Waialae Str. nr Waimea	020000		9.9		10-16			N	C
2-2-04	Waialae Str. at alt 800 ft nr Waimea	021000		16.0		16-21			N	C
2-2-04	Waimea R. below Kekaha Ditch intake nr Waimea	028000		1.4	67.90	21-69			Y	C
2-2-04	Waimea R. near Waimea	031000	A	15.0	124.00	10-	G	57.80	Y	C
2-2-04	Combined records for stations 16031000, 16036000	031001		50.0		43-68			Y	C
2-2-04	Waimea R. at Waimea	038000	A			43-			Y	P
2-2-04	Kekaha Ditch at Camp 1, nr Waimea	022000		55.0	57.10	09-68			D	C
2-2-04	Kekaha Ditch below tunnel 12 nr Waimea	027000		51.0	50.00	08-34			D	C
2-2-04.01	Makaweli R. nr Waimea	036000	A	29.0	85.5	43-	G	26.00	Y	C
2-2-04.01	Makaweli R. below Poowaiomahaihai Ditch nr Waimea	037100		23.0	105.00	11-17			Y	C
2-2-04.02	Mokihana Str. nr Waimea	029500				62-80			N	L
2-2-04.04	Koalie Str. at alt 3.770 ft nr Waimea	017000		8.2	24.6	19-68			N	C
2-2-04.04	Koai‘e Str. nr Waimea	018000				15-71			N	E
2-5-04-06.1	Mōhihi Str. nr Waimea	015000				09-17			N	C
2-5-04-06.1	Mōhihi Str. at alt. 3,420 ft nr Waimea	013000		3.0	8.62	20-71	P	1.60	N	C
2-5-04-06.3	Kawaikoi Str. nr Waimea	010000	A	13.0	34.40	09-	G	3.95	N	C
2-5-08	Nahomalu Valley nr Mana	130000	A		0.42	62-	F	3.77	N	C-P

Reference: Hawai‘i Cooperative Park Service Unit, 1990. Hawai‘i Stream Assessment: A Preliminary Appraisal Of Hawai‘i's Stream Resources. State of Hawai‘i, Department of Land and Natural Resources, Commission on Water Resource Management, Report R84, 294 p

Table 1-20 CWRM Gaging Records

Gage ID	Gage Name	Flow Type	Operator	Gage Information
23	North Wailua Ditch below Waikoko Stream	Diverted Flow	KIUC	Water data measures flow diverted from Waikoko Stream at DivID: 713 to ʻIliʻiliʻula North Wailua Ditch
24	North Wailua Ditch below North Fork Wailua Stream	Diverted Flow	KIUC	Water data measures flow diverted from Waiʻaleʻale Stream (North Fork Wailua River) at DivID: 716 to ʻIliʻiliʻula North Wailua Ditch.
49	Kōkeʻe Ditch-Puʻulua Reservoir	Diverted Flow	KAA	Water data measures flow in Kōkeʻe Ditch above Puʻu Lua Reservoir and records amount entering the reservoir. Water data represents the SUM of water diverted from three main diversions: Waiokoali (620), Kawaikōī (616), and Kauaʻikinana (607); several smaller diversions: Kumuwela #1, #2, #3, and #5 (619, 614, 603, 615), Poʻomau (621), and Halemanu (619); PLUS or MINUS water diverted or returned at the Kōkeʻe Intake/Outflow (622) ("fake waterfall"), MINUS water returned (dumped) at the Kōkeʻe Ditch Gaging Station (Kauhau Gulch) (610). The Mōhihi Intakes (#1, #2, and #3) (612, 617, and 606) are inactive. (as of 9/2016).
50	Kekaha Ditch @ Hukipo Flume	Diverted Flow	KAA	Water data from January 2018 is the measured flow in Kekaha Ditch at Hukipo Flume. Water data from January 2018 represents diverted flow from Koaie Stream (DivID: 609), Waiahulu Stream (DivID: 605), and Waimea River below the confluence with Waialae Stream (DivID: 604), MINUS amount returned to Waimea River at the Mauka Hydro Plant, and amount distributed to the Menehune Ditch and water treatment plant. Prior to January 2018, water data is the estimated flow at Hukipo Flume plus 2 mgd (estimate upstream distribution to Menehune Ditch).
75	Princeville Sump Pump #1	Diverted Flow	Princeville Prince Golf Course, LLC	Water data is the metered diverted flow from ʻAnini Stream.
92	Alexander	Diverted Flow	McBryde Resources, Inc.	Water data calculated flow in Kauaʻi Coffee Ditch (aka Powerhouse Ditch) below Alexander Reservoir on Wahiawa Stream (divID: 837).
93	Wainiha	Diverted Flow	McBryde Resources, Inc.	Water data is the calculated flow that passes through the Wainiha Hydroelectric Plant. Water data represents flow diverted from Maunahina and Wainiha Streams into the Wainiha Powerhouse Ditch. Water is returned to the stream on exit from the powerhouse. (Exclude from island-wide statistics - non-consumptive use.)
94	Lāwaʻi Intake	Diverted Flow	McBryde Resources, Inc.	Water data represents flow in Lāwaʻi Intake Ditch from Lāwaʻi Stream (DivID: 812).
95	Olokele Ditch Weir (Nonopahu Gage?)	Diverted Flow	Gay & Robinson	Water data is the estimated flow in Olokele Ditch at the hydroelectric plant. Water data represents the sum of flows diverted from from Kalāhiki, Kaluawai, Olokele, and Waiānuenue Streams (DivID: 374, 379, 377, 980, 378).
104	Upper Līhuʻe Ditch (USGS 16057000)	Diverted Flow	Grove Farm	Water data is the measured flow in the Upper Līhuʻe Ditch at the site of former USGS Gage station 16057000. Water data represents flow diverted from ʻIliʻiliʻula, North Fork Wailua, South Fork Wailua, Waiahi, Waiaka, and Waikoko Streams (DivID: 699, 700, 702, 703, 704, 705, 706, 707).
105	Waitā Ditch above Waitā Reservoir	Diverted Flow	Grove Farm	Water data is the measured flow in Kōloa Tunnel (aka Waitā Ditch) above Waitā Reservoir. Water data represents flow into Waitā Reservoir from Kōloa Tunnel. Kōloa Tunnel source is stream diversions on Komoʻoloa Stream (DivID: 816) and Kuʻia Stream (DivID: 842).

Table 1-20 CWRM Gaging Records (Continued)

Gage ID	Gage Name	Flow Type	Operator	Gage Information
106	Hanamāʻulu Ditch (USGS 16058000)	Diverted Flow	Grove Farm	Water data is the measured flow in the Hanamāʻulu Ditch at the site of former USGS gage station 16058000. Water data represents flow diverted from Waiahi Stream at DivID: 688
107	Papuaʻa Reservoir Intake from Kamoʻola Stream	Diverted Flow	Grove Farm	Water data measures flow in the Upper Haʻikū Ditch above Papuaʻa Reservoir. Water data represents flow diverted from Kamoʻola Stream to Papuaʻa Reservoir.
110	Kapahi Ditch Lateral #9 at USGS 16079000	Diverted Flow	East Kauaʻi Water Users' Cooperative	Water data is the estimated flow from Kapaʻa Stream at Intake 36 (diversion ID: 689) into Upper Kapahi Reservoir.
111	North Wailua Ditch above Wailua Reservoir	Diverted Flow	East Kauaʻi Water Users' Cooperative	Water data is the estimated flow in the North Wailua Ditch above Wailua Reservoir. Water data represents flow diverted from North Fork Wailua River at DivID: 675 to Wailua Reservoir.
112	Kealia Ditch above Kaneha Res	Diverted Flow	Kauaʻi Ranch	Water data is the estimated flow in Kealia Ditch above Kaheha Reservoir. Water data represents flow diverted from Kealia Stream to Kaneha Reservoir via Kealia Ditch.
159	Hanamāʻulu-ADC Ditch	Diverted Flow	CWRM	Water data is the measured flow in the portion of the Hanamāʻulu Ditch that bypasses the Kapaia Reservoir and terminates at Aiʻi Reservoir at the site of former USGS gage station 16058000. Water data represents the portion of flow measured at Gage 106 that serves ADC lands. (Exclude from island-wide water statistics to avoid "double-counting.")
162	Kōkeʻe Ditch below Waiakoali Intake	Diverted Flow	KIUC	Water data represents flow diverted from Waiakoali Stream at DivID: 620 into Kokee Ditch.
178	Waiahi SWTF Raw Inflow	Diverted Flow	Grove Farm	Water data is the metered volume of raw water pulled from the Kapaia Reservoir to the Waiahi Water Treatment Plant. (Exclude from island-wide water statistics to avoid "double-counting.)
179	Waiahi SWTF Return Inflow	Diverted Flow	Grove Farm	Water data represents the volume of water returned to Kapaia Reservoir. 'Volume returned' is (estimated) 10% of the (measured) potable/finished water produced by the plant (Subtract from island-wide total?)
191	NF Wailua Stream below Blue Hole Intake	Instream Flow	CWRM	Water data represents flow in North Fork Wailua River (Waialeale Stream) below ʻIliʻiliʻula-North Wailua Ditch Intake (DivID: 24 on Waialeale Stream)
192	Upper Waiahi Hydro Tailrace	Return Flow	KIUC	Water data is the calculated flow returned to Waiahi stream from the Upper Waiahi Hydroelectric Power Plant. (Subtracted from island-wide water-use statistics.)
193	Lower Waiahi Hydro Tailrace	Return Flow	KIUC	Water data is the calculated flow returned to Waiahi stream from the Lower Waiahi Hydroelectric Power Plant. (Subtracted from island-wide water-use statistics.)
194	Lāwaʻi Stream below Lāwaʻi Ditch Intake	Instream Flow	CWRM	Water data is the measured flow in Lāwaʻi Stream below Lāwaʻi Irrigation System intake.
199	Farmer's Ditch Intake from Pump 3 Ditch	Diverted Flow	McBryde Resources, Inc. (Myra Amisone)	Staff plate on flume at Farmer's Ditch downstream of control point from Pump 3 Ditch.
200	Waikoko Stream below Ditch	Instream Flow	CWRM	Water data is the measured flow in Waikoko Stream below ʻIliʻiliʻula North Wailua Ditch intake (DivID: 713 - Intake #11).

Table 1-20 CWRM Gaging Records (Continued)

Gage ID	Gage Name	Flow Type	Operator	Gage Information
205	NTBG Limahuli Gardens	Diverted Flow	National Tropical Botanical Garden Irrigation System (Chipper Wichman)	Water data is the estimated flow in transmission pipeline from Limahuli Stream (DivID: 1262 at 320 ft elev). Estimate based on metered flow from 11/2010 to 11/2019. End Use: ~120,000 gpd for micro hydro returned to stream. Remainder for irrigation of taro
207	Pake Stream Intakes	Diverted Flow	Maile Walters (Kalihiwai Bay Estates Water Association)	Water data is estimated flow from unnamed Kalihiwai tributary (aka: Pake Stream) based on "bucket method".
210	Kalihiwai Reservoir Intake	Diverted Flow	Porter Irrigation (Jennifer Luck)	Water data represents flow diverted from Pohakuhonu Stream to Kalihiwai Reservoir via the Kalihiwai Ditch.
241	Kōkeʻe Ditch – Left Branch	Diverted Flow	KAA (Michael Faye)	Water data is the measured flow in Kōkeʻe Ditch below the Puʻu Moe Divide - Left Branch (Eastern Branch).
248	Waimea Canyon Comfort Station	Diverted Flow	DLNR, Division of State Parks Kauaʻi	Meter on pipeline measures flow pumped from Kokee Ditch at DivID: 1074 to the Waimea Canyon Comfort Station.
250	Kōʻula Ditch Weir	Diverted Flow	Gay & Robinson, Inc. (Howard Greene)	
261	Pump 3 Ditch Intake from Hanapēpē	Diverted Flow	Mcbryde Resources Inc. (Myra Amisone)	Water data represents flow diverted from Hanapepe River to Pump 3 Ditch and Farmers Ditch from Diversion ID: 834.
283	Kekaha Ditch at Camp 1 (aka: Top of Ditch)	Diverted Flow	KAA (Michael Faye)	Water data represents flow in Kekaha ditch at Camp 1 (aka: Top of Ditch), below Mauka Hydro Tunnel exit into ditch.
284	East Wai'oli Ditch	Diverted Flow	Waiʻoli Valley Taro Hui	Water data is the estimated average daily flow diverted from Diversion_ID: 1412 ('East Waiʻoli Ditch Intake from Waiʻoli trib') into the East Waiʻoli Ditch based on once weekly staff plate reading. Rating curve developed by CWRM staff on 9/9/2021.

Interim IFS is generally defined as "the amount of water flowing in each stream on the effective date of this standard, and as that flow may naturally vary throughout the year and from year to year without further amounts of water being diverted off-stream through new or expanded diversions, and under the stream conditions existing on the effective date of the standard, except as may be modified [by the commission]."

The Code states that "adequate provisions shall be made for the protection of traditional and customary Hawaiian rights, the protection and procreation of fish and wildlife, the maintenance of proper ecological balance and scenic beauty, and the preservation and enhancement of waters of the State for municipal uses, public recreation, public water supply, agriculture, and navigation." The Code also specifically discusses the protection of Native Hawaiian water rights.

Water resource strategies should be reviewed for potential impact to instream uses and Native Hawaiian rights. Water supply reliability and quality, feasibility, environmental and cultural impacts, and water rights will be considered as projects and programs develop. More detailed and site-specific evaluation of these impacts will be required and accomplished through the environmental review process (HRS Chapter 343).

1.5.3.1 Native Hawaiian Water Rights

Section 174C-101 of the Code discusses the protection of Native Hawaiian water rights in greater detail addressing reservation of water for Hawaiian Home Land allotments, and traditional and customary (T&C) rights, including appurtenant rights. Hawaiian Home Lands are discussed further in **Section 2.2.2.5.2** of this document. In describing traditional and customary rights, Section 174C-101 states that "traditional and customary rights of ahupuaʻa tenants who are descendants of native Hawaiians who inhabited the Hawaiian Islands prior to 1778 shall not be abridged or denied by this chapter [the Code]. Such traditional and customary rights shall include, but not be limited to, the cultivation or propagation of taro on one's own kuleana and the gathering of hīhīwai, ʻōpae, ʻoʻopu, limu, thatch, tī leaf, aho card, and medicinal plants for subsistence, cultural, and religious purposes." As noted in the Code, instream use includes the protection of traditional and customary Hawaiian rights. These rights primary rely on adequate streamflow and/or ground water supply and are therefore an integral component of IFS.

A comprehensive database of the significant T&C areas is unlikely to be developed. Therefore, in collaboration with CWRM staff, a consultation process could be proposed and established to evaluate how the impact of specific source development projects on T&C issues may be assessed and how such impacts can be mitigated.

The CWRM staff currently seeks input on and addresses T&C issues in its well construction/pump installation permit application (WCPIPA) process through several steps:

1. Comments it solicits from the Department of Land and Natural Resources (DLNR) State Historic Preservation Division (SHPD) and Office of Conservation and Coastal Lands (OCCL), and from County Special Management Areas (SMA).

2. Other agency and public notification of WCPIPAs is via the CWRM's monthly bulletin posted on its website and directly emailed to over 100 individuals and agencies that includes the Office of Hawaiian Affairs (OHA) and DLNR Aquatic Resources Division (DAR). Although only required for water use permit applications, the bulletin also includes information for pending well construction and pump installation permit applications and stream diversion works permit (SDWP) applications. The applications are listed in the bulletin for 60 days after the permit is granted.

3. Staff review of OHA's online Kipuka database (http://kipukadatabase.com/kipuka/) and Papakilo (http://www.papakilodatabase.com/main/main.php).

4. Standard conditions in well construction and pump installation permits.

5. Conditions on certificates of completed well construction and pump installation.

CWRM staff is developing an additional process with the intent that it would apply to water source development projects involving well construction/pump installation permit application requests through the CWRM. Staff is proposing that T&C issues could be further vetted through the permitting process by including a more thorough Ka Paʻakai analysis in the WCPIPA. Ka Paʻakai analysis is an analytical framework to be applied when making decisions with potential impacts to

T&C as directed by the Supreme Court ruling in the Ka Paʻakai o ka ʻĀina v. Land Use Commission case. The three questions to be answered under Ka Paʻakai include:

1. Identification and scope of "valued cultural, historical, or natural resources" in the impacted area, including the extent to which traditional and customary native Hawaiian rights are exercised in the area;

2. The extent to which those resources, including traditional and customary native Hawaiian rights, will be affected by the proposed actions;

3. The feasible action, if any, to be taken to reasonably protect native Hawaiian rights if they are found to exist.

These questions can be added to the WCPIPAs for the applicant to address and for staff to vet. CWRM staff has identified ʻAha Moku as a potential liaison between applicants/landowners for a WCPIPA and practitioners that could be impacted by the specific project during the WCPIPA review process. Act 288, signed into law in 2012, formally recognizes the ʻAha Moku System and establishes the ʻAha Moku Advisory Committee within the Department of Land and Natural Resources (DLNR). ʻAha Moku's function is to serve in an advisory capacity on issues related to land and natural resources management through the ʻAha Moku System, and to integrate the native Hawaiian cultural and traditional values into the fabric of State policy. The ʻAha Moku System includes several tiers from the Individual Ahupuaʻa, which includes traditional practitioners within an ahupuaʻa, to the ʻAha Moku Advisory Committee, which includes a State-wide Committee of traditional practitioners consisting of one representative from each island. Vetting T&C issues using ʻAha Moku as a resource during the permitting process could therefore satisfy the Ka Paʻakai analysis. CWRM staff has begun discussions with ʻAha Moku, and development of this process is ongoing.

Other steps in the aforementioned process still need to be developed and vetted, notably the procedures by which T&C issues will be identified, reviewed and adjudicated. The latter is of particular importance, as proper dispute resolution procedures may be critical to the success of the process.

1.5.3.2 Diversions

As defined in the State Water Code, a diversion is "the act of removing water from a stream into a channel, pipeline, or other conduit." In 1989, CWRM began registering declarations of water use and stream diversion works. At the time, staffing and funding constraints largely prevented CWRM from completing field verifications for the majority of stream diversions statewide. In 2007, the CWRM initiated a statewide field investigation project to verify registered stream diversions. While the existence of many stream diversions was verified, there was difficulty in quantifying the diverted quantities.

CWRM maintains a database of diversions. There are 292 declared diversions on Kauaʻi as shown on **Figure 1-4** and listed in **Appendix B. Table 1-21** summarizes the number of diversions and the 1989 declared surface water use for each surface water hydrologic unit. Due to the difficulty quantifying diverted amounts, most of the quantities are unverified. CWRM is continually working to verify and update diversion information and to increase water use reporting. Stream diversion records are improving. However, verification of surface water diversions and quantification of diverted stream flows continues to be difficult to assess due to issues related to program funding, accessibility to diversion sites, and the large variety of existing diversion types. The verification of registered and permitted diversion structures is the first critical step required for the establishment of a long-term monitoring program and improving regulation of stream diversion structures.

Unlike ground water aquifer systems with an associated sustainable yield, most streams on Kauaʻi do not have quantitative interim instream flow standards. Streams that do have quantitative interim instream flow standards are noted in **Table 1-21**. In order to assess surface water sustainability, it is assumed that no additional diversions will be allowed from any stream without amending the interim IFS. Each existing declared diversion will be assigned to an aquifer system to estimate the amount of surface water that may be used in each aquifer system. The potential capability of irrigation systems to transfer surface water to adjacent aquifer systems will be noted.

Table 1-21 Inventory of Surface Water Resources

Unit Code	Unit Name	Area (sq. mi.)	Demand (MGD)[18]	No. of Diversions	No. of Gages	Active Gages	Interim IFS
2001	Awaʻawapuhi	1.29	0.000	0	0	0/0	HAR §13-169-45
2002	Honopū	1.74	0.000	0	0	0/0	HAR §13-169-45
2003	Nakeikionaiwi	0.49	0.000	0	0	0/0	HAR §13-169-45
2004	Kalalau	4.23	0.000	0	1	0/0	HAR §13-169-45
2005	Pōhakuao	0.58	0.000	0	0	0/0	HAR §13-169-45
2006	Waiolaʻa	0.36	0.000	0	0	0/0	HAR §13-169-45
2007	Hanakoa	2.01	0.000	0	1	0/0	HAR §13-169-45
2008	Waiahuakua	0.66	0.000	0	0	0/0	HAR §13-169-45
2009	Hoʻolulu	0.38	0.000	0	0	0/0	HAR §13-169-45
2010	Hanakāpīʻai	3.76	0.000	0	1	0/0	HAR §13-169-45
2011	Maunapuluo	0.45	0.000	0	0	0/0	HAR §13-169-45
2012	Limahuli	1.92	0.649	7	1	0/0	HAR §13-169-45. Amended to include SCAP KA-155 on Limahuli Stream for diversion of 0.115 MGD for landscape irrigation (07/19/1995).
2013	Mānoa	1.04	0.000	1	0	0/0	HAR §13-169-45
2014	Wainiha	23.71	0.000	29	3	1/0	HAR §13-169-45
2015	Lumahaʻi	14.44	0.000	0	1	0/0	HAR §13-169-45. Amended to include SDWP.3936.2 for diversion of 0.54 MGD
2016	Waikoko	0.69	0.000	0	0	0/0	HAR §13-169-45
2017	Waipā	2.52	0.000	2	0	0/0	HAR §13-169-45
2018	Waiʻoli	5.48	0.000	1	1	0/0	HAR §13-169-45
2019	Hanalei	23.96	0.026	10	3	1/0	HAR §13-169-45
2020	Waileia	0.82	0.000	0	0	0/0	HAR §13-169-45
2021	ʻAnini	3.20	0.092	4	0	0/0	HAR §13-169-45
2022	Kalihikai West	0.30	0.000	0	0	0/0	HAR §13-169-45

[18] 1989 Declared Surface Water Use

Table 1-21 Inventory of Surface Water Resources (Continued)

Unit Code	Unit Name	Area (sq. mi.)	Demand (MGD)	No. of Diversions	No. of Gages	Active Gages	Interim IFS
2023	Kalihikai Center	0.24	0.000	0	0	0/0	HAR §13-169-45
2024	Kalihikai East	0.49	0.000	0	0	0/0	HAR §13-169-45
2025	Kalihiwai	11.36	0.000	6	2	0/0	HAR §13-169-45. Amended to include SCAP KA-060 on Pake Stream for diversion of 0.028 MGD for aquaculture (10/18/1989).
2026	Puʻukumu	1.28	0.002	3		0/0	HAR §13-169-45
2027	Kauapea	1.05	0.000	0	0	0/0	HAR §13-169-45
2028	Kīlauea	12.87	0.000	9	3	1/0	HAR §13-169-45
2029	Kulihaili	1.10	0.000	0	0	0/0	HAR §13-169-45
2030	Pilaʻa	2.58	0.159	4	0	0/0	HAR §13-169-45
2031	Waipake	2.46	0.164	1	0	0/0	HAR §13-169-45
2032	Moloaʻa	3.67	0.001	7	0	0/0	HAR §13-169-45
2033	Pāpaʻa	4.41	0.013	5	0	0/0	HAR §13-169-45
2034	Aliomanu	1.64	0.000	0	0	0/0	HAR §13-169-45
2035	Anahola	13.86	0.001	6	3	0/0	HAR §13-169-45
2036	Kumukumu	1.21	0.000	0	0	0/0	HAR §13-169-45
2037	Kapaʻa	16.74	2.793	13	2	0/0	HAR §13-169-45
2038	Moikeha	2.26	0.053	1	0	0/0	HAR §13-169-45
2039	Waikaea	7.13	0.100	2	5	0/0	HAR §13-169-45. Amended to include SCAP KA-396 on Waikaea and Konohiki Streams for streams are impacted by a pumped well (07/12/2006).
2040	Wailua	53.34	7.564	30	7	3/1	HAR §13-169-45
2041	Kawailoa	3.94	0.000	0	0	0/0	HAR §13-169-45
2042	Hanamāʻulu	11.65	0.004	4	1	0/0	HAR §13-169-45
2043	Līhuʻe Airport	1.83	0.000	0	0	0/0	HAR §13-169-45
2044	Nāwiliwili	6.40	0.004	3	0	0/0	HAR §13-169-45
2045	Pūʻali	2.05	1.637	6	0	0/0	HAR §13-169-45
2046	Huleia	28.32	5.228	26	5	0/0	HAR §13-169-45
2047	Kipu Kai	3.04	0.018	1	0	0/0	HAR §13-169-45
2048	Mahaulepu	13.43	0.000	6	0	0/0	HAR §13-169-45
2049	Waikomo	9.12	1.000	11	0	0/0	HAR §13-169-45
2050	Aepo	2.58	0.000	5	0	0/0	HAR §13-169-45
2051	Lāwaʻi	9.73	1.739	11	2	0/0	HAR §13-169-45
2052	Kalāheo	6.56	0.000	9	0	0/0	HAR §13-169-45
2053	Wahiawa	7.34	7.175	1	0	0/0	HAR §13-169-45
2054	Hanapēpē	27.09	19.820	9	4	1/0	HAR §13-169-45
2055	Kukamahu	3.21	0.000	0	0	0/0	HAR §13-169-45
2056	Kaumakani	3.09	0.000	0	0	0/0	HAR §13-169-45
2057	Mahinauli	8.78	0.000	1	0	0/0	HAR §13-169-45
2058	Aʻakukui	5.27	0.216	3	0	0/0	HAR §13-169-45
2059	Waipao	9.26	0.000	1	0	0/0	HAR §13-169-45

Table 1-21 Inventory of Surface Water Resources (Continued)

Unit Code	Unit Name	Area (sq. mi.)	Demand (MGD)	No. of Diversions	No. of Gages	Active Gages	Interim IFS
2060	Waimea	86.50	17.693	46	15	3/0	Natural flow on Kōkeʻe Stream; 0.7 MGD on Kauaʻikinana Stream below Kōkeʻe Ditch; 4.9 MGD on Kawaikōī Stream below Kōkeʻe Ditch; 1.4 MGD on Waiakoali Stream below Kōkeʻe Ditch; 2.0 MGD on Koaiʻe Stream below Kekaha Ditch; 8.0 MGD on Waimea River below Kekaha Ditch (Waiahulu diversion); 25 MGD at USGS gaging station 16031000 on Waimea River with a minimum flow of 6.0 MGD in the Kekaha Ditch (04/18/2017).
2061	Kapilimao	6.44	32.847	1	0	0/0	HAR §13-169-45
2062	Paua	5.10	0.000	0	0	0/0	HAR §13-169-45
2063	Hōʻea	16.64	0.000	1	0	0/0	HAR §13-169-45
2064	Niu	2.82	0.000	0	0	0/0	HAR §13-169-45
2065	Kaʻawaloa	7.50	0.000	0	0	0/0	HAR §13-169-45
2066	Nahomalu	17.63	0.000	1	1	0/0	HAR §13-169-45
2067	Kaʻulaʻula	2.55	0.000	0	0	0/0	HAR §13-169-45
2068	Hāʻeleʻele	2.45	0.000	0	0	0/0	HAR §13-169-45
2069	Hikimoe	2.20	0.000	0	0	0/0	HAR §13-169-45
2070	Kāʻaweiki	2.15	0.000	0	0	0/0	HAR §13-169-45
2071	Kauhao	3.98	19.010	1	0	0/0	HAR §13-169-45
2072	Mākaha	2.80	0.000	0	0	0/0	HAR §13-169-45
2073	Miloliʻi	4.34	0.000	1	0	0/0	HAR §13-169-45
2074	Nuʻalolo	2.83	0.000	0	0	0/0	HAR §13-169-45

Reference: Water Resource Protection Plan 2019 Update, Appendix F Table F-21 and Appendix N

1.5.4 Rain Water Catchment

Private and municipal water systems primarily service the more heavily populated areas of the island, typically along the perimeter of the island. Developed properties located in more isolated areas, outside of identified water service areas, may rely on catchment systems as a source of water. **Figure 1-19** shows areas serviced by water systems and areas possibly served by rainwater catchment. These possible catchment areas are parcels that have building value greater than $20,000 but do not appear to be serviced by a water system or private well.

Rainwater is typically a pure and free source of water, and is dependent upon the prevailing climate. Rainwater catchment systems are set up to collect the rainwater that falls on rooftops or other surfaces before it reaches the ground. This water is stored in water tight vessel for later use onsite. Depending on the intended use of the collected rainwater, particularly if it is intended for domestic/potable uses, the catchment system may also include further water treatment components.

The State Department of Health (DOH) does not regulate rainwater catchment systems on individual homes. To provide greater assurances with regard to keeping these systems safe for consumption, the DOH, Safe Drinking Water Branch website[19] lists some considerations for rainwater catchment systems. A University of Hawai'i, College of Tropical Agriculture publication, "Guidelines on Rainwater Catchment Systems in Hawai'i"[20], provides additional suggestions for the development of rainwater catchment systems.

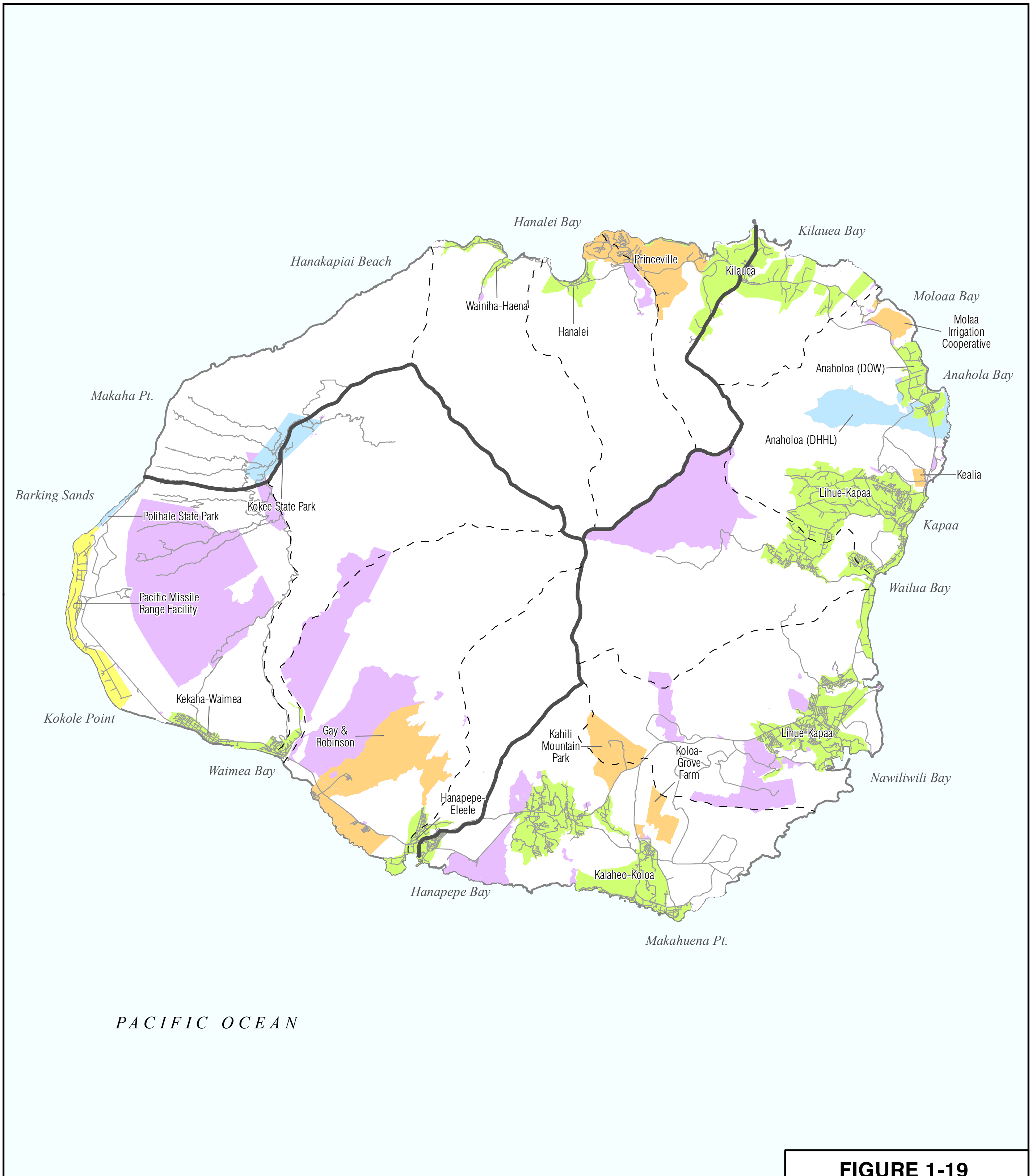
1.5.5 Recycled Water

Recycled water is wastewater that has been treated and can be used for other useful purposes. Most commonly, recycled water is used as a source of non-potable water such as for irrigation. Used for these purposes, recycled water helps to decrease demands on valuable potable water resources and to reuse water that might otherwise be disposed.

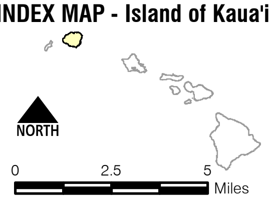
The County of Kaua'i, Department of Public Works operates four municipal wastewater treatment plants (WWTPs) on the island. These municipal wastewater systems collect, treat, and dispose wastewater from the more densely populated areas of the island. Three of the facilities produce recycled water from the wastewater. **Table 1-22** summarizes the County's WWTPs, along with their associated treatment capacities, current reuse amounts, and a short description of where the recycled water is used.

[19] http://health.hawaii.gov/sdwb/raincatchment/

[20] Macomber, Patricia S.H., 2010. Guidelines on Rainwater Catchment Systems for Hawai'i. University of Hawai'i at Mānoa, College of Tropical Agriculture and Human Resources, CTAHR Resource Management publication no. RM-12 ISBN 1-929325-23-1.



INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- Private Water System
- DOW Service Area
- State Water System
- Federal Water System
- Possible Catchment Area (Building Value > $20,000)
- State Highway/County Roads

FIGURE 1-19

PUBLIC AND PRIVATE WATER SYSTEMS MAP

Table 1-22 County of Kauaʻi WWTPs

Facility	Aquifer Code	Recycled Water Classification	Design Capacity (MGD)	Quantity Produced (MGD)	Current Reuse (MGD)	Irrigation Application
ʻEleʻele WWTP	20101	N/A (Secondary)[21]	0.8	N/A	0	N/A
Līhuʻe Wastewater Reclamation Facility (WWRF)	20102	R-1[22]	2.5	1.2	0.79	Kauaʻi Lagoons Resort – golf course irrigation; Roadway irrigation – landscape irrigation
Wailua WWTP	20102	R-2[23]	1.5	0.5	0.19	Wailua Golf Course – golf course irrigation; Lydgate Park – athletic field irrigation
Waimea WWTP	20301	R-1	0.7	0.3	0.18	Kikiaola Land Company – agriculture irrigation

References:
1) State of Hawaiʻi, Department of Health, Wastewater Branch.
2) The Limtiaco Consulting Group, July 2013. 2013 Update of the Hawaiʻi Water Reuse Survey and Report. Prepared for the Department of Land and Natural Resources, Commission on Water Resource Management.

There are also four privately owned WWTPs on the island that produce recycled water. **Table 1-23** summarizes these facilities, along with their associated treatment capacities, current reuse amounts, and a short description of where the recycled water is used.

[21] Secondary: Secondary treatment

[22] R-1: Recycled water that has been oxidized, filtered and disinfected. R-1 is considered the highest grade of recycled water.

[23] R-2: Recycled water that has been oxidized and disinfected.

Table 1-23 Privately Owned Wastewater Treatment Facilities Producing Recycled Water

Facility	Aquifer Code	Recycled Water Classification	Design Capacity (MGD)	Quantity Produced (MGD)	Current Reuse (MGD)	Irrigation Application
Poʻipū Water Reclamation Facility (WRF)	20101	R-1	1.0	N/R	0.30	Kiahuna Golf Club – golf course irrigation; Kōloa Landing – landscape irrigation
Grand Hyatt WWRF	20101	R-2	0.25	N/R	0.11	Poʻipū Bay Resort Golf Course – golf course irrigation
Līhuʻe-Puhi WWTP	20102	R-1	1.0	0.4	0.37	Puakea Golf Course – golf course irrigation; Costco, Kukui Market Place, and Pikake Circle – landscape irrigation
Princeville WWRF	20202	R-2	1.0	0.6	0.53	Princeville Makai Golf Course – golf course irrigation

N/R: Not reported

References: Ibid.

See **Figure 1-20** for the location of wastewater treatment facilities that produce recycled water.

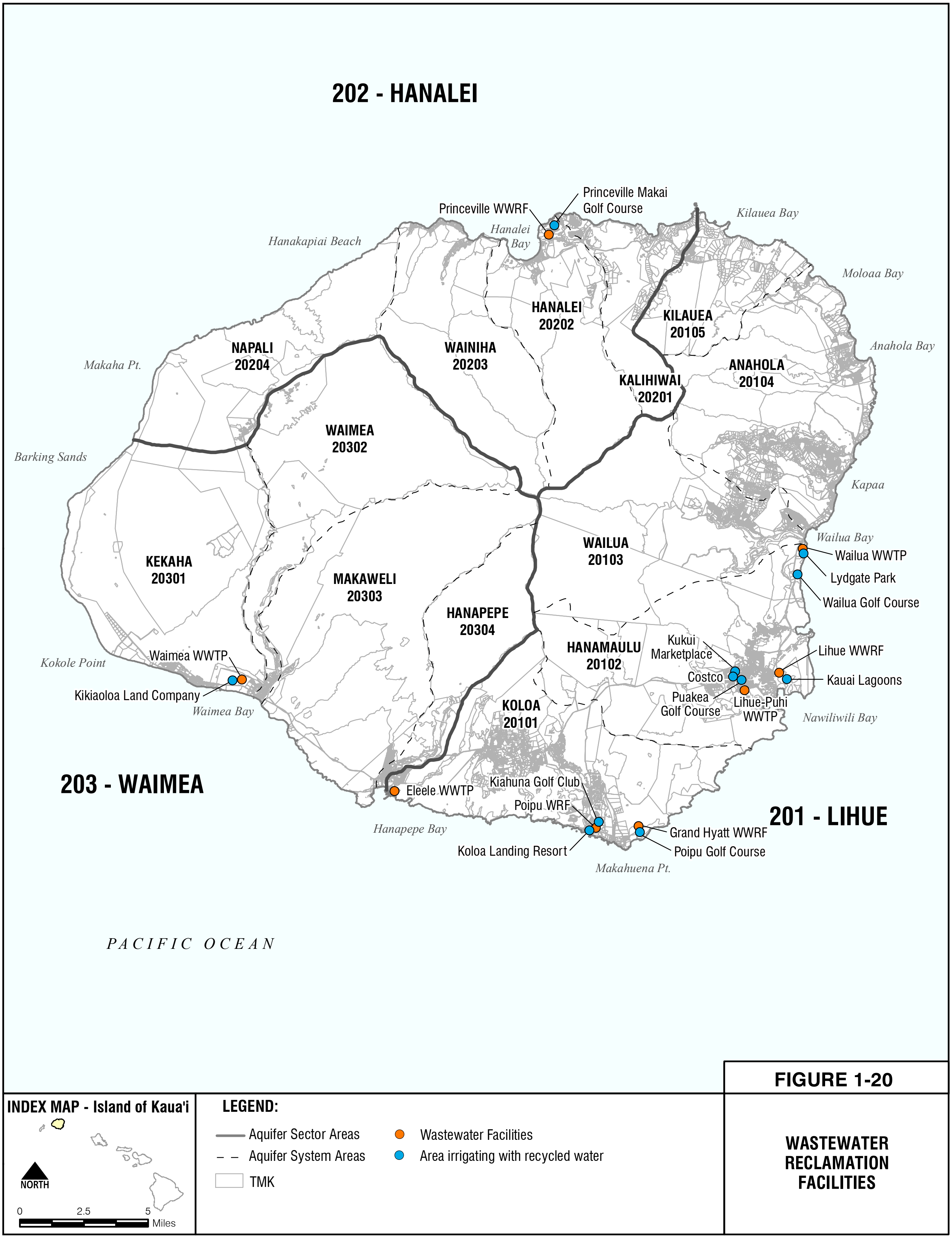


FIGURE 1-20

WASTEWATER RECLAMATION FACILITIES

1.5.6 Storm Water Reuse

Storm water reclamation and reuse is a relatively new concept and is a resource that is currently underutilized. Storm water reuse has the potential to be used as a source of non-potable water (e.g., irrigation), to be integrated with recycled water, or even to serve as potable and/or non-potable ground water recharge. Depending on the quality of the storm water and its intended use, required treatment may vary from screening to disinfection. The higher the level of treatment, the more expensive it will cost to reuse storm water. See **Table 1-24** for the required treatment based on storm water end use.

Table 1-24 Storm Water Reuse Treatment

	Treatment						
End Use	Screening	Grit Removal	Sedimentation	Chemical Addition	Filtration	Disinfection	Comments
Ground water Recharge							
Injection Well (Potable)	Y	Y	Y	Y	Y	Y	
Injection Well (Non-Potable)	Y	Y	Y	*	N	N	
Recharge Trench	Y	Y	Y	N	N	N	
Spreading Basin	Y	N	N	N	N	N	O&M required to ensure infiltration
Excavated Pond	Y	N	N	N	N	N	Series operation
Industrial Reuse	Y	Y	Y	Y	Y	N	
Direct Irrigation							
Contact w/ edible portion of crop	Y	Y	Y	Y	Y	Y	Not specific to stormwater; based on Hawai‘i’s recycled water guidelines
No contact w/ edible portion of crop	Y	Y	*	N	N	N	
Human contact	Y	Y	Y	Y	Y	Y	

* Depends on the quality of storm water

Reference: An Appraisal of the Statewide Framework for Stormwater Reclamation and Reuse in Hawai‘i, Element 3, Table 4

The U.S. Department of the Interior, Bureau of Reclamation published an Appraisal of Stormwater Reclamation and Reuse Opportunities in Hawai‘i in 2008 that identified two areas on the island of Kaua‘i that has the opportunity to use storm water reclamation and reuse. Both areas are within the Hanamā‘ulu ASYA and are discussed further in **Section 20102-5.2.1**:

1) Nāwiliwili Diversion
2) Līhu‘e Airport

The County of Kaua‘i does not operate a storm water utility that could be used to fund storm water infrastructure development for the purposes of storm water reclamation and reuse. The City and

County of Honolulu is in the process of developing a storm water utility which could serve as a model should the County of Kaua'i choose to pursue storm water reuse as an alternative water source.

1.5.7 Water Conservation

Within the State of Hawai'i, due to our isolated location, access to fresh water supplies is a very limited and is a very valuable resource. To effectively utilize the state's fresh water resources, establishment of and adherence to an effective water conservation program is needed. Although water conservation (in itself) does not increase the supply of water, conservation practices make more of the supply available for needed uses by decreasing waste of available resources. Incorporating conservation measures into planning for future water system improvements helps to ensure the long-term viability of Hawai'i's water resources.

The State Water Code (HRS Chapter 174C, §174-C-5: General powers and duties) mandates that the CWRM shall:

> "plan and coordinate programs for the development, conservation, protection, control, and regulation of water resources, based upon the best available information, and in cooperation with federal agencies, other state agencies, county or other local governmental organizations, and other public and private agencies created for the utilization and conservation of water."

Ongoing CWRM water conservation plans and programs are summarized in **Table 1-25**. Additional detailed information for each of these programs/plans can be found at the respective links provided in **Table 1-25**.

Table 1-25 CWRM Water Conservation Plans and Programs

Program/Report	Purpose
Hawai'i Water Conservation Plan (February 2013) http://files.Hawai'i .gov/dlnr/cwrm/planning/hwcp2013.pdf	Provide coordination and collaboration between various State and County water conservation programs
Prototype Water Conservation Plan for the Department of Land and Natural Resources (February 2005) http://files.Hawai'i .gov/dlnr/cwrm/planning/pwcp2005.pdf	Provide a framework for water conservation plans for all State agencies, and conservation program options and strategies for water purveyors throughout Hawai'i.
Conservation Manual for State of Hawai'i Facilities (May 2007) http://files.Hawai'i .gov/dlnr/cwrm/planning/wcmshf2007.pdf	Facilitate State agency implementation of water conservation programs.
Water Loss Audit Program[24] (2016)	Establishes a water loss audit program for public water systems, including technical assistance. Annual validated audits are required by affected systems.
Water Security Grant Program (2016) https://dlnr.hawaii.gov/wp-content/uploads/2017/10/CW18-Water-Security-Grant-Rpt-FY17.pdf	Created in response to Act 172, SLH 2016. Establishes a two-year pilot program to enable public-private partnerships that increase water security.

Reference: Water Resource Protection Plan 2019 Update (Public Review Draft October 2018).

Of these programs/plans, the water audit helps a utility understand how much water is lost from a distribution system through the detailed analysis of data. The DOW and other large capacity water systems are participating in the on-going Water Audit program and has submitted necessary information to CWRM to fulfill the requirements of the Water Audit program. Smaller water systems that do not serve a population of 1,000 or more or are not in a water management area do not meet the requirements to participate in the water loss audit program.

On a County level, water conservation practices typically include improving the efficiency of water delivery and identifying losses in the system. This includes reducing system leaks and losses, adopting universal metering, development and support of consumer water conservation and public education programs, influencing consumer water demand through adjusting water rates, and as a last resort during severe shortages, water rationing (as provided by county rules and ordinances).

Ongoing on-island conservation related programs/promotions are summarized in the following subsections.

[24] 2016 Hawai'i Legislature, Act 169: Requires the CWRM to establish a water audit program and to provide technical assistance and training to affected public water systems.

1.5.7.1 Kaua'i DOW Supply-Side Conservation Programs

• 100% Customer Metering	Currently all customer accounts are metered, including temporary fire hydrant meter and temporary construction meter accounts. Separate landscape meter services are available from the Kaua'i DOW depending on the availability of adequate water supply.
• Meter Replacement, Repair, and Defective Meter Programs	All water supplied by the DOW is measured by suitable water metering devices. DOW maintains a water-meter-shop test and repair program. According to standard operating procedures, testing of all 5/8-inch displacement water meters that were not tested within 10 years is required. Removed meters should be replaced with new or re-built meters. Large meters (compound, propeller, torrent, turbine, and crest meters,) should be tested every two years. Potential defective meters are reported by the Billing Section of the Fiscal Division for replacement or repair by the Operations Division.
• Non-revenue Water Analysis Report	The non-revenue water estimates are valuable in deciding whether a leak detection program is justified. The report is designed to monitor source/supply production and customer consumption on a bi-monthly basis. The difference between metered source production and metered sales to consumers is the non-revenue water that is pumped into the system but not sold. Non-revenue water includes line flushing, reservoir cleaning, firefighting, sewer flushing and street cleaning, and it's also a result of leaks, unauthorized water use, and inaccurate metering. The Fiscal Division monitors the report and informs the Operations Division if non-metered water is excessive.
• Leak Detection Program	The Kaua'i DOW conducts case-by-case leak detection investigations and repair for suspected section of leaking pipeline. The Kaua'i DOW is evaluating the purchase of leak detection equipment and/or use of contracted leak detection services to expand its program.
• Storage Tank Reservoir Overflow Alarm and Automatic Level Controls	The DOW maintains and operates tank overflow alarms and automatic valves to prevent system losses to unnecessary overflows.

1.5.7.2 Kauaʻi DOW Demand-Side Conservation Programs

- Plumbing Code Regulation

In July 1993, the County of Kauaʻi amended the County Plumbing Code to require the installation of water saving fixtures for new construction. The plumbing code also requires installation of pressure reduction valves in order to maintain a maximum 80-pound per square inch building service pressure. Since then, the County of Kauaʻi has adopted the Uniform Plumbing Code, 2012 Edition.

- Voluntary Emergency Water Shortage Notice

The Kauaʻi DOW requests voluntary water conservation during dry periods and emergency water outages. High consumption during dry summers has resulted in distribution of water shortage notices for affected areas. Water customers are asked to voluntarily reduce consumption by 10-25% in systems that are unable to meet higher peak demands. During emergencies (i.e., pump failure, pipeline breaks, storm damage, etc.) water conservation notices are issued to customers.

- Public Outreach/Education Program

Kauaʻi DOW's existing and future water conservation programs involves targeting both adults and children through printed brochures, advertisements, public service announcements, presentations, workshops, the Kauaʻi DOW website, and other media. Every year, the Kauaʻi DOW coordinates an island-wide water education festival for fifth grade students called, Make a Splash with Project WET (Water Education for Teachers). Project WET is an international-interdisciplinary-environmental education program. This festival brings together parents, students, teachers, government resource agencies and enthusiasts of all kinds for a common goal: to educate and promote awareness of water resources in a fun and interactive environment. Learning stations and exhibits are set up and led entirely by volunteer Kauaʻi DOW employees, educators and community members.

1.5.7.3 Kauaʻi DOW Conservation Promotions

- Low Flow Shower Head Distribution
- Low Flow Kitchen Aerator Distribution
- Shower Timer Distribution
- Leak Detection Tablet Distribution
- Public Education – Presentations; Community Events; Publications and Brochures
- Water conservation brochure "35 Tips to Save Water"
- Free low-flow water fixture forms
- Tips for conserving water around the house and outdoors
- Leak detection and instructions on fixing a leaky faucet
- Kids page with educational activities
- Public education programs for schools, clubs, and organizations

1.5.8 Watershed Protection

Watershed management is a critical source protection measure that enhance aquifer recharge and protect the native Hawaiian plants, which act as a “sponge” to capture and absorb rain and fog drip to replenish the aquifers and streams. There are three major groups that are dedicated to protecting Kauai’s watersheds: 1) DLNR – Division of Forestry and Wildlife, 2) Kaua‘i Watershed Alliance, and 3) Kaua‘i Invasive Species Committee.

1.5.8.1 DLNR – Division of Forestry and Wildlife Watershed Partnerships Program

The Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW) is the lead State agency responsible to protect 30% of Hawai‘i’s priority watershed forests by 2030. DOFAW has a Watershed Partnerships Program that was established to coordinate watershed protection efforts across private and public land ownership boundaries within the State of Hawai'i. There are currently 11 Watershed Partnerships across five of the main Hawaiian Islands with over 70 private and public landowners and partners covering over 2 million acres of land. Kaua‘i’s Watershed Partnership is the Kaua‘i Watershed Alliance, which is described in more detail in **Section 1.5.8.2**.

Work to protect the watershed includes invasive plant and ungulate removal and control, restoration, and installation of ungulate-proof fences.

1.5.8.2 Kaua‘i Watershed Alliance

The Kaua‘i Watershed Alliance (KWA) was formed in 2003 for the long-term protection of Kaua‘i’s uppermost watershed areas. The KWA consists of 11 partners and include the following members:

- County of Kaua‘i, Department of Water
- State of Hawai‘i, Department of Land and Natural Resources, Division of Forestry and Wildlife
- State of Hawai‘i, Department of Land and Natural Resources, Division of State Parks
- State of Hawai‘i, Department of Land and Natural Resources, Land Management Division
- Kamehameha Schools
- McBryde Sugar Company, Ltd.
- Grove Farm Company, Inc.
- Līhu‘e Land Company
- Kealia Ranch, LLC
- B.A. Dyer
- Princeville Development, LLC

The DOW supports the KWA by providing a grant to help fund natural resource management activities, which includes construction of ungulate barriers, removal of non-native invasive weeds and ungulates, surveying and monitoring forest conditions, and developing plans and technology to increase the impact of management efforts.

During Fiscal Year 2017, the KWA achieved the following: field staff reduced the population of pigs in the fenced headwaters of the Wainiha valley to a single known individual; intensive ungulate control work began in the newly-completed Halehaha management unit of the ʻAlakai Plateau; the second pass of aerial Australian tree fern control was completed in Wainiha Valley; Resource Mapping Hawaiʻi completed collection and delivered the analysis of high-resolution imagery of Lumahaʻi Valley following the first pass; and staff finished scouting and flagging the proposed KWA fencelines in Lumahaʻi Valley and scouted the back "bowl" area of the valley.

1.5.8.3 Kauaʻi Invasive Species Committee

The Kauaʻi Invasive Species Committee (KISC) was formed in 2001 and is a project of the Pacific Cooperative Studies Unit at the University of Hawaiʻi. KISC is a voluntary partnership of government, private, and non-profit organizations, and individuals, working to prevent high-risk invasive species from becoming established and widespread on Kauaʻi. KISC's mission is to prevent, control, or eliminate the most threatening invasive species in order to preserve Kauaʻi's native biodiversity and minimize adverse ecological, agricultural, economic, and cultural impacts.

KISC's intended role is to supplement existing programs: to fill the gaps between the island's natural resource management entities, and to complement work by Federal, State, County, and private organizations. Invasive plants, animals, insects, and pathogens are able to spread across Kauaʻi's landowner boundaries and overlap jurisdictions. KISC is uniquely positioned to address this with species-driven management strategies.

The KISC consists of 6 members:

- State of Hawaiʻi, Department of Land and Natural Resources, DOFAW
- University of Hawai'i College of Tropical Agriculture and Human Resources
- Hawaiʻi Invasive Species Council
- National Tropical Botanical Garden
- The Nature Conservancy Hawai'i
- Kauai Invasive Species Committee Staff

KISC prioritizes species that are recognized as having the greatest potential to impact Kauaʻi's watershed and ecosystem functions. High-risk invasive species, if left unchecked, have the potential to alter ecosystem functions and lead to increased soil erosion, increased runoff, decreased aquifer recharge, and modified stream and river hydrology. KISC works across the island's mid and lowland watershed areas on both private and public land to detect new invasive species early and control target species before they make lasting impacts to Kauaʻi's watersheds.

In 2022, the KISC surveyed 7,545 acres to detect invasive species. 1,881 individual targets were removed and 14 high-risk species were controlled including but not limited to: 521 immature and 8 mature miconia plants; 168 immature long thorn kiawe plants; 974 immature and 17 mature ivy gourd plants; 63 mature false kava plants, and 58 mature Arundo plants. In addition, 16 coqui frogs were captured from 6 locations and 195 acres were surveyed for little fire ants infestation, of which 54 acres were treated.

1.6 EXISTING WATER USE

CWRM classifies water use information based on six categories as listed in **Table 1-26** taken from the WRPP. Water use in this update report is categorized in accordance with this list and definitions to the extent possible.

Table 1-26 CWRM Water Use Categories

Well Operator	Category	Sub-Category
Individual Operator	Agriculture	• Aquatic plants and animals • Crop irrigation and processing • Livestock water, pasture irrigation, and processing • Ornamental and nursery plants • Taro • Other agricultural applications
	Domestic Residential Domestic, includes potable and non-potable water needs	• Single- and multi-family households, including non-commercial gardening
	Non-residential Domestic, includes potable (and non-potable) water needs	• Commercial businesses • Office buildings • Hospitals • Religious Institutes • Hotels • Schools • Other
	Industrial	• Fire protection • Mining, dust control • Geothermal, thermoelectric cooling, power development, hydroelectric power • Other industrial applications
	Irrigation	• Golf course • Hotel • Landscape and water features • Parks • Schools • Habitat maintenance • Other
Agency Operator	Military*	All military use
	Municipal*	• State • County • Private

* May also include agriculture, domestic, industrial, and irrigation uses

Estimated average water use is based on the best available information and is summarized in **Table 1-27**. DOW water meter data was obtained for the year of 2014. Well pumpage from CWRM for the same time period was also obtained. Sanitary surveys for public water systems were obtained from DOH, and public water systems were queried. Estimated recycled water use was also provided by DOH.

Table 1-27 Existing Water Use by Category

ASYA	Domestic (mgd)	Industrial (mgd)	Irrigation (mgd)	Agriculture (mgd)	Military (mgd)	Municipal (mgd)
20101 Kōloa	0.00	0.00	0.41	0.09	0.00	3.37
20102 Hanamāʻulu	0.00	0.003	1.59	0.00	0.00	2.83
20103 Wailua	0.00	0.00	0.00	0.00	0.00	0.98
20104 Anahola	0.01	0.00	0.00	0.14	0.00	2.18
20105 Kīlauea	0.00	0.00	0.03	0.03	0.00	0.78
20201 Kalihiwai	0.00	0.00	0.00	0.00	0.00	1.07
20202 Hanalei	0.00	0.00	0.53	0.00	0.00	0.46
20203 Wainiha	0.00	0.00	0.00	0.00	0.00	0.15
20204 Nāpali	0.00	0.00	0.00	0.00	0.00	0.00
20301 Kekaha	0.00	0.00	0.18	0.03	0.22	1.18
20302 Waimea	0.00	0.00	0.00	0.00	0.00	0.04
20303 Makaweli	0.00	0.00	0.00	0.00	0.00	1.51
20304 Hanapēpē	0.00	0.00	0.00	0.00	0.00	0.51
TOTAL	0.01	0.003	2.74	0.29	0.22	15.06

1.6.1 Domestic Use

Domestic use includes residential and non-residential water use for potable and non-potable needs. Existing water use for this category is based on well pumpage reported to CWRM. There are 117 wells on Kauaʻi classified as "domestic" in the CWRM database.

1.6.2 Industrial Use

Industrial use can include fire protection, mining, dust control, geothermal, thermoelectric cooling, power development, and hydroelectric power. Existing water use for this category is based on well pumpage reported to CWRM. There are 8 wells on Kauaʻi classified as "industrial" in the CWRM database.

1.6.3 Irrigation Use

Irrigation use consists of non-potable water demands including irrigation for golf courses, hotels, landscape and water features, parks, schools, and habitat maintenance. Irrigation demands can be met by ground water, recycled water, or surface water. There are 29 wells on Kauaʻi classified as "irrigation" in the CWRM database. As noted in **Section 1.5.5**, there are 7 wastewater treatment plants that produce recycled water that is used for irrigation. Information on surface water for irrigation is to be determined by the AWUDP. However, typically, due to the location of parks and other landscaped areas within communities, it is assumed that it is unlikely for landscaping to be irrigated with surface water.

1.6.4 Agricultural Use

Agricultural use includes water use for aquatic plants and animals, crop irrigation and processing, livestock and pasture, ornamental/nursery plants, taro, and other agricultural applications. This does not include demand met by rainfall. Agriculture demands can also be met by ground water, recycled water, or surface water. There are 50 wells on Kaua‘i classified as "agriculture" in the CWRM database. The Waimea wastewater reclamation facility (WWRF) in Kekaha is currently the only WWRF on Kaua‘i that produces recycled water that is used for agriculture use.

Currently, agricultural water use is extremely difficult to determine due to the absence of comprehensive, island-wide data. Defining existing agricultural water demands is an objective of the AWUDP, which is a major effort. It is anticipated that additional information on agriculture use will be provided in future AWUDP updates.

1.6.5 Military Use

There is one potable water system serving military use on the island. The Pacific Missile Range Facility is served by Public Water System 430. Three wells are classified as "military" in the CWRM database. One of these wells, Mana Shaft, is the main water source for the water system. The system can also receive water from the DOW Kekaha-Waimea water system.

1.6.6 Municipal Use

Municipal use includes use served by County, State, Federal, or private-public water systems. The Department of Health (DOH) regulates public water systems. A public water system is defined as "a system which provides water for human consumption, through pipes or other constructed conveyances if the system has at least fifteen service connections or regularly serves an average of at least twenty-five individuals daily at least sixty days out of the year." **Table 1-28** lists the Kaua‘i public water systems, owners, number of service connections, and population served. The information was obtained from the DOH sanitary surveys. Refer to **Figure 1-19**, shown previously, for the general service area of the public water systems.

Table 1-28 Kaua'i Public Water Systems

PWS No.	Name	Owner	No. of Connections	Population Served
400	Līhu'e-Kapa'a	DOW	9,560	31,337
401	Anahola	DOW	620	2,174
402	'Anini	DOW	61	109
403	Hanalei	DOW	349	988
404	Hanapēpē-'Ele'ele	DOW	1,710	4,430
406	Kekaha-Waimea	DOW	1,880	5,135
407	Kīlauea	DOW	1,468	3,758
415	Hā'ena-Wainiha	DOW	357	1180
417	Gay & Robinson	Gay & Robinson	325	999
421	Kōloa	Knudsen Trust	19	40
422	Kāhili Mountain Park	Knudsen Trust	38	150
423	Keālia	Keālia Water Co. Holdings, LLC	69	260
425	Kōke'e State Park	DLNR	93	2,000
426	Polihale State Park	DLNR	1	300
428	Princeville	Princeville Utilities, Co., Inc.	1,029	1,698
430	Pacific Missile Range Facility	U.S. Dept. of Navy	185	1,200
432	Anahola Farm Lots	DHHL	77	385
434	Kalāheo-Kōloa	DOW	4,799	15,108
436	Moloa'a	DLNR	3	29
437	Moloa'a Irrigation Cooperative	Moloa'a Irrigation Cooperative	57	47

1.6.6.1 County Water Systems

The DOW owns and operates 9 water systems on the island and services approximately 21,000 customers. DOW meter data provides the most detailed water use. In 2014, DOW water systems delivered an average of 10.5 mgd based on meter data. Descriptions of the individual water systems are covered in the pertinent aquifer system chapters of this KWUDP.

Ground water is the primary water source for the DOW systems. There are 57 wells classified as DOW wells in the CWRM database. Additionally, the Līhu'e-Kapa'a water system is also supplied by surface water from the Kapaia Reservoir.

1.6.6.2 State Water Systems

The State owns four public water systems on Kaua'i: Kōke'e State Park Water System, Polihale State Park Water System, Anahola Farm Lots Water System, and Moloa'a Water System. The Kōke'e State Park Water System and Polihale State Park Water System are located on the west side of the island and are owned by the Department of Land and Natural Resources (DLNR). The Moloa'a

Water System is located in the Anahola ASYA and is also owned by DLNR. The Anahola Farm Lots Water System is located in Anahola and owned by the Department of Hawaiian Home Lands (DHHL). Descriptions of the water systems are covered in the pertinent aquifer system chapters of this KWUDP.

1.6.6.3 Federal Water Systems

The federal government owns one water system on Kaua'i – the Pacific Missile Range Facility (PMRF) Water System, which is located in the Kekaha ASYA and owned by the United States Department of the Navy.

1.6.6.4 Private-Public Systems

There are six privately-owned public water systems on Kaua'i: Gay & Robinson Water System, Kahili Mountain Park Water System, Kōloa-Grove Farm Water System, Keālia Water System, Moloa'a Irrigation Cooperative Water System, and Princeville Water System. Descriptions of the water systems are covered in the pertinent ASYA chapter of this KWUDP.

1.6.7 Water Use by Resource

Existing water resources include ground water, surface water, water conservation, rainwater catchment, and recycled water. This KWUDP update also organizes available water consumption data by type of resource.

1.6.7.1 Ground Water

The CWRM has data on well pumpage as provided by well owners. However, as of 2016, water use is reported for only 139 wells, equaling a compliance rate of approximately 48%. The DOW reports pumpage for all of its production wells. Better reporting is needed for non-municipal wells.

The Code requires owners and operators of wells and stream diversion works to measure their water use and submit regular monthly reports. Initially, the monthly water use reporting requirement was difficult to implement and enforce. CWRM focused its efforts on water use monitoring and reporting for large ground water uses and drinking-water wells, and a list of priorities and exemptions, including exemptions for small users, was approved in 1992. In 2014, CWRM unanimously approved rescinding the 1992 priorities and exemptions and replacing it with the following:

> "The following exemptions from the requirement to measure and report monthly water use for the activities listed below are allowed, UNLESS the Commission determines a specific need for this data to resolve disputes, establish instream flow standards, or quantify the amount of water use for a water use permit in a water management, or for similar needs.
>
> 1. Passive agricultural consumption (e.g., when crops are planted in or adjacent to natural springs and natural wetland areas);
>
>   - Livestock drinking from dug wells or stream channels;

- In non-surface water management areas, individual end uses on multi-user ditch systems where IFS or water use permits are not an issue;

- Salt-water wells may continue to report monthly estimates of pumpage and monthly actual measured water-levels and salinity on an annual basis.

2. Affirmatively require that unused and observation wells report monthly water-levels and salinity as determined by staff."

CWRM is currently focused on obtaining pumpage reports from all users in designated water management areas and from large users in non-designated areas. Subsequently, CWRM will pursue statewide reporting of pumpage, water-level, and chloride (or conductivity) data from all water use reporters. In the effort to manage all its water resource information more efficiently and effectively, CWRM launched its Water Resource Information Management System (WRIMS) in 2012. This online water use reporting database allows water users to file their reports online and monitor their historical use via the internet.

Table 1-29 summarizes current production, sustainable yield (SY), and percentage of SY for the current production. Current production is represented by the 2014 pumpage reported to CWRM.

Table 1-29 Well Production and Sustainable Yield

ASYA	ASYA Code	Pumpage (mgd)	SY (mgd)	Pumpage Portion of SY (%)
Kōloa	20101	3.47	29	12.0
Hanamāʻulu	20102	1.27	27	4.7
Wailua	20103	0.26	51	0.5
Anahola	20104	2.34	21	11.1
Kīlauea	20105	0.84	10	8.4
Kalihiwai	20201	1.07	16	6.7
Hanalei	20202	0.46	35	1.3
Wainiha	20203	0.15	24	0.6
Nāpali	20204	0	20	0
Kekaha	20301	1.43	10	14.3
Waimea	20302	0.04	37	0.1
Makaweli	20303	1.52	26	5.8
Hanapēpē	20304	0.51	22	2.3
Kauaʻi	**Total**	**17.76**	**328**	**5.4%**

1.6.7.2 Surface Water

As noted above, owners and operators of stream diversion works are required to measure their water use and submit monthly reports. Unfortunately, CWRM's focused effort on ground water resources has resulted in a lack of historical surface water data. Additionally, the lack of guidelines for surface water monitoring and the wide range of methods for diverting water has made it difficult to regulate the amount of water diverted via registered and permitted stream diversion works. To date, few users report surface water use to CWRM. However, these users represent many of the large irrigation systems which use the majority of surface water statewide, and CWRM is making progress on verifying and updating information and increasing water use reporting.

1.6.7.3 Water Conservation

Water conservation, including water loss management, may reduce water use. See **Section 1.5.7** for existing conservation efforts.

1.6.7.4 Rainwater Catchment

Developed parcels that are not supplied by ground water or surface water are assumed to be supplied by rainwater catchment.

1.6.7.5 Recycled Water

Recycled water information was obtained from the Department of Health (DOH), Wastewater Branch, as previously listed in **Table 1-22** and **Table 1-23.** Approximately 2.5 mgd of recycled water is used on the island, primarily for irrigation of golf courses, landscaping, and agriculture.

Chapter 2

Technical Approach

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2 TECHNICAL APPROACH

The approach used in the update of the County of Kaua'i WUDP was documented in the Project Description, as required by the Framework. The Project Description was presented to and approved by the CWRM on June 24, 2015. The approach involved inventory of existing water use and resources, projection of water demand for full build-out of land use policies, and 5-year incremental water demand projections based on rate of population growth to the year 2035. The various elements of the approach are described in this chapter.

The Framework requires data and analyses to be based on ground water and surface water hydrologic units designated by the CWRM. Evaluation of the surface water hydrologic units and the ground water hydrologic units indicate that they generally share similar boundaries, thereby allowing the surface water hydrologic units to be "assigned" to a specific ground water hydrologic unit. Since the surface water hydrologic units and ground water hydrologic units are well-correlated, surface water data and analyses will be presented based on the ground water hydrologic units or aquifer systems.

2.1 STAKEHOLDER AND PUBLIC INVOLVEMENT

2.1.1 Stakeholder Advisory Group

A stakeholder advisory group was established in 2013 to provide a comprehensive cross-section of the community and interested parties and to act as a conduit to disperse information about the KWUDP to the public. Stakeholders were selected by the DOW to represent Kauai'i's broad community bases and to provide a spectrum of viewpoints. The advisory group represents the following sectors:

- Agriculture
- Native Hawaiian/Aha Moku
- Government
- Major land owner/Development/Business

The first stakeholder meeting was held in January 2015 to explain and discuss the proposed methodology described in the Project Description and to obtain feedback from a variety of interests regarding water resource management in the WUDP. Discussion topics included land use planning, stream issues, infrastructure, agricultural issues, cultural issues, public trust doctrine, watersheds, and climate change.

The second stakeholder meeting was held in June 2018 to review and discuss the results of the preliminary findings and to discuss the Prototype Chapter for the Hanamā'ulu aquifer system area (ASYA), which would serve as a guide for developing the chapters for the other ASYAs.

The third stakeholder meeting was held in May 2023 to review and discuss the draft WUDP update. Discussion topics included full build-out and future demands and how they impact DOW's infrastructure, climate change, agricultural and surface water issues, and the upcoming public meetings.

2.1.2 Public Involvement

Public meetings were held at various stages of development of the WUDP update to provide information to and obtain input from the public. In addition to public meetings, the Kauaʻi DOW website was used to disperse information on the WUDP update, including preliminary findings, meeting presentations and minutes, and draft reports.

The first round of five meetings was held in October 2015 in the communities of Kīlauea, Kapaʻa, Kalāheo, Waimea, and Līhuʻe. The methodology described in this chapter and preliminary results were presented at these meetings. Discussion topics included data limitations and responsible agencies, the sustainable yield update by CWRM which was in progress at the time, water use reporting, alternative water resources, the full build-out analysis, and agricultural demands and irrigation systems. Following the first round of meetings, the Kauaʻi DOW website was updated to include meeting presentations, handouts, and minutes.

A second round of public meetings was held in August 2023 in the same communities as the first round of public meetings. The draft WUDP update was posted on the Kauaʻi DOW website prior to the meetings, and the draft WUDP update and its findings were presented at the meetings. The draft WUDP and recommendations specific to each ASYA were presented. Various details were revised within the WUDP based on comments received; however the planning methodology were not changed. Discussion topics included interim instream flow standards, stream diversions, water use reporting, sustainable yield development, reservoir decommissioning, fire protection, and DOW water system infrastructure improvements.

The public review draft of the WUDP update was prepared in November 2023 and posted on the Kauaʻi DOW website in December 2023. The public review draft was also posted on the CWRM website. A briefing on the WUDP update was provided at the CWRM meeting on December 19, 2023. The briefing included an opportunity for questions and comments.

Meetings with DHHL beneficiaries were held in March 2024 in the Anahola and West Kauaʻi homesteads. The draft WUDP update, its findings, and how it relates to the DHHL tracts were presented. Discussion topics included interim instream flow standards, water reservations, DHHL projected water demands and DHHL homestead progress. Two pre-meetings with DHHL community members as identified by DHHL were held in March 2024, prior to the DHHL beneficiary meetings. The pre-meetings were conducted similar to the stakeholder advisory group meetings, and the primary purpose was to obtain input from the community members in preparation for the meetings with the DHHL beneficiaries.

Meeting summaries from both rounds of public meetings and the DHHL beneficiary meetings are included in **Appendix C**.

2.2 WATER RESOURCES PLANNING METHODOLOGY

Water resource planning for the Kaua'i WUDP update considers both land use based water demand projections and rate of population growth to develop estimates of future water needs. Land use based evaluations provide full build-out projections, or the ultimate water needs, if the maximum density allowed is developed. This assesses the sustainability of land use policies set by the State of Hawai'i and the County of Kaua'i in terms of the water needs associated with the potential full build-out development. Incremental water needs for the next 20 years are based on population and growth rate projections. Flow charts diagramming the conceptual water resources planning methodology are shown in **Figure 2-1** and **Figure 2-2**. **Figure 2-3** illustrates a theoretical example of the projected demands.

Figure 2-1 Full Build-Out Water Demand Projection Methodology

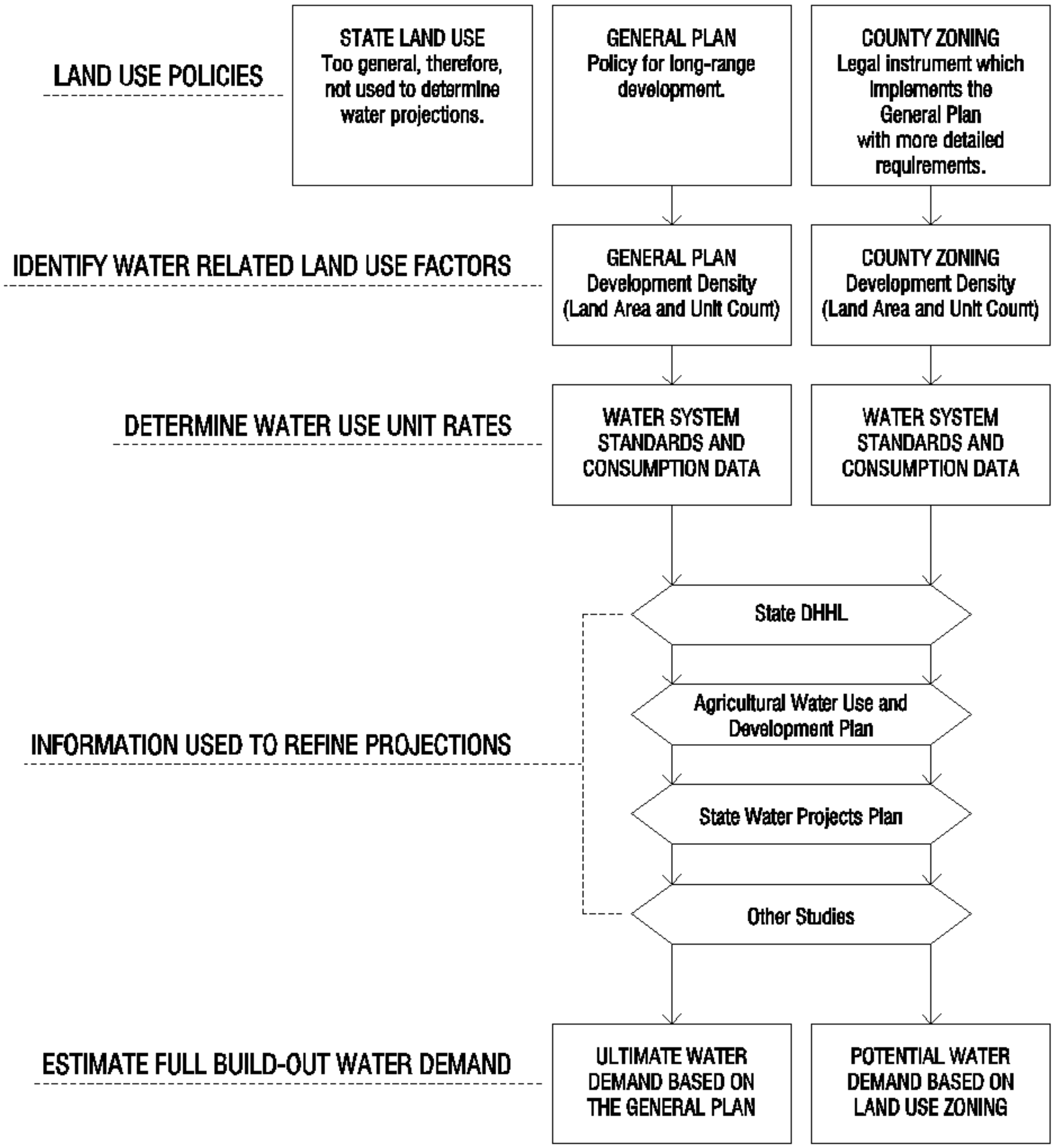


Figure 2-2 20-Year Water Demand Projection Methodology

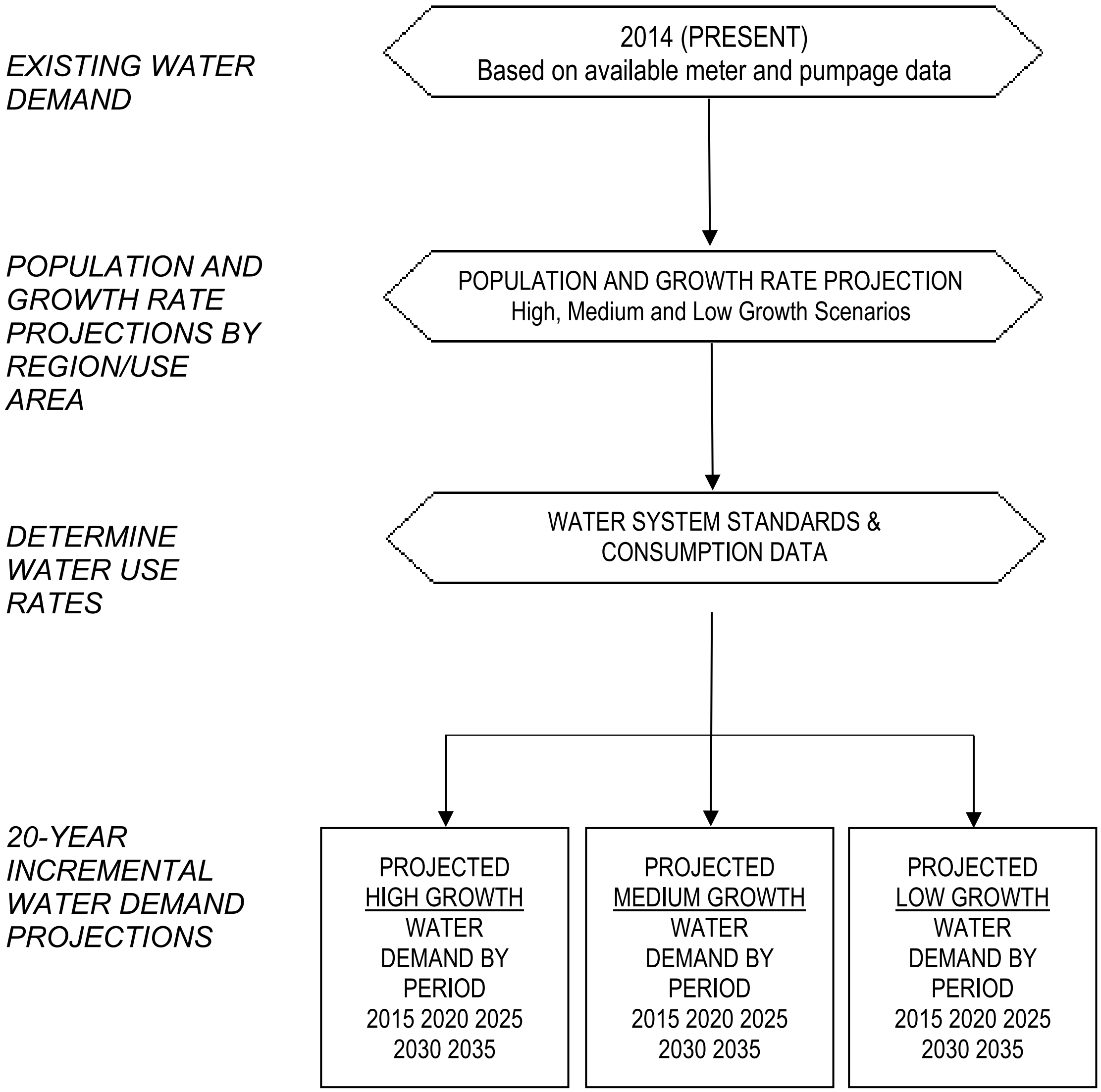
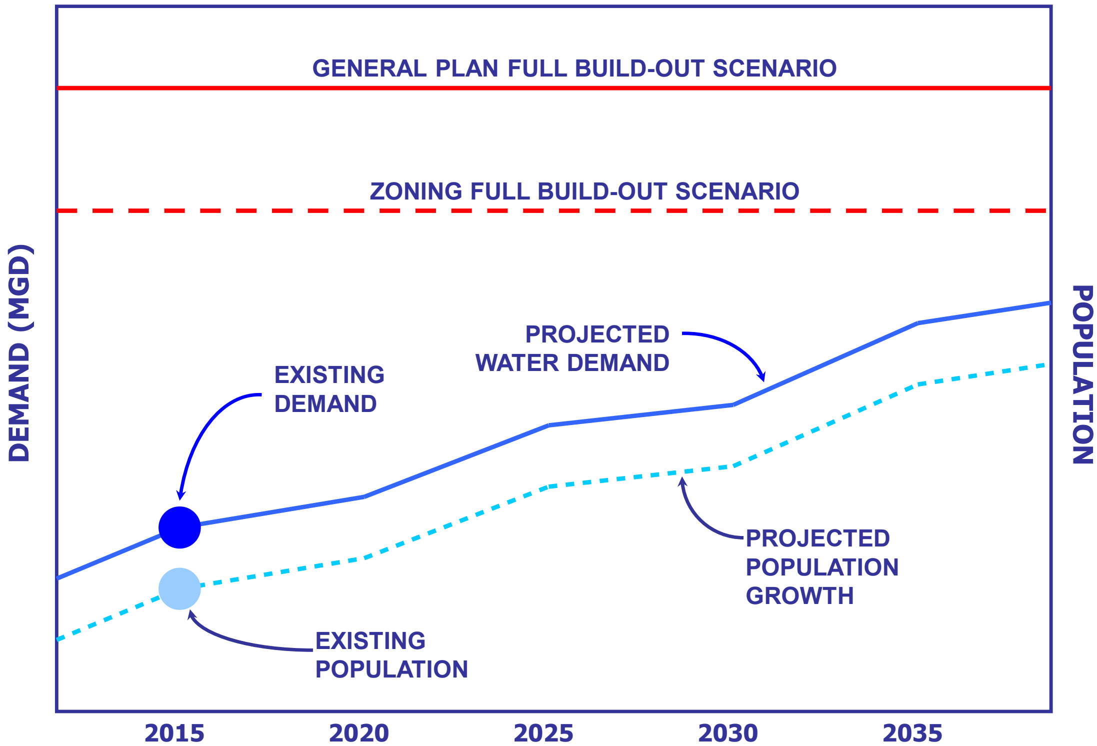


Figure 2-3 Theoretical Projected Demand



2.2.1 Water Use Rates

Water use rates were based on the *Water System Standards* (WSS) and actual consumption data. Potable and non-potable water requirements were differentiated where appropriate.

Applicable water use rates from the WSS Table 100-18 – Domestic Consumption Guidelines are listed in **Table 2-1**.

Table 2-1 Domestic Consumption Guidelines

Land Use	Average Daily Demand
RESIDENTIAL	
Single Family or Duplex	500 gals/unit
Multi-Family Low Rise	350 gals/unit
Multi-Family High Rise	350 gals/unit
COMMERCIAL	
Commercial Only	3,000 gals/acre
Commercial/Industrial Mix	5,000 gals/acre
RESORT	350 gals/unit
LIGHT INDUSTRY	4,000 gals/acre
SCHOOLS, PARKS	4,000 gals/acre or 60 gals/student
AGRICULTURE	3,400 gals/acre*

*Agriculture average daily demand based on AWUDP water application rate for diversified crops.

Water use unit rates were also calculated based on actual consumption data to compare against the WSS rates. The WSS water use unit rates were used for calculating full build-out water demands unless the water use rate calculated from actual consumption data indicated a rate that was more appropriate.

2.2.2 Full Build-Out Water Demand Projections

Full build-out water demand projections are land use based and provides an estimate of the maximum water needs anticipated if all land is developed to the highest extent allowed by current land use policies set by the State of Hawaiʻi and County of Kauaʻi. Maximum development, in terms of unit counts and land area, is determined from land use policies as described below. Full build-out demand is determined by multiplying these unit counts and land areas by the appropriate planning water use rates described in **Section 2.2.1**. Comparing these full build-out water demand projections to the SYs of each ASYA identifies areas where water resources are more than adequate to support maximum demands, thereby providing guidance for future assessments to focus efforts on the more sensitive areas. It is also noted that the full build-out scenarios are unlikely to occur because the scenarios assume that all land area is developed to the maximum density allowed, including redeveloping existing developed areas and developing areas that in reality need to remain open for roads and buffer areas or because they are undevelopable due to topography. Therefore, the full build-out water demand projections are conservatively high.

2.2.2.1 State Land Use

The State Land Use classification (SLUC) is very general with only four land use districts: Urban, Rural, Agriculture, and Conservation. The State Land Use classification has no guidelines to identify the level of development densities within the various districts, and therefore, it has been decided that SLUC will not be used to estimate full build-out water demand.

2.2.2.2 Kaua'i County General Plan

The full build-out water demand based on the General Plan is used to determine if there are adequate water resources to sustain the long-range land use vision adopted by the County.

Although the General Plan is more detailed than the State Land Use classification, the land use designations are broad. In addition, since the General Plan is a direction-setting policy document and not a legal instrument, it does not provide specific density guidelines. In the absence of specific density guidelines in the General Plan, County Zoning guidelines were applied to General Plan land use designations in order to determine full build-out water demand, as described below.

The General Plan provides only a broad density guideline of 1 to 20 units per acre for the Residential Community designation. Instead of using 1 unit per acre or 20 units per acre on all lands designated as Residential Community, an intermediate density was applied. Community Plans have indicated that most residents would like their communities, including the development density, to remain similar in the future. Therefore, the intermediate density for each ASYA was calculated from the weighted average density of lands zoned as Residential by County Zoning.

$$Weighted\ average\ density\ = \frac{Total\ number\ of\ units\ allowed\ in\ Residential\ zones\ according\ to\ County\ Zoning}{Total\ land\ area\ of\ Residential\ zones}$$

Table 2-2 lists the densities calculated for Residential Community for each ASYA.

Table 2-2 Estimated Residential Community Densities

ASYA	ASYA Code	Density (Unit/Acre)
Kōloa	20101	5.40
Hanamā'ulu	20102	7.41
Wailua	20103	3.08
Anahola	20104	4.83
Kīlauea	20105	5.42
Kalihiwai	20201	6.84
Hanalei	20202	5.92
Wainiha	20203	2.49
Nāpali	20204	N/A
Kekaha	20301	4.66
Waimea	20302	3.24
Makaweli	20303	5.74
Hanapēpē	20304	3.58

The General Plan does not provide a density guideline for the Resort land use designation. Therefore, similar to the approach used for Residential Community, the weighted average density of lands zoned as Resort by County Zoning in each ASYA was used to estimate full build-out water demands. **Table 2-3** lists the densities calculated for Resort for each ASYA.

Table 2-3 Estimated Resort Densities

ASYA	ASYA Code	Density (Unit/Acre)
Kōloa	20101	13.72
Hanamāʻulu	20102	18.97
Wailua	20103	N/A
Anahola	20104	20.00
Kīlauea	20105	N/A
Kalihiwai	20201	7.46
Hanalei	20202	12.37
Wainiha	20203	8.00
Nāpali	20204	N/A
Kekaha	20301	4.00
Waimea	20302	N/A
Makaweli	20303	1.00
Hanapēpē	20304	N/A

The General Plan acknowledges that dwellings are allowed on lands designated as Agricultural and Open, but does not provide a specific density guideline. Regulations placed on lands zoned as Agricultural and Open by County Zoning were used to estimate the potential number of dwelling units on lands designated as Agricultural and Open by the General Plan.

The water use rates used for each General Plan land use designation are listed in **Table 2-4**.

Table 2-4 Water Use Rates for General Plan

General Plan Land Use Designation	Daily Water Use Rate
Agricultural*	500 gals/unit
Military	300 gals/acre
Open	500 gals/unit
Park	4,000 gals/acre
Residential Community	500 gals/unit
Resort	700 gals/unit**
Transportation	N/A
Urban Center	5,000 gals/acre

* Agriculture irrigation use calculated separately as described in Section 2.2.2.5.4.
** This rate is based on 350 gallons per hotel room and two hotel rooms per unit.

This WUDP update analyzes the full build-out water demand based on the 2000 General Plan which was the current version at the time of analysis. Since then, the 2018 General Plan has been adopted by the County. The 2018 General Plan incorporates the Līhuʻe and South Kauaʻi Community Plans, which were analyzed by this WUDP update and used to refine the General Plan full build-out water demand projections as described below. For areas outside of the Līhuʻe and South Kauaʻi Planning Districts, this WUDP update compared the 2018 General Plan to the 2000 General Plan and did not identify any areas where the water demand projections would significantly increase.

2.2.2.3 Kauaʻi County Development Plans

Community development plans establish more detailed policy than the General Plan. Not every community needs or desires a development plan since some communities may not require more specific, detailed policy than what is established in the General Plan. Full build-out water demand was calculated for the Līhuʻe Community Plan and the South Kauaʻi Community Plan. The General Plan full build-out water demand projections were refined by these community plan demands where applicable.

2.2.2.4 Kauaʻi County Zoning

The Comprehensive Zoning Ordinance (CZO) is the County's legal instrument that regulates land development, and implements the General Plan policies; therefore, zoning must be consistent with the General Plan. The full build-out water demand based on County Zoning is used to determine if there are adequate water resource to sustain the level of development that is allowed by law. County Zoning is more detailed and precise than the General Plan. In addition, County Zoning addresses existing conditions and shorter range planning; therefore, the potential full build-out development based on zoning typically would be assumed to be less than the full build-out based on the General Plan.

The water use rates used for each zoning district are listed in **Table 2-5**.

Table 2-5 Water Use Rates for Zoning

Zoning District	Daily Water Use Rate
Agriculture*	500 gals/unit
Commercial – General	5,000 gals/acre
Commercial – Neighborhood	5,000 gals/acre
Conservation	0 gals
Industrial – General	4,000 gals/acre
Industrial – Limited	4,000 gals/acre
Open	500 gals/unit
Residential R-10 and below R-15 and above	 500 gals/unit 350 gals/unit
Resort	700 gals/unit**

* Agriculture irrigation use calculated separately as described in Section 2.2.2.5.4.
** This rate is based on 350 gallons per hotel room and two hotel rooms per unit.

2.2.2.5 Refine Land Use Based Projection

The Framework recommends that forecasts from the most recent *State Water Projects Plan* (SWPP) and the *Agricultural Water Use and Development Plan* (AWUDP) be used to refine the projections. More recent information is available from the ongoing SWPP updates (State-wide), State agencies, and the *County of Kaua'i Important Agricultural Lands Study*; therefore, this more recent information will also be used to refine the projections.

2.2.2.5.1 State Water Projects Plan

The State Water Projects Plan (SWPP), dated May 2021, is a water development plan specific to future State projects through the year 2034. The water demand projections for State projects from the 2021 SWPP are incorporated into this WUDP update. The State projects, with the exception of lands owned by the Department of Hawaiian Home Lands (DHHL), conform to the County zoning (and therefore conform to the General Plan). Therefore, the water projections for State projects, not including DHHL, are already accounted for with the WUDP update methodology. The DHHL projects are addressed separately.

The SWPP assigned water development strategy options (hereafter called "strategy options") to each of the State projects in order to identify and evaluate source development options for the proposed State projects. As a result, SWPP projects with potential source options and SWPP projects without source options (therefore requiring additional source development) could also be identified. The strategy options applicable to SWPP projects within the County of Kaua'i are listed in **Table 2-6** below.

Table 2-6 SWPP Water Development Strategy Options

Abbreviation Code	Water Development Strategy Option	Water Type
EXSWS	Existing State Water Systems	Potable & Non-Potable
COUNTY-CREDIT	Credit for County Water Department facilities charges	Potable
NEWSWS	New State Water Systems	Potable & Non-Potable
NEWSS	New and/or planned State wells	Potable
REMAIN	Remaining balance of water demand to be supplied by County Water Systems	Potable
OTHER-CATCHMENT	Rain water catchment systems	Potable & Non-Potable
OTHER-STREAM DIVERSION	Potential stream diversions	Non-Potable
NONE	Ambient rainfall sufficient to sustain agricultural demands	Non-Potable

For the purposes of this WUDP update, SWPP projects assigned the strategy option of "REMAIN" will be focused on as this strategy option indicates that the SWPP project demand is anticipated to be supplied by a County water system.

The SWPP indicates that, "Typically, projects with small demands can be supplied by County water systems without issue; however, projects with larger demands will be subject to water availability review by the respective water department and must be coordinated in greater detail. In the event County water systems are unable to supply remaining SWPP water demands, DLNR may be required to develop new State sources or propose a State-County joint venture to develop new sources." Coordination between appropriate State agencies and the County should be continued to cooperatively and jointly develop future source requirements, and to provide for more expeditious and efficient utilization of government resources whenever possible.

2.2.2.5.2 State Department of Hawaiian Home Lands

The Department of Hawaiian Home Lands (DHHL) is exempt from State and County land use classifications and determines the land use classification for its lands. The *Kaua'i Island Plan* dated May 2004 provides recommendations for future use of DHHL and is based on a 20-year planning period. Although the plan is originally dated May 2004, DHHL recognized the plan as current in 2012; therefore, the planning period is from 2012-2032.

In 2017, the SWPP was updated only for the DHHL projects due to budgetary constraints. The SWPP update methodology determined DHHL water needs based on the *Kaua'i Island Plan* and supplemental information from DHHL, and does not consider existing County zoning. The water demand projections for DHHL from the 2017 SWPP are incorporated into this WUDP update.

Water Reservations

The Code provides for reservations of water in both designated and non-designated water management areas. Water reservations in designated areas may be made pursuant to HRS §174C-49(d), which states that "[t]he Commission, by rule, may reserve water in such locations and quantities and for such seasons of the year as in its judgment may be necessary. Such reservations shall be subject to periodic review and revision in the light of changed conditions; provided that all presently existing legal uses of water shall be protected".

The Code also authorizes water reservations for DHHL, whether or not the area has been designated a water management area as stated in HRS §174C-101(a): "decisions of the commission on water resource management relating to the planning for, regulation, management, and conservation of water resources shall, to the extent applicable and consistent with other legal requirements and authority, incorporate and protect adequate reserves of water for current and foreseeable development and use of Hawaiian home lands as set forth in section 221 of the Hawaiian Homes Commission Act."

The procedures for water reservations are defined in HAR §13-171-60. The reservation process is separate from the Hawai'i Water Plan and therefore, this WUDP update.

Thus far, CWRM has made a total of six reservations (four groundwater and two surface water) for the island of Kaua'i under this authority, and all are for DHHL and are presented in **Table 2-7**. In general, the reservation actions by CWRM were supported by findings regarding future DHHL water use in the 2017 SWPP.

Table 2-7 DHHL Water Reservations

Hydrologic Unit Code	Hydrologic Unit	Reservation (mgd)
20103	Wailua	0.708
20104	Anahola	1.470
20301	Kekaha	0.336
20302	Makaweli	0.405
	Ground Water Subtotal	*2.919*
2040	Wailua	0.513
2060	Waimea	6.903*
	Surface Water Subtotal	*7.416*

*This reservation was made following the Waimea Watershed Agreement Mediated Settlement.

2.2.2.5.3 Agricultural Water Use and Development Plan

According to the Framework, "the major objective of the AWUDP is to develop a long-range management plan that assesses state and private agricultural water use, supply and irrigation water systems. The plan shall address projected water demands and prioritized rehabilitation of existing agricultural water systems." The AWUDP, dated December 2003 and revised December 2004, is limited in scope due to time and funding constraints; it assesses the needs and proposes improvements for the East Kauaʻi irrigation system (IS), Kauaʻi Coffee IS, Kekaha IS, and Kōkeʻe Ditch IS.

In 2019, the State Department of Agriculture (DOA) released a draft of the AWUDP update, which includes an inventory of the following irrigation systems:

- Ka Loko and Puʻu Ka Ele Ditches,
- Stone Dam and Kalihiwai Irrigation Subsystems,
- Anahola Ditch,
- Upper and Lower Līhuʻe Ditches and a portion of the Waiahi-ʻIliʻiliʻula Ditch,
- Upper and Lower Haʻikū Ditches,
- Waiʻaha-Kuʻia Aqueduct, a portion of the Waiahi-ʻIliʻiliʻula Ditch, and the Kōloa-Wilcox Ditch, and,
- Olokele Ditch

General information about the irrigation systems and their condition from the draft AWUDP update have been incorporated into this WUDP update.

More recent, comprehensive information on agricultural lands is available in the *County of Kauaʻi Important Agricultural Lands (IAL) Study* and is therefore relied upon as the best available information for estimating agricultural water demand. The information in the AWUDP update will supersede the agricultural water use estimates included in this WUDP.

2.2.2.5.4 County of Kauaʻi Important Agricultural Lands Study

The purpose of the *County of Kauaʻi Important Agricultural Lands Study* is to operationalize the County-specific directives of Act 183 (SLH 2005) Important Agricultural Lands. According to Act 183, IALs are lands that are capable of producing sustained high yields when treated and managed according to accepted farm methods and technology, contribute to the State's economic base and produce agricultural commodities for export or local consumption, and are needed to promote the expansion of agricultural activities and income for the future, even if currently not in production. Act 183 also includes eight criteria for identifying IALs which are as follows:

1. Land currently used for agricultural production;
2. Land with soil qualities and growing conditions that support agricultural production of food, fiber, or fuel- and energy-producing crops;
3. Land identified under agricultural productivity rating systems, such as the agricultural lands of importance to the State of Hawaii (ALISH) system adopted by the board of agriculture on January 28, 1977;
4. Land types associated with traditional native Hawaiian agricultural uses, such as taro cultivation, or unique agricultural crops and uses, such as coffee, vineyards, aquaculture, and energy production;
5. Land with sufficient quantities of water to support viable agricultural production;
6. Land whose designation as important agricultural land is consistent with general, development, and community plans of the county;
7. Land that contributes to maintaining a critical land mass important to agricultural operating productivity;
8. Land with or near support infrastructure conducive to agricultural productivity, such as transportation to markets, water, or power.

The study, conducted from 2009 to 2011, evaluated Kauaʻi's agricultural lands for these eight IAL criteria. Agricultural lands that met all eight criteria to some degree received a score of 28. Only a subset of lands with a score of 28 or better is expected to be designated as IALs. A total of 37,410.3 acres of agricultural lands have been designated as IAL thus far. See **Table 2-8** for a breakdown of the IALs by aquifer system.

Table 2-8 Designated Important Agricultural Lands

ASYA	Owner	IAL Area (ac)	Primary Use
Kōloa	Māhāʻulepū Farm, LLC	1,553	Taro cultivation, seed corn, forage crops, cattle ranching
	Alexander & Baldwin, Inc.	3,773.1	Coffee, seed corn cultivation
Hanamāʻulu	Grove Farm Company	11,206.2	Cattle ranching, diversified agriculture, biomass production, bioenergy crops
Hanalei	Kamehameha Schools	190	Taro cultivation, diversified agriculture, pasture
Makaweli	Robinson Family Partners	20,888	Cattle ranching, seed production

It is not reasonable to assume that all lands designated or zoned as Agricultural will be fully irrigated at all times. Therefore, this WUDP compares only agricultural lands that met all eight criteria to the diversified water use rate of 3,400 gallons per acre per day (gpad) estimated in the 2004 AWUDP and to declared surface water use. In the analysis, declared surface water use is viewed as an existing water source, or estimate of the amount of surface water that may be used, rather than an existing water demand. The comparison shows what percentage of these lands can be irrigated at a rate of 3,400 gpad, and conversely, what irrigation rate could be applied to all the lands that meet the eight IAL criteria. Agricultural water demand rates and agricultural water demand forecasts are anticipated to be provided by the AWUDP update. In the meantime, with limited available information, the results of this IAL analysis portray the general scenario of potential agricultural demands compared to surface water.

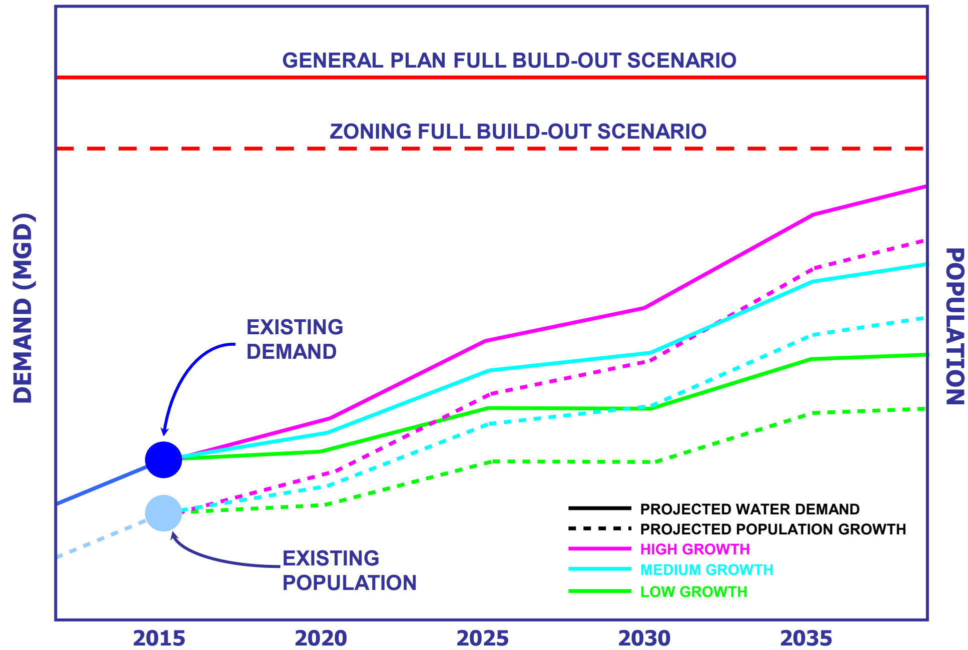
A challenge with developing surface water is transmission. Farmers generally grow what is feasible for the area; therefore, it is anticipated that agricultural water use will follow the availability of irrigation water.

2.2.3 Water Demand Projections to the Year 2035

Existing population and existing water use are the basis of the water demand projections to the year 2035. Water demand to the year 2035 is projected by applying the population growth rate to existing water demand. Projecting water demand at the same rate as population growth assumes that the character of communities, including per capita water demand and the density of units within communities, will be similar in the future. Population and growth rate projections were applied in 5-year increments for the next 20 years; and have high-growth, medium-growth (base case) and low-growth (the most conservative) scenarios, as shown on Figure 2-4. The demands are further differentiated into potable and non-potable demands in the ASYA chapters.

It was assumed that population growth, and thus water use, from projects described in the 2021 SWPP Update and the 2017 DHHL SWPP Update are already accounted for by the population projections; therefore, information from these documents was not used to further refine the 5-year incremental water demand projections.

Figure 2-4 Theoretical Projected Demand H-M-L Growth Scenarios



2.2.3.1 Population and Growth Rate Projections

The population projections to the year 2035, including the high, medium, and low scenarios, are from the Socioeconomic Analysis and Forecasts, dated February 2014, and are also the basis of the General Plan. The growth rates were derived from this data.

2.2.3.2 Agriculture Water Demand Projections

Agriculture demands are not included in the population and growth rate projections as these demands do not track with population growth. It is difficult to project future agricultural water needs as it is dependent on several factors rather than just population growth. As stated in the Increased Food Security and Food Self-Sufficiency Strategy report, dated 2012, Hawai‘i imports between 85 and 95 percent of food. Hawai‘i’s 2050 Sustainability Plan, prepared by the Office of Planning, set a goal to double Hawai‘i’s food production by 2030, but no legislation has been adopted and no funding has been allocated yet.

Due to climate change, drought, and government regulations, it is anticipated that the amount of water needed for the existing agriculture demands will increase, which further complicates estimating future agriculture demands. For example, the U.S. Food and Drug Administration’s Food Safety and Modernization Act (FSMA) Final Rule on Produce Safety set stringent water quality and testing requirements for agricultural water use. The FSMA prohibits the use of untreated surface water to be used for final processing unless the surface water is extensively tested and treated. Alternatives include using agricultural water received from public water systems or using potable water in lieu of surface water.

Agricultural water demand forecasts are being developed by the AWUDP update. The information in the AWUDP update will supersede the agricultural water use estimates included in this WUDP. As an alternative to estimating future agriculture demands with the limited information available, an analysis of the more recent and comprehensive County of Kaua'i Important Agricultural Lands (IAL) Study was performed as described in **Section 2.2.2.5.4**.

2.3 RESOURCE AND FACILITY RECOMMENDATIONS

2.3.1 Water Source Adequacy

2.3.1.1 Full Build-Out

Water demand based on full development of the County General Plan and County Zoning land use classifications are compared to the sustainable yield of each ASYA to determine if the land use policies can be sustained. See **Figure 2-5** and **Figure 2-6** for the general plan and zoning full build-out water demand as compared to the sustainable yield for each ASYA, respectively.

2.3.1.2 Twenty-Year Projection

The water demand projections to the year 2035 are assessed to estimate the percentage of the sustainable yield that could be utilized by present and 20-year water requirements, and are compared to the County General Plan and County Zoning water demand requirements to assess relative timing of the full build-out scenarios.

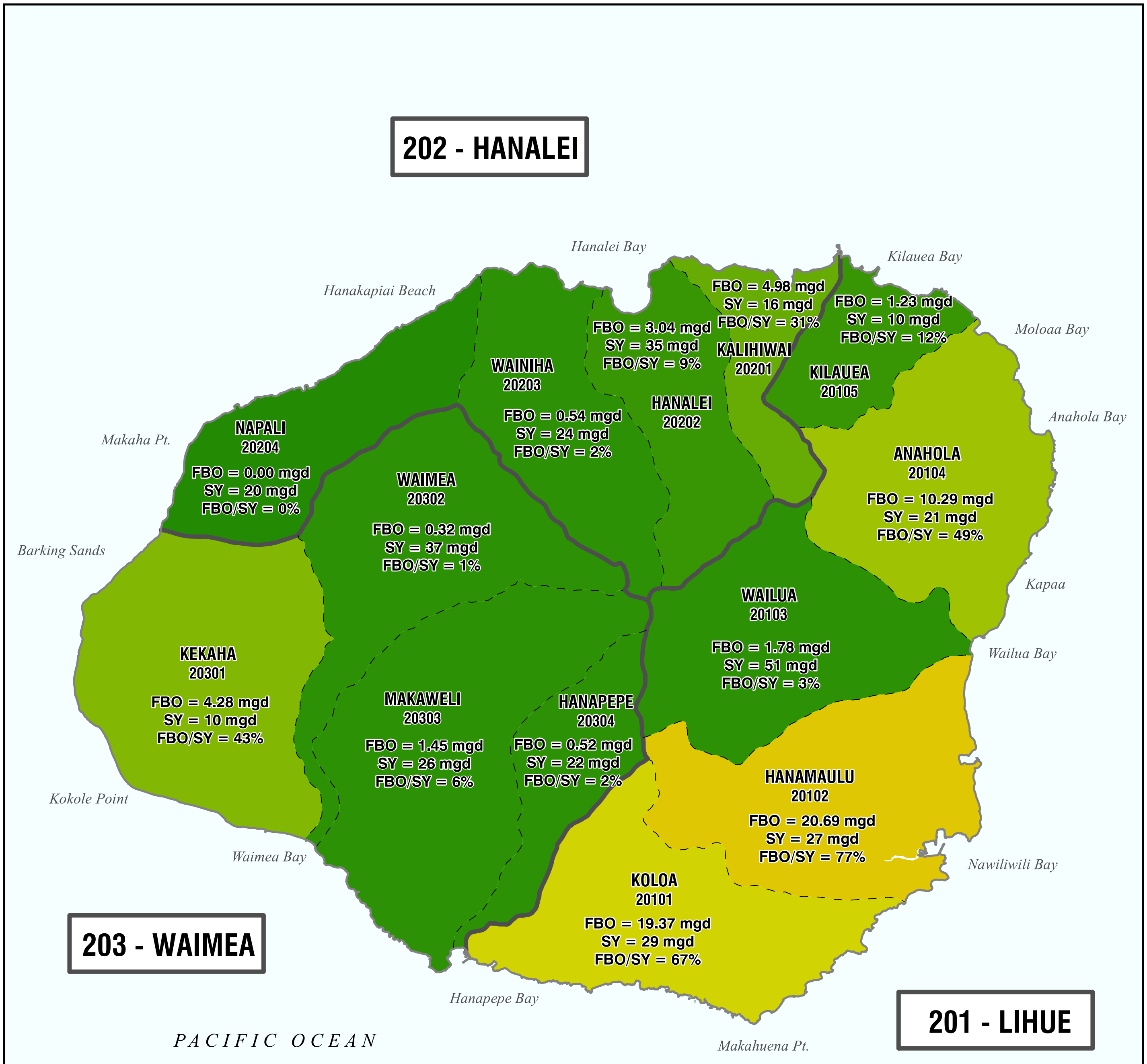
2.3.2 Source Development Requirements

2.3.2.1 Planning Objectives

Planning objectives form the basis of the evaluation of resource strategies. The following guiding principles were discussed at stakeholder and public information meetings and have guided the development of resource strategies.

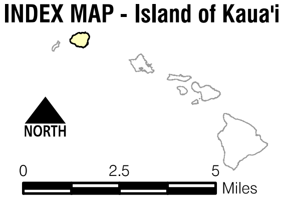
To optimize appropriate use of water resources, the quality of the water source should be matched to the quality of water required. The recommendations for each ASYA were made with this and the following contributing themes in mind.

- Prioritize and protect public trust uses of water
- Public Trust Doctrine: the State serves as the primary steward of the water resources public trust. As a trustee, the State is responsible for the management and protection of Hawai'i's water resources for the benefit of the people of the State
- Reserve the highest quality of water for the most valued end use
- Promote water conservation
- Meet future demands at a reasonable cost



NOTE: The General Plan full build-out demand projections are conservative and are unlikely to be realized as it assumes that all land area is developed to the maximum density allowed. This includes the development of areas that are undevelopable (e.g. due to topography and roads/highways), and the redevelopment of underdeveloped parcels.

INDEX MAP - Island of Kaua'i

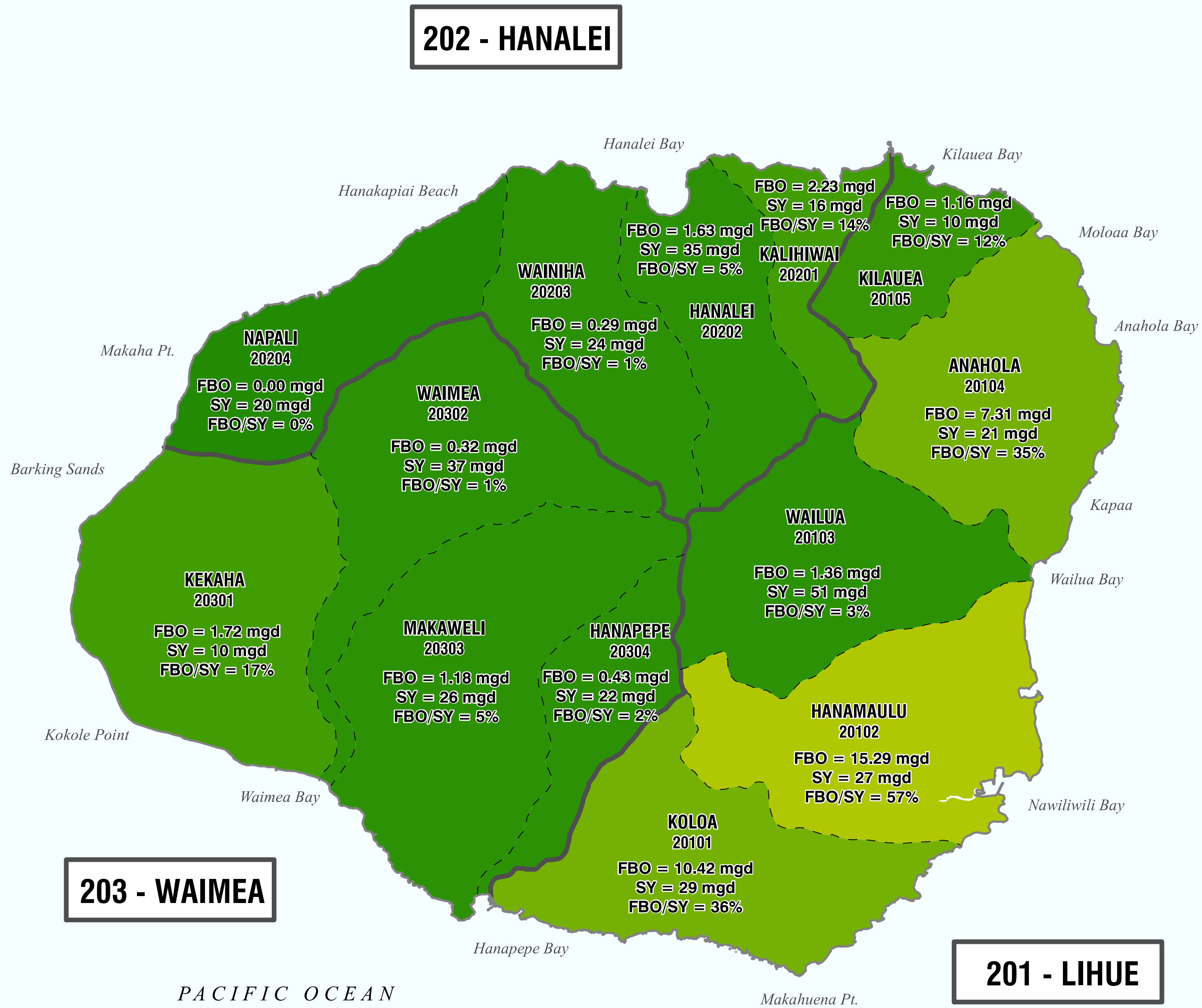


LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- FBO/SY = 0%-100%

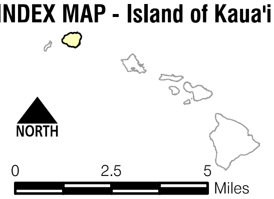
FIGURE 2-5

GENERAL PLAN FULL BUILD OUT VS. SUSTAINABLE YIELD



NOTE: The Zoning full build-out demand projections are conservative and are unlikely to be realized as it assumes that all land area is developed to the maximum density allowed. This includes the development of areas that are undevelopable (e.g. due to topography and roads/highways), and the redevelopment of underdeveloped parcels.

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- FBO/SY = 0%-100%

FIGURE 2-6

ZONING FULL BUILD OUT VS. SUSTAINABLE YIELD

Potable water is considered the highest quality water, and the sustenance of life is considered the most valuable end use. Recycled water, brackish ground water, untreated surface water, and other lower quality water sources should be used for landscaping and agriculture, thereby reserving potable water for human consumption. Further, if there is a practical alternative water source available, such as recycled water, that alternative source should be used in lieu of ground water or surface water.

Water resources are a finite resource that should be managed and used wisely. It should be conserved and not wasted. Implementation of conservation measures and watershed management should continue to be encouraged.

2.3.2.2 Supply-Side Management

Supply-side management, including conventional water resource measures and alternative water resource enhancement measures, is evaluated to meet projected water demands. Reserving the highest quality of water for the highest valued need, i.e., human consumption, is prudent. Non-potable water uses should depend upon available non-potable water sources whenever available. However, economics often govern supply-side management, such that non-potable water uses are often served by potable water systems. In most cases, it is not economical to develop a separate non-potable water system parallel to an existing potable water system to serve the "lower value" needs such as irrigation, industrial and agricultural use. However, when conventional potable water resources become limited and more costly alternative water resource enhancement measures are necessary, reserving the highest quality of water for the highest value need will become a more favorable option, and possibly may eventually become a requirement.

Conventional Water Resource Measures

The development of ground water and surface water should be considered after first considering conservation options and alternative water sources. However, ground water and surface water are typically the most cost-effective means for meeting projected water demands. Ground water is usually the least costly potable resource as treatment requirements are significantly less in comparison to surface water resources for potable uses. Surface water is usually the least costly non-potable resource because pumping costs are less than for ground water sources; minimal treatment, if any, is required; and water quality monitoring is not required for non-potable uses.

It is noted that development of conventional water resource measures can have challenges. The safe yield of an individual production well may be limited by localized ground water behavior near the well as a result of pumpage. Water supply reliability and quality, feasibility, environmental and cultural impacts, and water rights will be considered as projects and programs develop. More detailed and site-specific evaluation of these impacts will be required and accomplished through the environmental review process (HRS Chapter 343) for source development projects and programs utilizing public funding, and CWRM could consider requiring compliance with the environmental review process for private source development projects and programs also. **Section 1.5.3.1** provides additional information regarding the protection of traditional and customary rights.

This WUDP update includes only general water resource strategies for the ASYAs. The DOW is currently working on a separate plan that will include specific projects for the DOW water systems, such as source development projects. This DOW plan is the Water System Investment Plan (WSIP) which will be the DOW long-range capital improvements plan.

Water Conservation

Reduction in water demand through water conservation cannot solely ensure sufficient source water to meet demand; however, it is universally recommended that water conservation programs be implemented to ensure protection of valuable water resources. Water audits by a utility are an important tool to determine and pursue opportunities for water conservation and efficiency improvements.

Existing water conservation measures are listed in **Section 1.5.7**. These existing measures should be promoted, and proposed water conservation measures should complement existing programs.

Other conservation measures could consider requirement of neighborhood development and new construction to be LEED (Leadership in Energy and Environmental Design) certified. LEED is a nationally accepted rating system developed by the U.S. Green Building Council that recognizes performance in five key areas of human and environmental health, one of which is water savings.

Alternative Water Resource Measures

Alternative water resource measures include rainwater catchment systems, recycled water, storm water reuse and desalination. While alternative sources may not be able to completely provide enough source water to meet demand, alternative water resources should be developed whenever feasible to help ensure the long-term viability of naturally occurring water resources, such as ground water and surface water. Alternative water resource measures are necessary when the conventional water resources, ground water and surface water, are not available. These alternative measures are considered enhancement measures due to limitations and restrictions on use. Rainwater catchment is not as reliable as conventional water resources because it is extremely sensitive to the climate. The use of recycled water is limited, and uses must be approved and in close proximity to the wastewater reclamation facility. Desalination is more costly than conventional water resources, due to treatment and monitoring requirements. Brackish ground water would often be the preferred resource for desalination to meet potable water quality because monitoring requirements are not as stringent and demanding as they are for a surface water source. However, according to the WRPP, brackish ground water contributes toward the sustainable yield of the aquifer; therefore, desalinization of seawater is advantageous because seawater is not a limited resource.

2.3.2.3 Demand-Side Management

Demand-side management, including development density control, is a means to meet source development requirements by reducing demand.

Development Density Control

In areas where the potential land use based water demand is projected to exceed the ASYA sustainable yield, land use policies should be reevaluated to ensure that the planned development density can be sustained and alternative water resource options should also be evaluated. In particular, County zoning should be reassessed because development in accordance with the CZO is already legally accepted. If the development density is not reduced, alternative resource enhancement measures would be required as the aquifer sustainable yield becomes stressed.

2.4 DATA LIMITATIONS

Fulfillment of the Framework requirements for the WUDP update requires significant information, some of which is not available at this time. Therefore, the WUDP should be viewed as a dynamic document and tool which needs to be updated regularly, and becomes a more detailed working document as more information and data become available.

2.4.1 Hawaiʻi Water Plan Update

Update of the AWUDP is in progress and ultimately will provide agricultural water demand projections, information on irrigation water systems, and consideration of related factors such as crop types, climatic factors, soil, terrain, etc. A draft of the AWUDP was released in 2019 and general information on the irrigation systems and their condition has been incorporated into this WUDP update. However, more specific information, such as existing water use, recommended water demand rates, and future agriculture demand scenarios, have not been incorporated from the draft AWUDP update. In addition, existing agriculture and irrigation water use was not provided for majority of the irrigation systems studied in the 2004 AWUDP and the draft AWUDP update. It is anticipated that that additional information on agriculture and irrigation use will be included in future AWUDP updates.

2.4.2 CWRM Well and Pumpage Database

Update of the well database helps to better assess which wells are no longer in use, change of ownership, change of use, etc. Pumpage data for all wells would provide more precise information on actual impact on the aquifer sustainable yields. According to the WRPP update, only 48% of production wells on Kauaʻi reported water use in 2016. DOW reports pumpage for all its wells. Better reporting is needed for non-municipal wells.

2.4.3 CWRM Stream Diversion Database

The impact of surface water use is difficult to assess due to a deficit of surface water use data. However, CWRM has made great strides in water use data collection and is focusing on water use reporting for large irrigation systems. CWRM staff is continuing to work with water users in the field and to promote the use of the Water Resource Information Management System (WRIMS) to improve reporting and data record accessibility.

Chapter 20101

Kōloa Aquifer System Area

CHAPTER 20101 - TABLE OF CONTENTS

FIGURES

TABLES

20101 KŌLOA AQUIFER SYSTEM AREA

20101-1 SYSTEM AREA PROFILE

20101-1.1 General

The Kōloa [20101] Aquifer System Area (ASYA) is roughly bound on the east by the Hāʻupu Mountain Range, Knudsen Gap, and Mount Kāhili, on the west by the Wahiawa Gulch, and on the south by the Pacific Ocean. The Kōloa ASYA lies almost entirely within the South Kauaʻi Planning District and includes the communities of Poʻipū, Kukuiʻula, Kōloa, ʻŌmao, Lāwaʻi, and Kalāheo. The Kōloa ASYA also includes the community of ʻEleʻele.

The South Kauaʻi Community Plan, adopted in July 2015, does not provide quantitative target numbers for the future development within the planning area. It does, however, describe the desired qualitative goals and objectives for the area that were developed with input from the community.

As described in the South Kauaʻi Community Plan (Section 2.1 Vision Statements), "South Kauaʻi is comprised of distinct rural communities, each embracing its own rich cultural, natural, and historic heritage".

- Kōloa: Is to be maintained as a thriving commercial and residential community while preserving its existing rural feel and historic old sugar plantation charm.
- Poʻipū: Is to be a world-class, sustainable resort destination servicing both residents and visitors to the island. The area is to be well-connected and accessible to everyone and is to be developed responsibly with clean, healthy beaches and ocean environments, welcoming parks, and preserved heritage resources.
- Kalāheo: Is to remain a residential community with neighborhood scaled commercial center and supported by small businesses.
- ʻŌmao: Is to be maintained as a small rural residential community.
- Lāwaʻi: Is to remain a rural crossroads with limited commercial areas centered on the Post Office and Old Cannery.

The South Kauaʻi Community Plan (§2.2 Guiding Principles) also identified a set of nine guiding principles under which the plan's vision is to be implemented. Key principles with regards to the development and management of water resources include:

- Watershed Management: Recognition that water resource services and nature are interrelated
- Hazard and Climate Risk Management: Prepare for potential impacts of natural hazards and climate changes
- Sustainable Resorts and Tourism: This is tied into the development of the Poʻipū Resort area as a sustainable visitor destination

- Diversity of Housing Types: Support workforce housing development within and around town cores

- Public Infrastructure and Facilities: Prioritize (development and improvements) to meet basic needs and support economic development

Average annual rainfall ranges from 35 inches per year along the coast to 160 inches in the mountains. The sustainable yield is 29 mgd.

20101-1.2 Economy and Population

20101-1.2.1 Economy

Poʻipū is currently the most popular visitor destination on the island and has the highest concentration of visitor accommodation units on the island and is anticipated to remain so into the future. In 2014, The Hawaiʻi Tourism Authority estimated that approximately 36 percent of the visitor units in inventory on Kauaʻi were located in the Poʻipū-Kukuiʻula area.

The largest industries in the various town areas located within the Kōloa ASYA are as follows:

- Kōloa: Accommodation and food service, retail trade, and administration, support, waste management services.
- Poʻipū : Accommodation and food service, public administration, and healthcare and social assistance
- Kalāheo: Accommodation and food service, retail trade, and educational services
- ʻŌmao: Retail trade, accommodation and food service, and healthcare and social assistance
- Lāwaʻi: Accommodation and food service, educational services, and retail trade
- ʻEleʻele: Port Allen is an active harbor and industrial hub

20101-1.2.2 Population

The population contributing to the water demand within the Kōloa ASYA is almost completely from the South Kauaʻi Planning District. Historical population data, as summarized in **Table 20101-1,** shows that, over the past 20 years, this area has experienced growth in the order of 10 to almost 15 percent per decade.

Population projections for the Kōloa ASYA are summarized through the year 2035 in **Table 20101-2a**. For planning purposes, a range of values (low, medium and high estimates) is provided. As shown in **Table 20101-2b**, it is estimated that the area will continue to experience growth rates between 10 and 15 percent per decade.

Table 20101-1: Historical Population – Kōloa ASYA

	Year		
	1990	2000	2010
Population	10,918	12,032	13,825
Percent Change		10.2	14.9

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report. Data redistributed and evaluated for Kōloa ASYA.

Table 20101-2a: Population Projection – Kōloa ASYA

Growth Rate	Population by Year								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
A – Low	14,655	14,813	14,972	15,132	15,293	15,454	16,278	17,127	18,002
B – Med.	14,799	15,005	15,212	15,421	15,632	15,845	16,939	18,083	19,275
C – High	14,823	15,037	15,253	15,470	15,690	15,912	17,051	18,248	19,496

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report. Data redistributed and evaluated for Kōloa ASYA.

Table 20101-2b: Population Projection – Percent Change – Kōloa ASYA

Growth Rate	2015-2025 % Change	2025-2035 % Change
A – Low	11.1	10.6
B – Medium	14.5	13.8
C – High	15.0	14.3

20101-1.3 Land Use

20101-1.3.1 2000 Kaua'i General Plan

The 2000 Kaua'i County General Plan Land Use Designation Map for the Kōloa ASYA is shown on **Figure 20101-1.** The estimated land use allocation acreage for each land use designation within the system area is listed in **Table 20101-3**.

Table 20101-3: General Plan Estimated Land Use Allocation Acreage – Kōloa ASYA

General Plan Land Use Designation	Acreage	Percent of Total
Agricultural	15,368	47.2
Military	0	0.0
Open	12,365	37.9
Park	277	0.9
Residential Community	3,843	11.8
Resort	596	1.8
Transportation	9	0.0
Urban Center	124	0.4
DHHL	0	0.0
TOTAL	**32,582**	**100.0**

20101-1.3.2 Kaua'i Zoning

Kaua'i County Zoning Map for the Kōloa ASYA shown on **Figure 20101-2**. The estimated land use allocation acreage for each zoning district within the system area is listed in **Table 20101-4**.

Table 20101-4: County Zoning Estimated District Allocation Acreage – Kōloa ASYA

Zoning District	Acreage	Percent of Total
Agriculture	15,193	46.3
Commercial – General	53	0.2
Commercial - Neighborhood	64	0.2
Conservation	8,136	24.8
Industrial – General	53	0.2
Industrial - Limited	32	0.1
Open	6,252	19.0
Residential	2,644	8.0
Resort	123	0.4
Project Development	12	0.0
Special Planning Area	0	0.0
Special Treatment	0	0.0
No Zoning	251	0.8
DHHL	0	0.0
TOTAL	**32,813**	**100.0**

Estimated water demand for the Kōloa ASYA will be based on the number of dwelling units allowed in residential and resort districts varies by the type of residential or resort district. The average number of dwelling units allowed in residential districts in the Kōloa ASYA is 5.40 dwelling units per acre. The average number of dwelling units allowed in resort districts in the Kōloa ASYA is 13.72 dwelling units per acre.

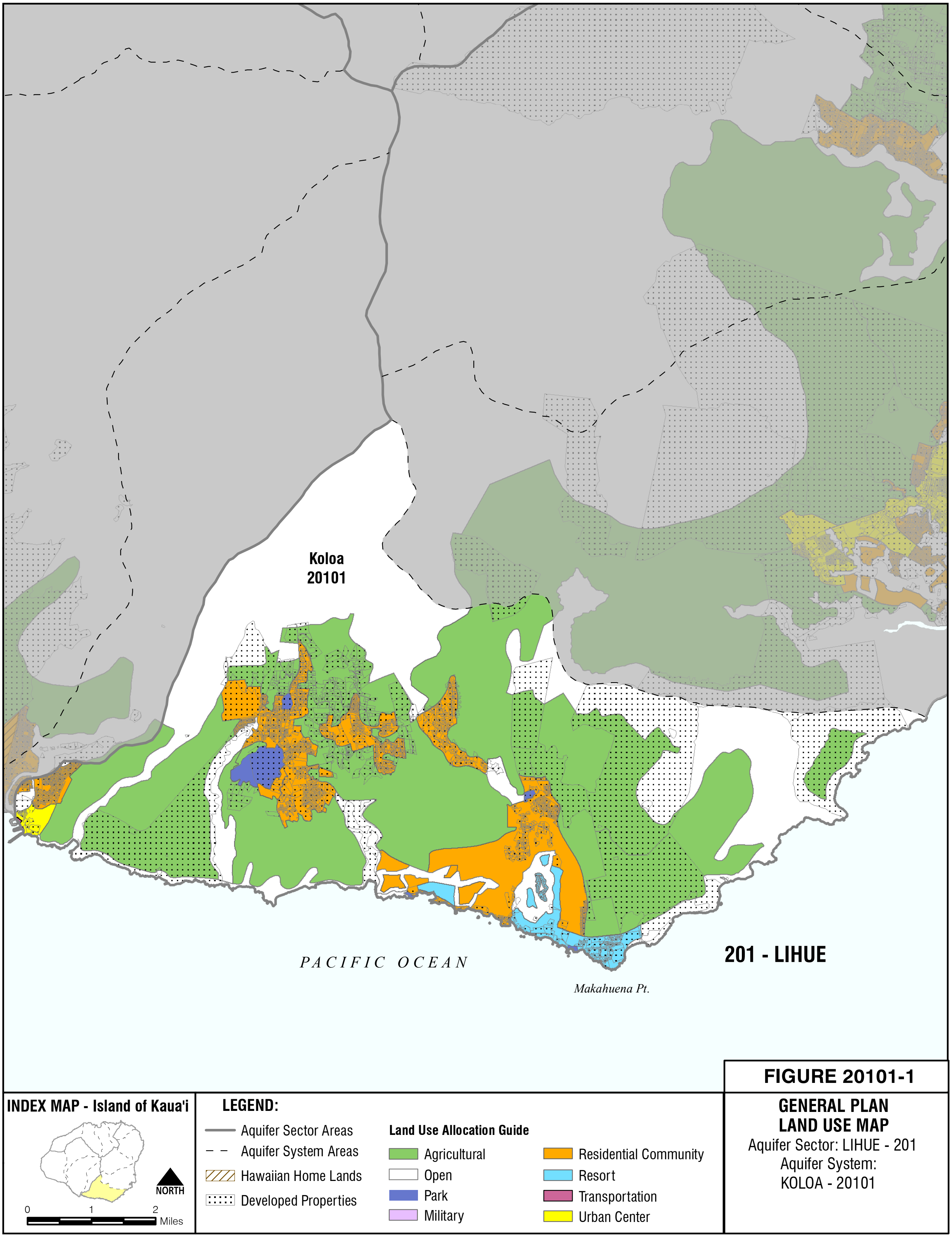


FIGURE 20101-1

GENERAL PLAN
LAND USE MAP
Aquifer Sector: LIHUE - 201
Aquifer System:
KOLOA - 20101

Fukunaga & Associates, Inc.
Consulting Engineers

Kaua'i County - Department of Water
KAUA'I WATER USE AND DEVELOPMENT PLAN UPDATE

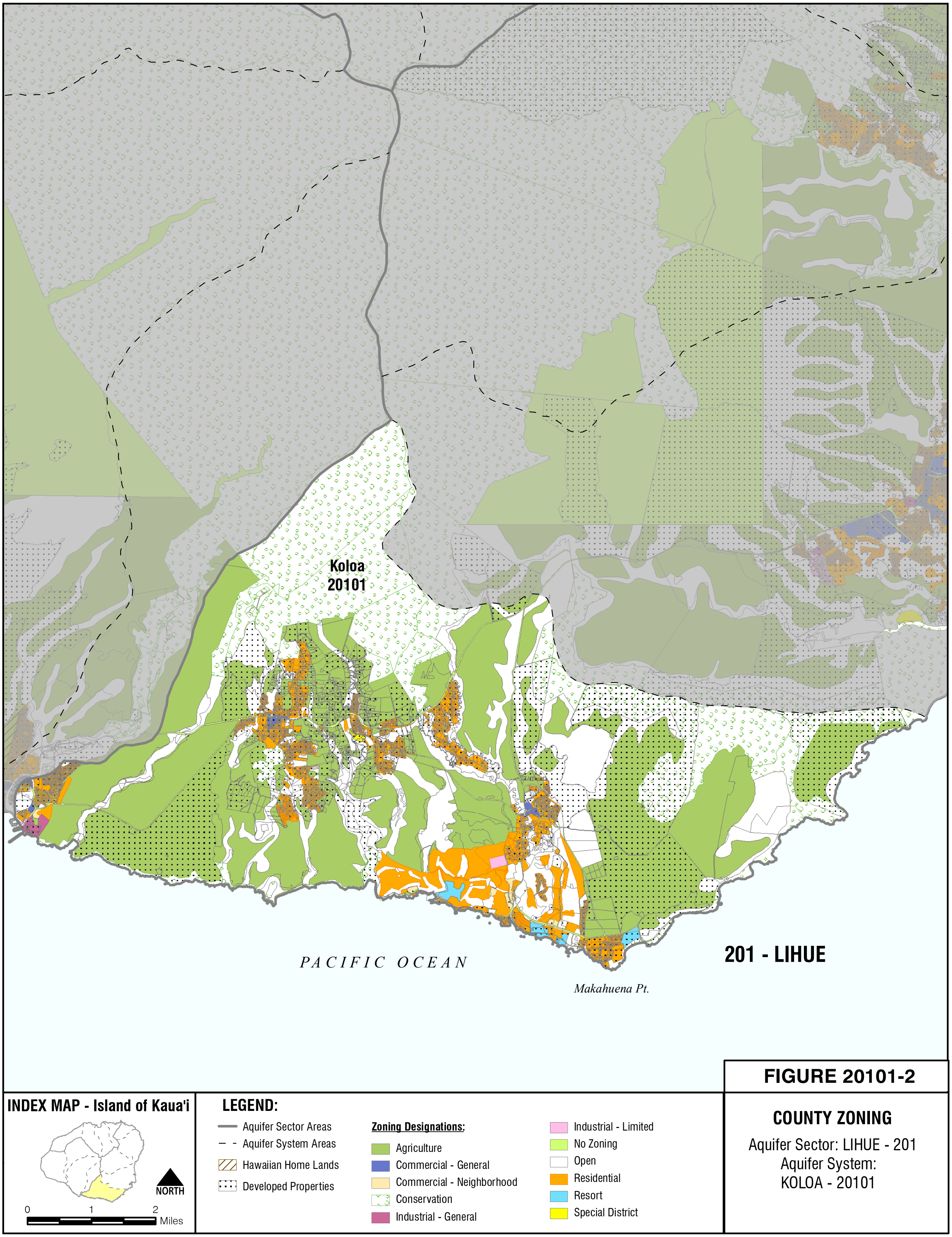


FIGURE 20101-2

COUNTY ZONING

Aquifer Sector: LIHUE - 201
Aquifer System:
KOLOA - 20101

20101-2 EXISTING WATER RESOURCES

20101-2.1 Ground Water

The Kōloa ASYA has a sustainable yield of 29 mgd. According to the 2014 CWRM database, there are 35 production wells in the system, 5 agriculture, 12 municipal, 3 domestic, 5 industrial, 9 irrigation, and 1 well with a user type of "other". There are also 10 drilled wells drilled and categorized as "unused". Refer to **Appendix A** for the 2014 database. **Figure 20101-3** shows the well locations.

20101-2.2 Surface Water

There are four streams classified as perennial within the Kōloa ASYA, all of which are considered continuous. The continuous streams are Kīpū Kai Stream, Waikomo Stream, Lāwaʻi Stream, and Wahiawa Stream. The USGS has one active surface water gage in the system area. The gage is located on Lāwaʻi Stream.

There are 21 non-potable reservoirs located within the Kōloa ASYA. The largest of these reservoirs are the Waitā and the Alexander Reservoirs. The Waitā Reservoir, located near Kōloa Town, along with other non-potable reservoirs in the area are fed by surface waters from perennial streams and diverted through man-made ditches. The non-potable water from these reservoirs, supplemented by approximately 0.47 mgd of recycled treated wastewater[1], are used for irrigation of landscaped areas and golf courses within the Kōloa ASYA. The Alexander Reservoir was created by damming the Wahiawa Stream above Kalāheo. The Alexander Reservoir provides hydroelectric power and irrigation water to Kauaʻi Coffee plantation.

In accordance with the Code, the CWRM must establish and administer instream flow standards (IFS) on a stream-by-stream basis as necessary to protect public interests. IFS is defined as "a quantity or flow of water or depth of water which is required to be present at a specific location in a stream system at certain specified times of the year to protect fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses." Considerably more research and study need to be completed to accumulate the data and perspective necessary to conduct a thorough and meaningful assessment of IFS. Until permanent IFS are established, interim IFS have been adopted. The interim IFS are defined as the amount of water flowing in each stream at the time the administrative rules governing them were adopted in 1988 and 1989. In order to assess surface water sustainability, this KWUDP assumes that no additional diversions will be allowed from any stream without amendment of the interim IFS.

The CWRM database lists 44 stream diversions in Kōloa ASYA, see **Table 20101-5** for listing and **Figure 20101-4** for locations. This accounts for about 15 percent of the 292 declared stream diversions on the island. The declared stream diversions are listed in **Appendix B**. The total declared flow for the Kōloa ASYA is 9.93 mgd. In addition, some existing irrigation systems have the capability to transfer surface water to adjacent ASYAs. 11.26 mgd of declared flow from

[1] Estimated recycled water in 2013. Reference: 2015 South Kauaʻi Community Plan

diversions in the Hanapēpē ASYA appear to be associated with irrigation lines that have service area in the Kōloa ASYA.

Table 20101-5: Kōloa ASYA Stream Diversions

Unit Code	Unit Name	Area (sq. mi.)	Demand[2] (mgd)	No. of Diversions	No. of Gages	Active Gages	Interim IFS
2048	Māhā'ulepū	13.43	0.000	6	0	0/0	HAR §13-169-45
2049	Waikomo	9.12	1.000	11	0	0/0	HAR §13-169-45
2050	Aepo	2.58	0.000	5	0	0/0	HAR §13-169-45
2051	Lāwa'i	9.73	1.739	11	2	0/0	HAR §13-169-45
2052	Kalāheo	6.56	0.000	9	0	0/0	HAR §13-169-45
2053	Wahiawa	7.34	7.175	1	0	0/0	HAR §13-169-45

Reference: 2019 WRPP

The Alexander Reservoir provides water to the Kaua'i Coffee Irrigation System. This system is owned by McBryde Sugar Company and operated/maintained by Kaua'i Coffee Company, both wholly owned subsidiaries of Alexander & Baldwin, LLC. The irrigation system was originally constructed to irrigate sugarcane fields in Hanapēpē through 'Ele'ele, Kalāheo, Lāwa'i, and into Kōloa. The system includes:

- Alexander Dam Ditch
- Pump 3 Ditch

The Waitā Reservoir is the largest fresh water body in the State. The reservoir is fed from the Waiahi-Ku'ia Aqueduct, Waiahi-'Ili'ili'ula Ditch, and Kōloa-Wilcox Ditch. This system was formerly owned by Kōloa Plantation and was developed to irrigate the leeward coastal plains in and around Kōloa, Po'ipū, and Lāwa'i. Little is known about the overall current condition of the system; however, the upstream portion of the existing system may have been partially abandoned. The downstream portion of the system still provides irrigation water to the Kōloa and Po'ipū areas. The Lāwa'i portion of the system is reportedly in good condition and being maintained.

20101-2.3 Water Conservation

Water conservation measures for this ASYA are as described in **Section 1.5.7** of this report. There are no ASYA specific special conservation measures in place at this time.

20101-2.4 Rainwater Catchment

Rainwater catchment is a viable resource for areas that are not served by ground water or surface water. **Figure 20101-5** shows the possible catchment areas, or parcels with a building value greater than $20,000 and assumed to be developed but without a ground water or surface water source.

[2] 1989 Declared Surface Water Use

20101-2.5 Recycled Water

There are 2 wastewater reclamation facilities in the Kōloa ASYA. **Table 20101-6** lists the wastewater facilities, recycled water classification, facility treatment capacity, current reuse amount, facility type, and current application. **Figure 20101-6** shows the facility locations.

Table 20101-6: Wastewater Reclamation Facilities – Kōloa ASYA

WWRF/ WWTP	Recycled Water Classification	Design Capacity (mgd)	Quantity Produced (mgd)	Current Reuse Amount (mgd)	Owner	Irrigation Application
Grand Hyatt WWRF	R-2	0.25	N/R	0.11	Private	Poʻipū Bay Resort Golf Course
Poʻipū WRF	R-1	0.8	N/R	0.30	Private	Kiahuna Golf Course, Kōloa Landing (landscape irrigation)

N/R: Not reported

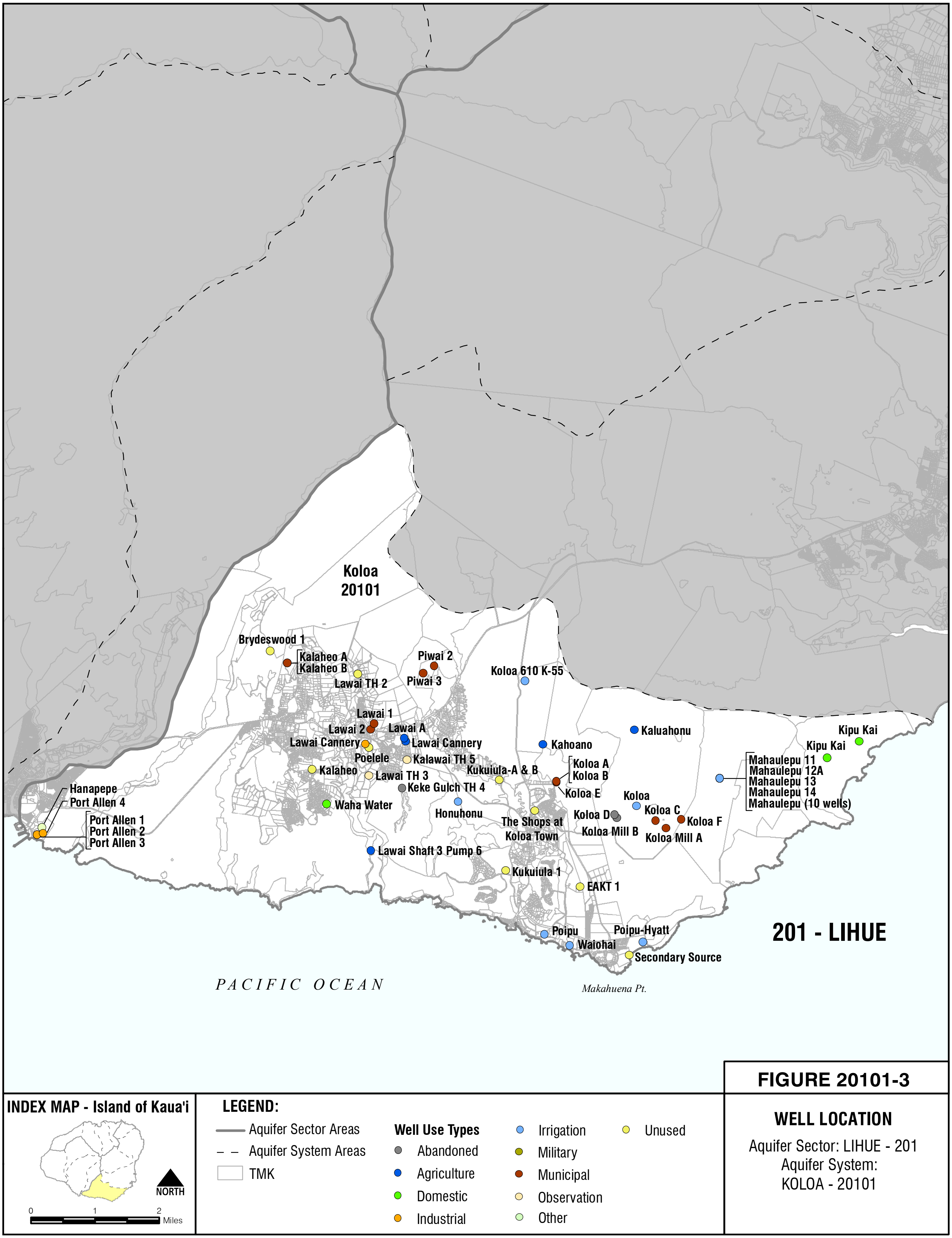


FIGURE 20101-3

WELL LOCATION

Aquifer Sector: LIHUE - 201
Aquifer System:
KOLOA - 20101

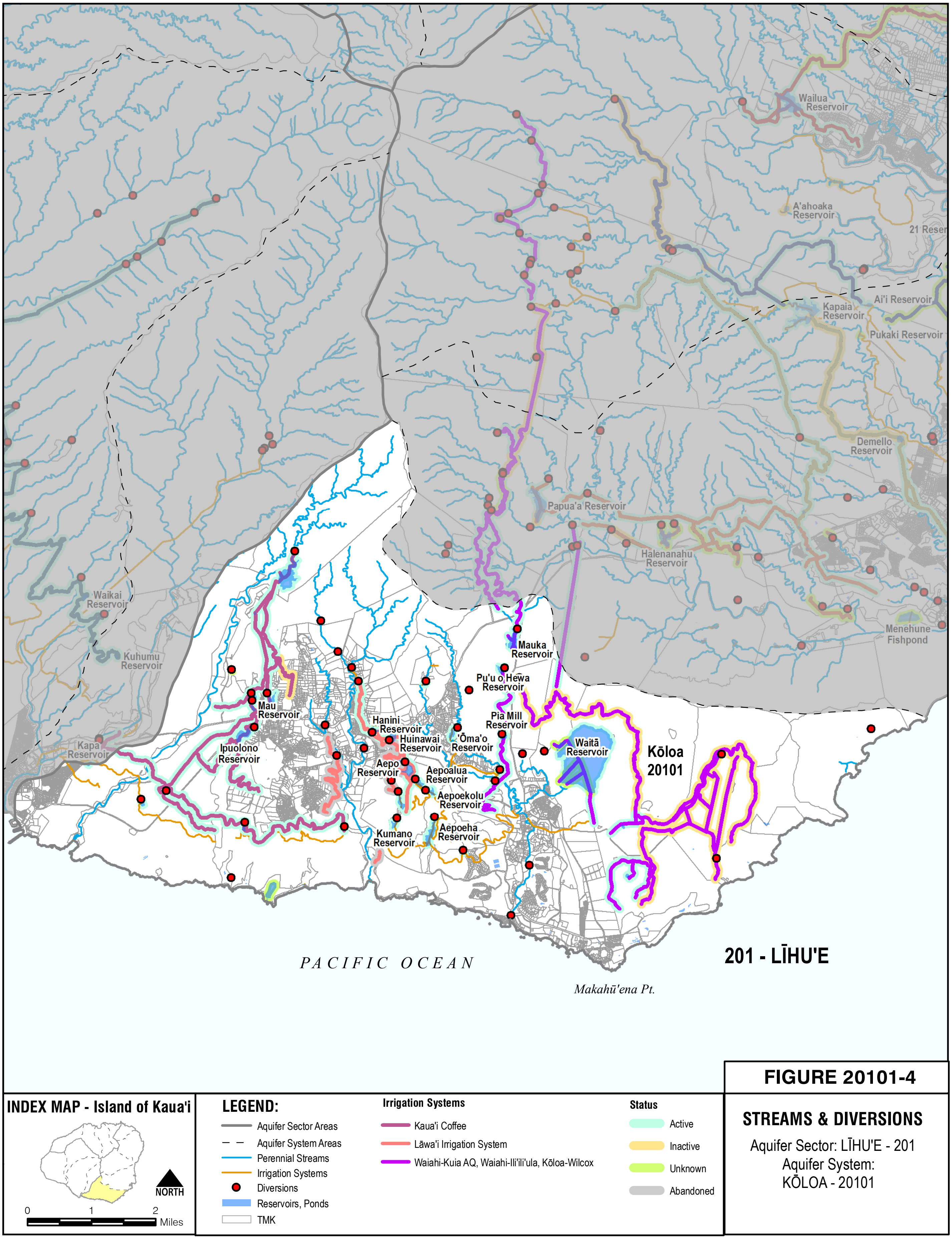


FIGURE 20101-4

STREAMS & DIVERSIONS

Aquifer Sector: LĪHU'E - 201
Aquifer System:
KŌLOA - 20101

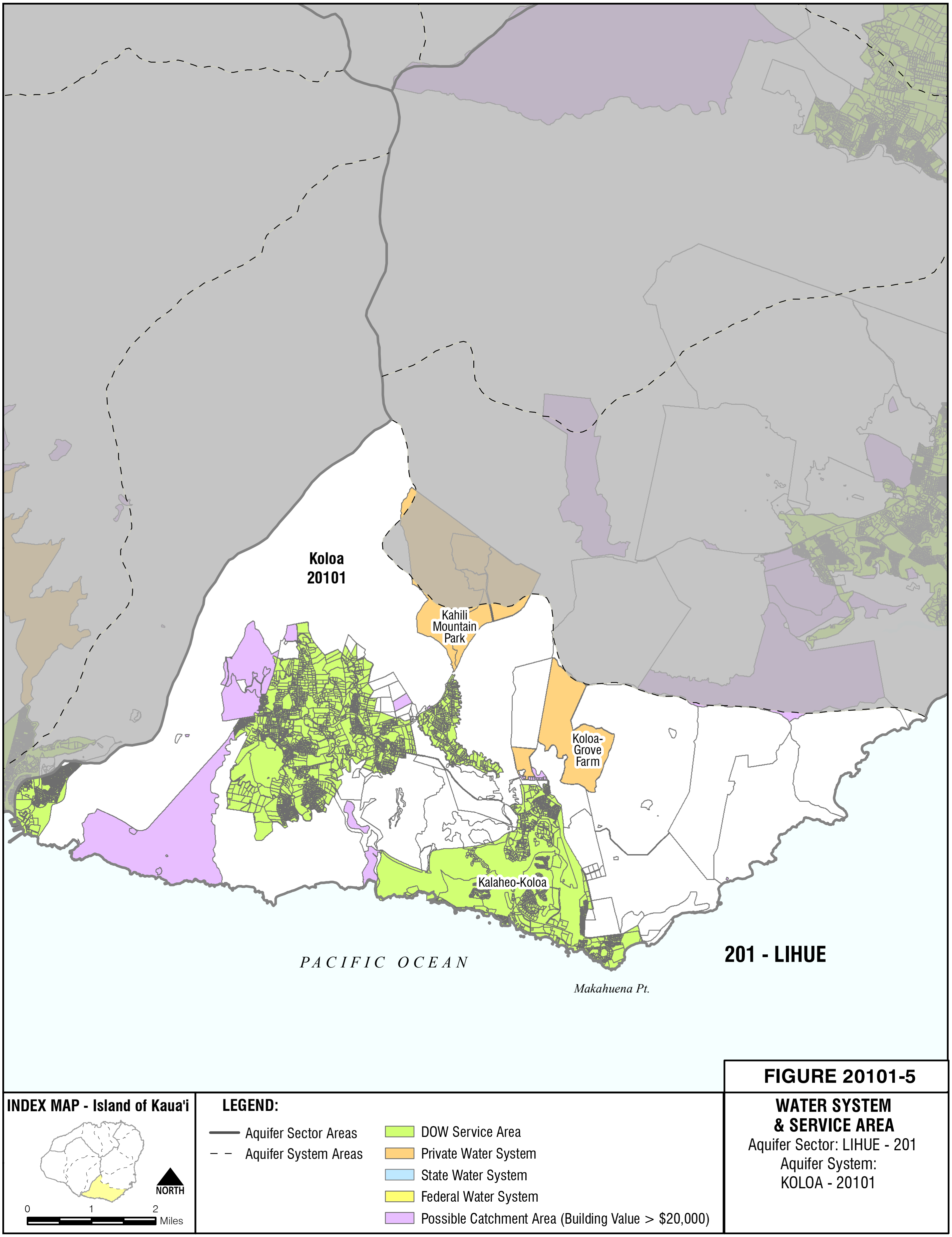


FIGURE 20101-5

WATER SYSTEM & SERVICE AREA

Aquifer Sector: LIHUE - 201
Aquifer System:
KOLOA - 20101

Fukunaga & Associates, Inc.
Consulting Engineers

Kaua'i County - Department of Water

KAUA'I WATER USE AND DEVELOPMENT PLAN UPDATE

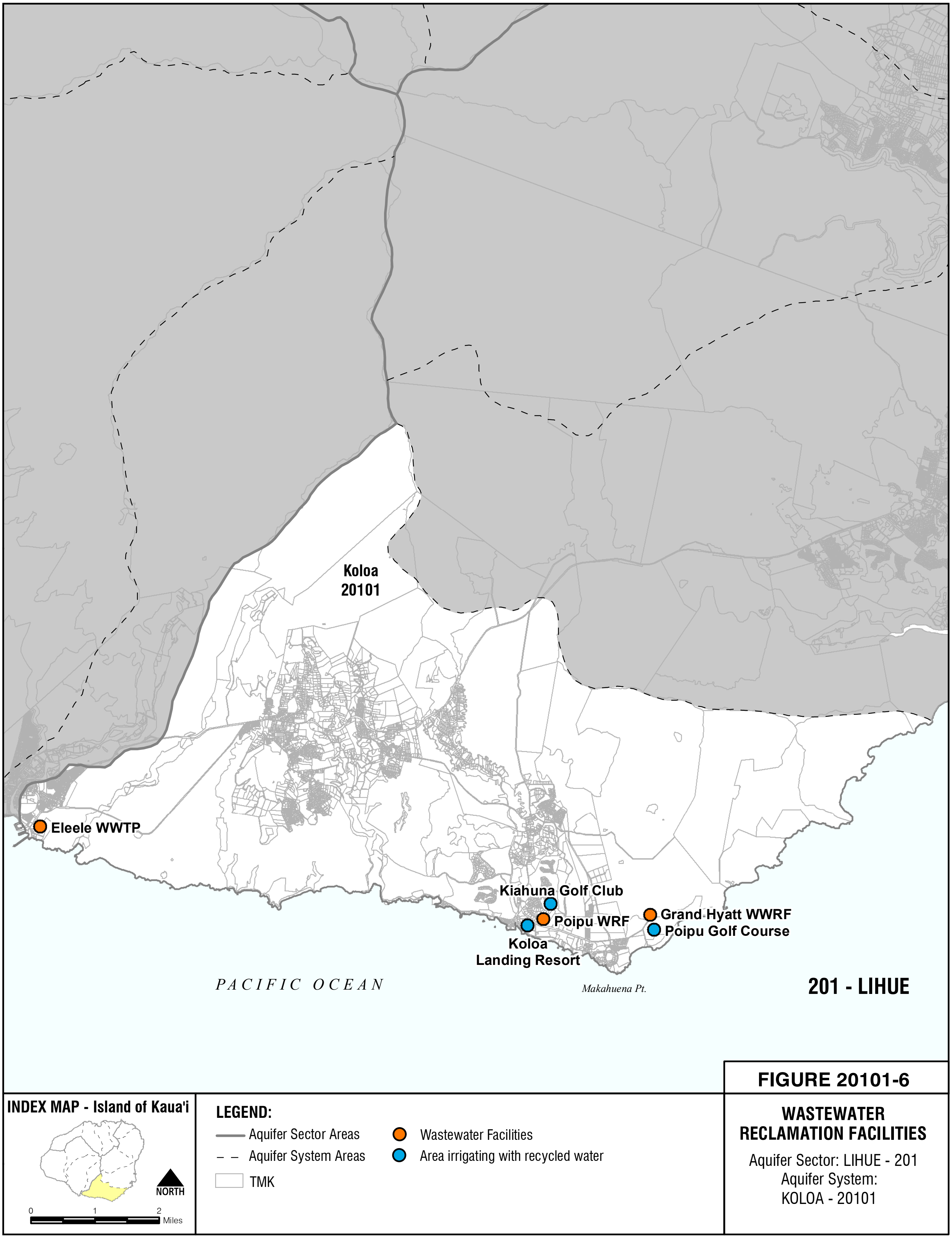


FIGURE 20101-6

WASTEWATER RECLAMATION FACILITIES

Aquifer Sector: LIHUE - 201
Aquifer System:
KOLOA - 20101

20101-3 EXISTING WATER USE

20101-3.1 General

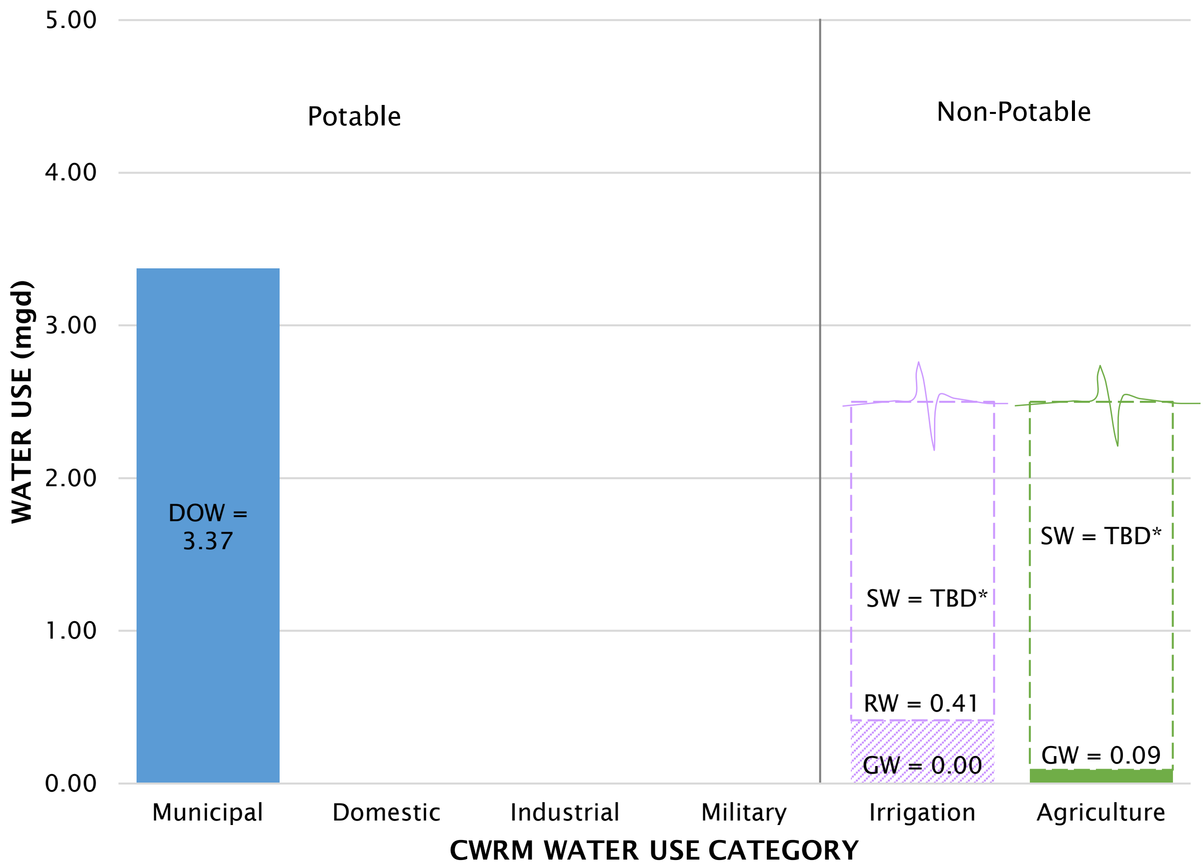
The following section presents the total estimated average water use within the Kōloa ASYA. The total estimated average water use was based on data from CWRM (well pumpage) and DOH (Sanitary Surveys for Public Water Systems and estimated recycled water usage) for the year of 2014. Well classification changes since 2014 are noted in the following sub-sections. **Table 20101-7** and **Figure 20101-7** summarizes water use by CWRM water use categories.

Table 20101-7: Existing Water Use by Category – Kōloa ASYA

CWRM Category	Ground Water (mgd)	Other Sources (mgd)	Total (mgd)	Percent of Total
Domestic	0.00		0.00	0.0
Industrial	0.00		0.00	0.0
Irrigation	0.004	0.41[1]	0.41	10.6
Agriculture	0.09	TBD[2]	0.09	2.3
Military			0.00	0.0
Municipal				
DOW System	3.37		3.37	87.1
Private-Public WS	0.00		0.00	0.0
TOTAL	**3.46**	**0.41**	**3.87**	**100.0**

[1] Recycled Water
[2] Surface Water – TBD from AWUDP

Figure 20101-7: Existing Water Use by Category – Kōloa ASYA



*Values to be determined by other components of the Hawai'i Water Plan

20101-3.2 Domestic Use

There are three wells classified as "Domestic" in the CWRM database. One is owned by Twin Pines Farm and two are owned by J. Waterhouse. All three wells have not reported pumpage.

20101-3.3 Industrial Use

There are five wells classified as "Industrial" in the CWRM database, with four further classified as INDEL - geothermal or thermoelectric cooling industrial. The four INDEL wells are owned by Citizens Utilities Co. and the fifth industrial well is owned by McBryde Sugar Company. All five wells have not reported pumpage. The well owned by McBryde Sugar Company has been removed from the CWRM well database as of 2017.

There are two hydropower plants in the Kōloa ASYA: the Kalāheo Hydropower plant and the Green Energy Hydropower plant.

The Kalāheo Hydropower plant was built in 1928 by McBryde Sugar Company when the Alexander Dam and Reservoir were built. This was the second hydropower plant for McBryde Sugar Company (the first hydropower plant was the Wainiha Power Plant, and will be discussed in **Section 20203** of this report). The Kalāheo Hydropower Plant has the capacity to generate 1 megawatt of power from the Wahiawa Stream diverted into the Alexander Dam. The electricity generated from this facility powers the Kaua'i Coffee factory, visitor center, and offices in Numila. Excess energy is sold to the Kaua'i Island Utility Cooperative (KIUC).

The Green Energy Hydropower plant was built in 2010 by Green Energy Hydro, LLC, Hawaiian Mahogany, Inc., and Pacific Hydro. This plant provides power to 75 nearby homes and the Hawaiian Mahogany mill. A 40 MG reservoir located approximately one mile north of Kōloa Town provides water to this facility. Excess energy is sold to the KIUC.

20101-3.4 Irrigation Use

Water for irrigation use is divided into ground water, recycled water, and surface water.

20101-3.4.1 Ground Water

There are nine wells classified as "Irrigation" in the CWRM database. Under the nine listed "Irrigation" wells, three wells are further classified as IRRHOT (hotel irrigation) and one well further classified as IRROTH ("other" irrigation).

Five of the "Irrigation" wells are owned by McBryde Sugar Co., Ltd with none reporting pumpage. Based on information from to the 2017 CWRM Well Database, all five of the McBryde-owned wells have either been re-classified under a different owner or has changed ownership (but is still listed under the "irrigation" well use classification). Three of these wells are now owned by Hawai'i Dairy Farm, LLC and are listed under the well use classification of AGRLI (Livestock, Processing, and Pasture Agriculture). The remaining two wells are now owned by Grove Farm Company and Po'ipū Ranch.

The three IRRHOT wells are owned by Hyatt Regency, Kiahuna Plantation, and Marriott Ownership Resorts, Inc. The well owned by Hyatt Regency has a reported pumpage of 0.004 mgd. The other two other IRRHOT wells do not have any reported pumpage. The IRROTH well is owned by Honuhonu Ranch and does not have any reported pumpage.

20101-3.4.2 Recycled Water

There are two golf courses in the Kōloa ASYA that are irrigated with recycled water. The Po'ipū Bay Resort Golf Course receives R-2 water from the Grand Hyatt WWRF and the Kiahuna Golf Club receives R-1 water from the Po'ipū WRF. The Po'ipū WRF also provides landscape irrigation to the Kōloa Landing Resort.

20101-3.4.3 Surface Water

Information on surface water use for irrigation is to be determined by the AWUDP. However, due to where parks and other landscaped areas are typically located within communities, it is assumed that it is unlikely that surface water will be used to irrigate these areas.

20101-3.5 Agricultural Use

Agricultural use has been divided into ground water, recycled water, and surface water.

20101-3.5.1 Ground Water

There are five wells classified as "Agriculture" in the CWRM database, with three wells further classified as AGRCP (crops and processing agriculture) and one well further classified as AGRON (ornamental and nursery plant agriculture). Two of the wells are owned by McBryde Sugar Co., Ltd. One is classified as "agriculture," and one well classified as AGRCP. Neither well has reported pumpage. The remaining two AGRCP wells are owned by Grove Farm Company, Inc., and has no reported pumpage. The AGRON classified well is owned by National Tropical Botanical Garden with reported pumpage of 0.09 mgd.

As mentioned in the **Section 20101-3.4.1**, three of the McBryde Sugar Co. wells that were formerly classified as "Irrigation" are now under the ownership of Hawaiʻi Dairy Farm, LLC is now listed under the classification of AGRLI. These wells have not reported any pumpage.

20101-3.5.2 Recycled Water

There are no agriculture demands served by recycled water in the Kōloa ASYA.

20101-3.5.3 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP.

The Kauaʻi Coffee Irrigation System currently delivers surface water to agricultural lands in the Kōloa ASYA. The long term average water delivery of the irrigation system was estimated at approximately 27 mgd. The service area of the irrigation system includes approximately 3,773 acres of Important Agricultural Lands (IAL), owned by Alexander & Baldwin, LLC. The majority of the area designated as IAL is used for coffee cultivation, and a smaller portion of the area designated as IAL is used for seed corn cultivation, pasture, and other crops (rice, taro).[3]

The Waiahi-Kuʻia Aqueduct and the Kōloa-Wilcox Ditch System serve agricultural lands in the Kōloa ASYA. The service area of the system includes approximately 1,553 acres of IAL, owned by Māhāʻulepū Farm, LLC. The current water use for the IAL is approximately 2.4 mgd for the cultivation of taro, seed corn, forage crops as well as for cattle ranching[4].

20101-3.6 Military Use

There is no military use in the Kōloa ASYA.

[3] DR08-37 Alexander and Baldwin, Inc., Findings of Fact, Conclusions of Law, Decision and Order, dated March 2009
[4] DR11-43 Māhāʻulepū Farm, LLC, Findings of Fact, Conclusion of Law, Decision and Order, dated May 2011

20101-3.7 Municipal Use

There are 12 wells in the CWRM database classified as "Municipal" (MUNCO – Municipal County). Municipal can be subcategorized into the other water use categories: Domestic, Industrial, Agricultural, Military, and Municipal.

20101-3.7.1 County Water Systems

Kalāheo-Kōloa Water System

The DOW has one major water system that within the Kōloa ASYA: the Kalāheo-Kōloa Water System is DOH Public Water System (PWS) No. 434. This DOW system includes 4,799 service connections to 15,108 people. This system was created after the 2009 merger of the former Kalāheo Water System (PWS 434), Kōloa-Po'ipū Water System (PWS 408), and Lāwa'i-'Ōmao Water System (PWS 409). All three systems were already inter-connected.

The Kalāheo-Kōloa Water System provides service to the towns of Kalāheo, Kōloa, Po'ipū, Lāwa'i, and 'Ōmao. Water for this water system is supplied by 12 wells (one of which is currently inactive). **Table 20101-8** lists the water sources, well number, pumping capacity, pressure zone, and pumpage amount.

Table 20101-8: DOW Kalāheo-Kōloa Water System Water Sources

WELL NAME	WELL NUMBER	PUMPING CAPACITY (gpm)	PRESSURE ZONE (ft)	PUMPAGE (mgd)
Kōloa Well 16-A	2-5427-001	600	366	0.57
Kōloa Well 16-B	2-5427-002	560	366	0.00
Kōloa Well E	2-5427-003	700	366	0.47
Kōloa Well C	2-5426-004	1200	245	0.34
Kōloa Well D	2-5426-005	1200	245	0.51
Kōloa Well F	2-5425-015	1200	245	0.32
Kalāheo Deepwell A	2-5631-001	1000	1112	0.04
Kalāheo Deepwell B	2-5631-002	1000	1112	0.41
Lāwa'i Well 1	2-5530-003	425	677	0.09
Lāwa'i Well 2	2-5530-004	550	677	0.12
Piwai Well 2	2-5629-001	1050	677	0.36
Piwai Well 3	2-5629-002	1050	677	0.14

Within the Kalāheo-Kōloa Water System, there are eight primary pressure zones (at elevations 245 feet, 366 feet, 677 feet, 825 feet, 886 feet, 1112 feet, 1222 feet, and 1290 feet) and 14 storage tanks.

The Hanapēpē-'Ele'ele Water System (PWS 404) crosses over from the Hanapēpē AYSA into the Kōloa ASYA. It is noted however, that based on the configuration of this system, the majority of the Hanapēpē-ʻEleʻele Water system supplies areas within the Hanapēpē ASYA. As such, the Hanapēpē-ʻEleʻele Water system will therefore be discussed under the Hanapēpē ASYA in **Section 20304** of this report.

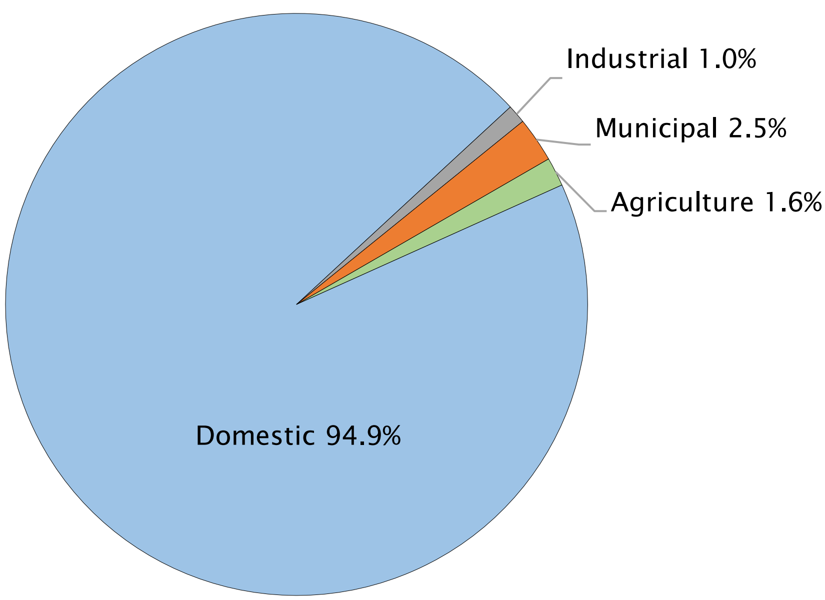
DOW Water Use by Category

DOW water use has been subcategorized to the extent possible based on available meter data and summarized in **Table 20101-9** and is also shown graphically in **Figure 20101-8**.

Table 20101-9: DOW Existing Water Use by Category – Kōloa ASYA

CWRM Water Use Category	DOW Metered Water Use (mgd)	Percent of Total
Agricultural	0.053	1.6
Domestic	3.105	94.9
Industrial	0.034	1.0
Military	0.000	0.0
Municipal	0.082	2.5
Total	**3.273**	**100.0**

Figure 20101-8: DOW Existing Water Use by Category – Kōloa ASYA



20101-3.7.2 State Water Systems

There are no DOH regulated State water systems located within the Kōloa ASYA.

20101-3.7.3 Federal Water Systems

There are no DOH regulated Federal water systems located within the Kōloa ASYA.

20101-3.7.4 Private-Public Water Systems

The Knudsen Trust's Kōloa Water System (PWS 421) is the only DOH regulated privately owned public water system located within the Kōloa ASYA. This Knudsen Trust water system includes 21 service connections which provides 0.02 mgd of water to 40 people. The sole water source feeding this system is from Kāhili Tunnel No. 1. When water is diverted into the Kāhili Mountain Park tank, flow into the Kōloa system stops entirely.

20101-3.7.5 Per Capita Use

The per capita existing water use consumption based on domestic DOW metered water use and private-public water system use is presented in **Table 20101-10**. The per capita use in the Kōloa ASYA is approximately 20.2% higher than the overall County of Kauaʻi per capita use.

Table 20101-10: Per Capita Use – Kōloa ASYA

	DOW Metered Water Use – Domestic (mgd)	Private-Public Water System (mgd)	90% of 2015 Population	Per Capita Use (gpd)
Kōloa ASYA	3.105	0	13,319	233
County of Kauaʻi	**9.360**	**2.951**	**63,462**	**194**

20101-3.8 Existing Water Use by Resource

20101-3.8.1 Ground Water

Table 20101-11 summarizes the current production, sustainable yield (SY), and percentage of SY for the current production. Current production is represented by the 2014 average yield calculated from the actual pumping data.

Table 20101-11: Pumpage – Kōloa ASYA

Pumpage (mgd)	SY (mgd)	Pumpage Portion of SY
3.46	29	11.9%

Based on available information from the CWRM database, the current ground water use is 11.9 percent of the sustainable yield.

20101-3.8.2 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP. However, some limited information is available in the AWUDP dated 2003 (revised 2004) and in IAL designation documents.

According to the AWUDP dated 2003 (revised 2004) and an IAL designation document, the Kaua'i Coffee Irrigation System delivers approximately 27 mgd to agricultural lands, including approximately 3,773 acres of IAL. The Waiahi-Ku'ia Aqueduct and the Kōloa-Wilcox Ditch System also serve agricultural lands in the Kōloa ASYA. The service area of the system includes approximately 1,553 acres of IAL, owned by Māhā'ulepū Farm, LLC, and current water use for the IAL is approximately 2.4 mgd.

20101-3.8.3 Water Conservation

Water conservation, including water loss management, may reduce water use. See **Section 20101-2.3** for discussion of existing conservation efforts.

20101-3.8.4 Rainwater Catchment

Developed parcels that are not supplied by ground water or surface water are assumed to be supplied by rainwater catchment.

20101-3.8.5 Recycled Water

Recycled water from the two wastewater treatment facilities are used for golf course and landscape irrigation. Refer to **Table 20101-6** presented earlier for recycled water summary.

20101-4 FUTURE WATER USE

20101-4.1 Full Build-Out Water Demand Projections

The full build-out water demand projections based on the General Plan and County Zoning for the Kōloa ASYA is listed in **Table 20101-12a** and **20101-13**, respectively. Each land use class is associated with the most appropriate CWRM water use category.

Table 20101-12a: General Plan Full Build-Out Water Demand Projection – Kōloa ASYA

General Plan Category	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	1.42
Open	Domestic	0.14
Military	Military	0.00
Park	Irrigation	1.11
Residential	Domestic/Municipal	10.37
Resort	Domestic/Irrigation/Municipal	5.72
Transportation	Municipal	0.00
Urban Center	Domestic/Industrial/Municipal	0.62
DHHL	Domestic	0.00
	TOTAL	**19.37**

The General Plan was further refined by replacing the portion of the General Plan that coincides with the South Kaua'i Community Plan and its associated demand with the South Kaua'i Community Plan and its associated demand as shown in **Figure 20101-9**. **Table 20101-12b** is the full build-out water demand projection based on the South Kaua'i Community Plan.

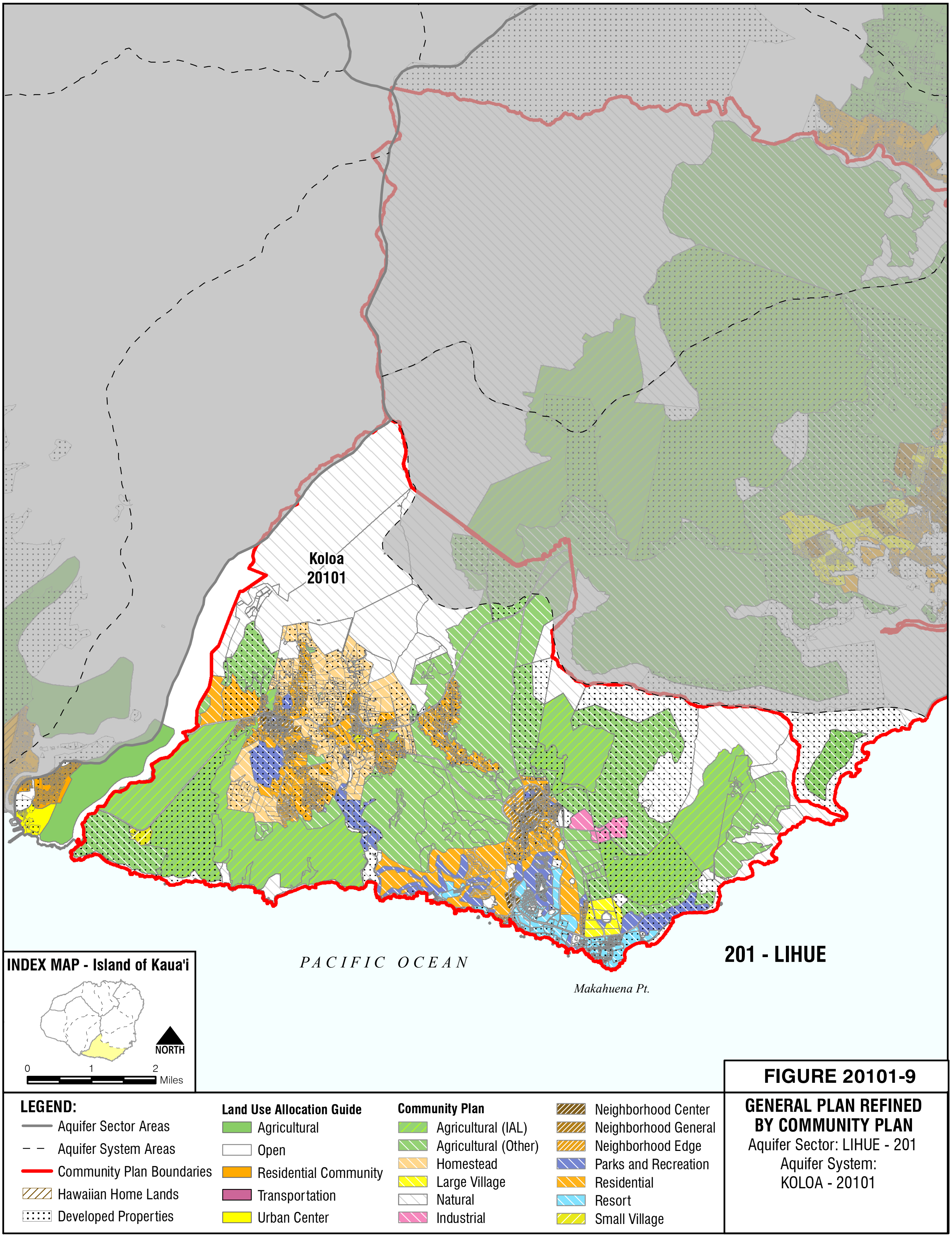


FIGURE 20101-9

GENERAL PLAN REFINED BY COMMUNITY PLAN

Aquifer Sector: LIHUE - 201

Aquifer System: KOLOA - 20101

Table 20101-12b: South Kaua'i Community Plan Full Build-Out Water Demand Projection – Kōloa ASYA

Community Plan Category	CWRM Category	Water Demand (mgd)
Agricultural (Others)	Agriculture/Domestic	0.00
Industrial	Industrial	0.64
Neighborhood Center	Municipal/Residential	0.21
Neighborhood General	Municipal	0.55
Neighborhood Edge	Domestic	0.30
Small Village	Municipal	0.19
Large Village	Municipal/Residential	0.52
Open	Domestic	0.00
Military	Military	0.00
Parks & Recreation	Irrigation	4.07
Residential	Domestic/Municipal	8.42
Resort	Domestic/Irrigation/Municipal	1.76
DHHL	Irrigation/Municipal	0.00
	TOTAL	**16.66**

The full build-out water demand projection for the General Plan refined by the South Kaua'i Community Plan is 19.32 mgd. See calculation below:

(1) General Plan full build-out water demand projection = 19.37 mgd

(2) Portion of General Plan full build-out water demand projection that coincides with the South Kaua'i Community Plan = 16.71 mgd

(3) South Kaua'i Community Plan full build-out water demand projection = 16.66 mgd

Refined General Plan full build-out water demand projection = (1) – (2) + (3)
= 19.37 – 16.71 + 16.66
= **19.32 mgd**

Estimated full build-out projected water demands for the Kōloa ASYA are summarized by zoning class in **Table 20101-13**.

Table 20101-13: Zoning Full Build-Out Water Demand Projection – Kōloa ASYA

Zoning Class	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	1.42
Commercial	Municipal	0.59
Industrial	Industrial/Municipal	0.34
Open	Domestic	0.14
Project Development	Domestic/Municipal	0.01
Residential	Domestic/Municipal	6.74
Resort	Domestic/Irrigation/Municipal	1.18
DHHL	Domestic	0.00
	TOTAL	**10.42**

20101-4.1.1 Refined Land Use Based Water Projection

State Water Projects Plan

Table 20101-14 lists future State water projects reported in the 2021 SWPP update. The total projected demand to the year 2034 for these 3 State water projects within the Kōloa ASYA is 0.071 mgd, 0.063 mgd using potable and 0.008 mgd non-potable using potable sources.

Table 20101-14: Future State Water Projects – Kōloa ASYA

Project Name	State of Hawai'i Department	Primary Use	Water Development Strategy	2034 Demand (mgd)
Kōloa Elementary School New 6 Classroom	DOE	Potable	REMAIN	0.0036
		Non-potable using Potable	REMAIN	0.0075
Kōloa II Elementary School	DOE	Potable	REMAIN	0.0600
			TOTAL REMAIN	0.0710
			TOTAL KŌLOA ASYA SWPP 2034 DEMAND	0.0710

As mentioned in **Section 2.2.2.5.1**, State water projects with the water development strategy of REMAIN are located within the service areas of County water systems which need to be coordinated with the respective County water departments. All 3 of the State water projects within the Kōloa ASYA were assigned the REMAIN water development strategy and results in a total 2034 demand of 0.0710 mgd. This accounts for 0.24 percent of the 29 mgd sustainable yield.

State Department of Hawaiian Home Lands

There are no DHHL tracts located within the Kōloa ASYA.

Agricultural Water Use and Development Plan

The AWUDP dated 2003 (revised 2004) was limited in scope. More recent, comprehensive information on agricultural lands is available in the County of Kauaʻi Important Agricultural Lands Study.

In 2019, a public review draft of the AWUDP was released and it is anticipated that the next phase of the AWUDP will provide agricultural water demand projections in greater detail and will supersede information in the KWUDP when it becomes available.

County of Kauaʻi Important Agricultural Lands Study

10,264 acres of agricultural lands within the Kōloa ASYA received a score of 28 or better in the County of Kauaʻi Important Agricultural Lands (IAL) Study. Lands that receive a score of 28 or better were determined to have met all eight IAL criteria to some degree. Only a subset of lands with a score of 28 or better is expected to be designated as IAL. **Table 20101-15** compares these lands that received a score of 28 or better to the declared surface water use from diversions and to the diversified water use rate of 3,400 gallons per acre per day (gpad) estimated in the 2004 AWUDP.

Table 20101-15: Irrigation of Agricultural Lands

(1) Declared Surface Water Use from Diversions (mgd)	21.19
(2) Agricultural Lands with a Score ≥ 28 (Acres)	10,264
- How many acres can be sustained by **(1)** at a water rate of 3,400 gpad? (Acres)	6,232
- What percent of **(2)** can be sustained with a water rate of 3,400 gpad?	61%
- If all of **(2)** were to be irrigated, what is the water unit rate? (gpad)	2,065

Over 5,400 acres of agricultural lands have been designated as IAL in the Kōloa ASYA.

20101-4.1.2 Water Use Unit Rates

Water use unit rates are based on the *Water System Standards* (WSS), as discussed in Chapter 2.

The General Plan provides only broad density guidelines for residential and resort designations. For these designations, under the assumption that most residents would like their communities, including the development density, to remain similar in the future, the average number of dwelling units as allowed by zoning was used as the density (i.e., 5.40 dwelling units per acre for residential designation and 13.72 dwelling units per acre for resort designation).

20101-4.2 Water Demand Projections to the Year 2035

The following section presents water demand projections to the year 2035 for the Kōloa ASYA. The projected low, medium, and high growth rates are listed in **Table 20101-16** and are graphed in

Figure 20101-10. Potable (domestic, industrial, municipal, and military water uses) and non-potable (irrigation) water demands are also differentiated. As mentioned in Chapter 2, agriculture and irrigation water demands are not included in the population and growth rate projections.

Table 20101-16: Water Demand Projections – Kōloa ASYA

Water Use Category	Water Demand by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
GROWTH RATE C (HIGH)									
TOTAL	**3.78**	**3.84**	**3.90**	**3.96**	**4.02**	**4.08**	**4.37**	**4.67**	**4.99**
Potable	3.37	3.42	3.47	3.52	3.57	3.62	3.88	4.15	4.43
Non-Potable	0.41	0.42	0.43	0.44	0.45	0.46	0.49	0.52	0.56
GROWTH RATE B (MEDIUM)									
TOTAL	**3.78**	**3.84**	**3.90**	**3.96**	**4.02**	**4.08**	**4.36**	**4.65**	**4.95**
Potable	3.37	3.42	3.47	3.52	3.57	3.62	3.87	4.13	4.40
Non-Potable	0.41	0.42	0.43	0.44	0.45	0.46	0.49	0.52	0.55
GROWTH RATE A (LOW)									
TOTAL	**3.78**	**3.82**	**3.86**	**3.90**	**3.94**	**3.98**	**4.19**	**4.41**	**4.63**
Potable	3.37	3.41	3.45	3.49	3.53	3.57	3.76	3.96	4.16
Non-Potable	0.41	0.41	0.41	0.41	0.41	0.41	0.43	0.45	0.47

Figure 20101-10: Water Demand Projection Summary – Kōloa ASYA

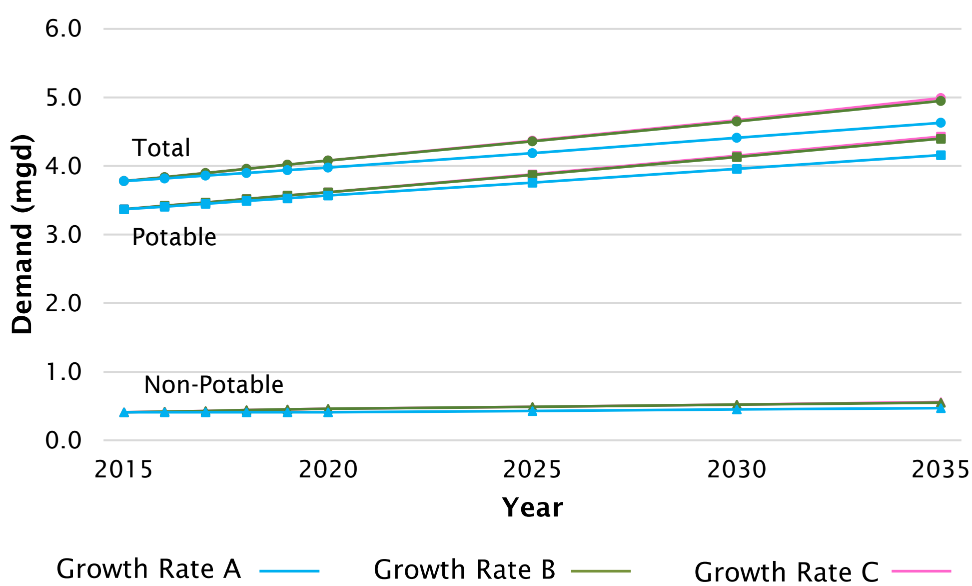


Figure 20101-11 shows the breakdown of water demand projections for a medium growth rate by CWRM categories through the year 2035. **Table 20101-17** summarizes this figure.

Figure 20101-11: Medium Growth Rate B Water Demand Projection by Category – Kōloa ASYA

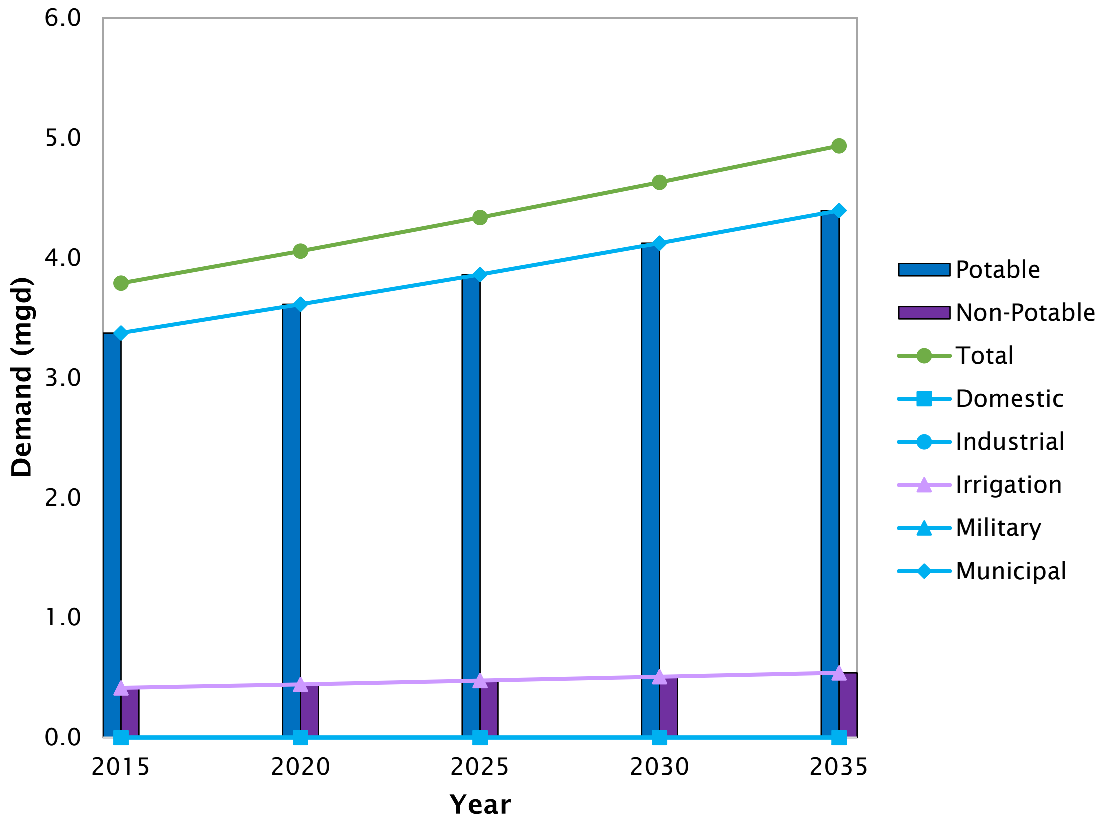


Table 20101-17: Medium Growth Rate B Water Demand Projection by Category – Kōloa ASYA

Water Use Category	Water Use by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
Total	**3.78**	**3.84**	**3.90**	**3.96**	**4.02**	**4.08**	**4.36**	**4.65**	**4.95**
Potable	3.37	3.42	3.47	3.52	3.57	3.62	3.87	4.13	4.40
Non-Potable	0.41	0.42	0.43	0.44	0.45	0.46	0.49	0.52	0.55
Domestic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Irrigation	0.41	0.42	0.43	0.44	0.45	0.46	0.49	0.52	0.55
Military	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Municipal	3.39	3.44	3.49	3.54	3.59	3.64	3.89	4.15	4.42
DOW	3.37	3.42	3.47	3.52	3.57	3.63	3.87	4.13	4.40

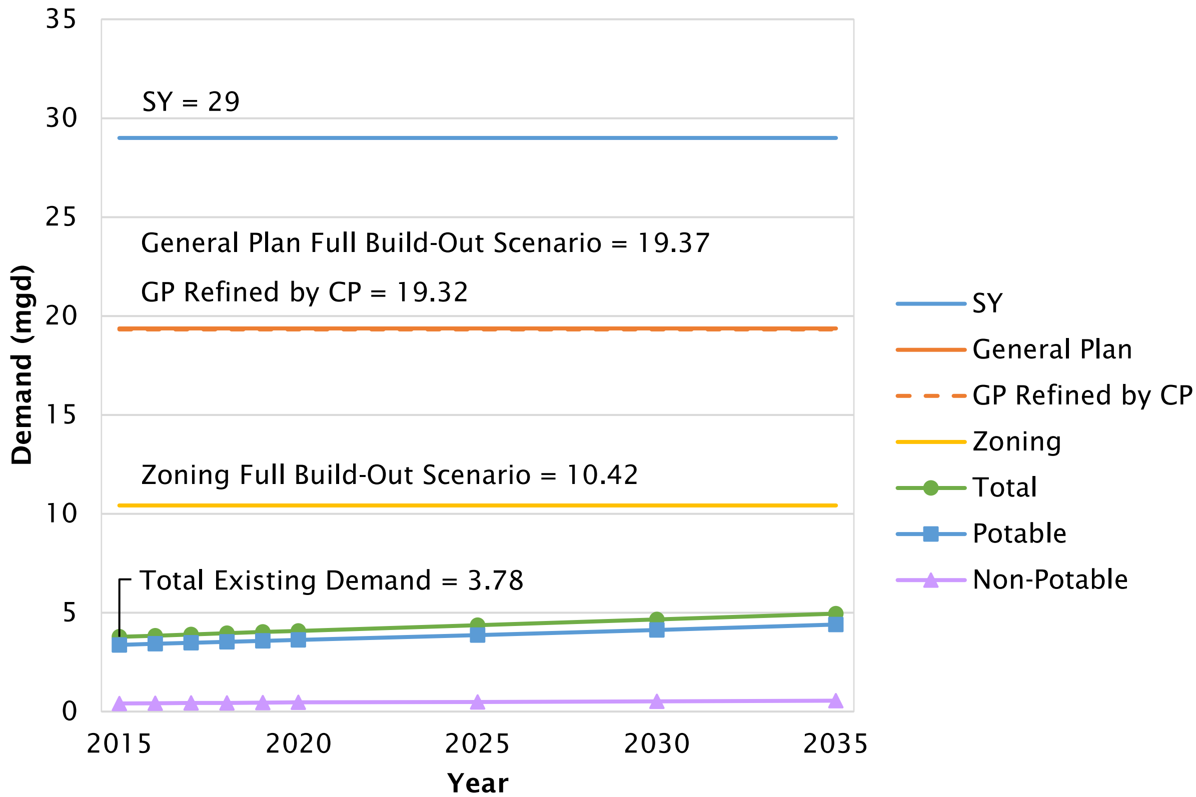
20101-4.3 Summary

Figure 20101-12 illustrates the magnitude of the sustainable yield, both General Plan and Zoning full build-out (FBO) water use projections, and water use projection through the year 2035 focusing on Medium Growth Rate B. **Table 20101-18** summarizes the General Plan (GP), Zoning, and 20-year water demand projection scenarios for the Kōloa ASYA. The sustainable yield is presented to draw comparisons. All demands are in mgd.

Table 20101-18: Summary of Demand Projections

SY (mgd)	FBO (mgd)		Medium Growth Rate Demand by Year (mgd)								
	GP	Zoning	2015	2016	2017	2018	2019	2020	2025	2030	2035
29	19.37	10.42	3.78	3.84	3.90	3.96	4.02	4.08	4.36	4.65	4.95

Figure 20101-12: Medium Growth Rate B Water Demand Projections and Full Build-Out – Kōloa ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use. For future agricultural water use analysis, please see Section 20101-4.1.1 County of Kaua'i Important Agricultural Lands Study.

20101-5 RESOURCE AND FACILITY RECOMMENDATIONS

20101-5.1 Water Source Adequacy

20101-5.1.1 Full Build-Out

Development to the highest extent allowed by the General Plan and County Zoning within the Kōloa ASYA is sustainable, with General Plan and County Zoning full build-out water demands requiring 67 and 36 percent of the 29 mgd sustainable yield, respectively. Full build-out water demand based on the General Plan refined by the South Kaua'i Community Plan is 67 percent of the sustainable yield.

20101-5.1.2 Twenty-Year Projection

The 2035 water demand projection for the Kōloa ASYA is sustainable, requiring only 17 percent of the 29 mgd sustainable yield.

20101-5.2 Source Development Requirements

20101-5.2.1 Supply-Side Management

Supply-side management, including conventional water resource measures, water conservation, and alternative water resource measures, were evaluated to meet projected water demands.

Conventional Water Resource Measures

Ground Water

The Kōloa ASYA contains basal, perched, and high level ground water resources. Most reported pumpage is from the perched zone.

The 2035 water demand projection for the Kōloa ASYA is only 17 percent of the 29 mgd sustainable yield. This indicates that theoretically, more water could be pumped from the aquifer without impairing the utility or quality of the water resource if wells are optimally placed and the proper due diligence with regard to traditional and customary rights and impacts has been completed. However, it is noted that sustainable yield does not consider the feasibility of developing the ground water resources, and that the safe yield of an individual production well may be limited by localized ground water behavior near the well as a result of pumpage. Water supply reliability and quality, feasibility, environmental and cultural impacts, and water rights shall be considered as projects and programs develop. More detailed and site-specific evaluation of these impacts shall be required and accomplished through the environmental review process (HRS Chapter 343) for source development projects and programs utilizing public funding, and CWRM could consider requiring compliance with the environmental review process for private source development projects and programs also. **Section 1.5.3.1** provides additional information regarding the protection of traditional and customary rights.

The DOW's Kalāheo-Kōloa Water System serves the towns of Kalāheo, Kōloa, Poʻipū, Lāwaʻi, and ʻŌmao. The DOW's Water Plan 2020 identified water supply projects to meet the growing demand of its service areas. For DOW's Kalāheo - Kōloa Water System, a couple of well projects were proposed and completed. The completed wells are included in **Table 20101-7**. As demand continues to grow, DOW proposes the addition of three new wells: ʻŌmao Well, Kōloa Well G, and Kalāheo Well #3.

The DOW's Water Plan 2020 also identified potential storage and distribution system upgrades. Several new tanks are proposed, including a new Poʻipū tank for the 245-foot pressure zone and a new Kukuiolono tank at the 886-foot pressure zone. There are many proposed water main projects, including replacing mains in Kalāheo town and replacing older and undersized mains in Lāwaʻi-ʻŌmao.

Surface Water

The Kōloa ASYA has 44 declared diversions. Until permanent instream flow standards are established, interim instream flow standards have been adopted. According to Section 13-169-46, Hawaiʻi Administrative Rules, "Interim Instream Flow Standard for all streams on Hawaiʻi, as adopted by the commission on water resource management on June 15, 1988, shall be that amount of water flowing in each stream on the effective date of this standard, and as that flow may naturally vary throughout the year and from year to year without further amounts of water being diverted offstream through new or expanded diversions, and under the stream conditions existing on the effective date of the standard, except as may be modified [by the commission]." Therefore, for the purposes of assessing surface water availability, it is assumed that no additional diversions will be allowed without amendment of the interim IFS.

The existing declared diversions have the potential to meet additional demands. However, a challenge with developing surface water is transmission of these resources from source to location of need. Farmers generally grow what is feasible for the area; therefore, it is anticipated that agricultural water use will follow the availability of irrigation water. Increase in the availability of surface water would likely promote additional usage and could thereby minimize ground water being used for irrigation.

There are several existing irrigation systems in the Kōloa ASYA, including the Kauaʻi Coffee Irrigation System, Waiahi-Kuʻia Aqueduct, Waiahi-ʻIliʻiliʻula Ditch, and Kōloa-Wilcox Ditch. Due to the cessation of sugarcane cultivation, many of these irrigation systems may not be functioning as efficiently as they once were. The Agricultural Water Use and Development Plan (AWUDP) should include an inventory of large irrigation systems and provide information on their rehabilitation and maintenance needs. The AWUDP should also include a more detailed assessment of agricultural water demand projections that will supersede information in the KWUDP when it becomes available.

Water Transfer

Some existing irrigation systems have the capability to transfer surface water to adjacent ASYAs. The AWUDP should study irrigation system services areas and provide information on irrigation systems' water transfer.

Water can also be transferred between ASYAs through public water systems. The DOW's Hanapēpē-'Ele'ele Water System services areas in the Makaweli, Hanapēpē, and Kōloa ASYAs. Currently, the water sources for this system are two wells located in the Hanapēpē ASYA and one well located in the Makaweli ASYA. Water must be transferred to 'Ele'ele via booster pump stations.

Water Conservation

The per capita use in the Kōloa ASYA is approximately 20.2% higher than the overall County of Kaua'i per capita use. There are no ASYA-specific conservation measures in place at this time; however, there are general water conservation programs that are described in **Section 1.5.7**. Water conservation, including water loss management, can increase the amount of water available and help to ensure the long-term viability of water resources.

Alternative Water Resource Measures

Rainwater Catchment

Rainwater can be utilized as a water resource in several ways.

Rainwater can be harvested in rainwater catchment systems which can be utilized to supply domestic potable water needs. These systems are viable in areas that receive abundant rainfall and are a suitable source of potable water for individual domestic users in areas outside the limits of municipal water systems. Generally, these are remote areas and are not expected to expand significantly because most development is anticipated to be concentrated within existing urban areas. Therefore, use of rainwater catchment systems is not anticipated to increase significantly.

Rainwater can also be used to supplement or satisfy agricultural non-potable water needs through ambient rainfall.

See the Storm Water Reuse section below to see how rainwater as storm water runoff can be reclaimed and reused.

Storm Water Reuse

Rainfall can turn into storm water runoff. Storm water runoff from impervious surfaces in urban areas can be significant. This water could be captured, treated, and used as a source of non-potable water (e.g., irrigation), integrated with recycled water, or even as potable and/or non-potable ground water recharge. However, due to the lack of storm water reuse standards, the high initial infrastructure costs, and the treatment requirements, storm water reclamation and reuse on a small or large scale may not be feasible and requires further assessment as noted in the Water Resource Protection Plan. The U.S. Department of the Interior, Bureau of Reclamation published An Appraisal of Stormwater Reclamation and Reuse Opportunities in Hawai'i (Storm Water Report) in 2008 but did not identify any storm water reclamation and reuse opportunities in the Kōloa ASYA.

Recycled Water

Recycled water is a valuable resource; an increase in its use may lower the dependence on potable sources. There are two wastewater reclamation facilities (WWRFs) in the Kōloa ASYA. Poʻipū WRF produces R-1 water, and Grand Hyatt WWRF produces R-2 water. Comparing the current reuse amount to the design capacity of each facility, it appears that there is recycled water available to meet additional demands, see **Table 20101-19** below. However, the actual additional recycled water use will depend on several factors, including the quantity of wastewater generated (which may be significantly less than the design capacity), the demand for recycled water, and the number of viable users within close proximity to the facility.

Table 20101-19: Wastewater Reclamation Facilities Available Capacity – Kōloa ASYA

WWRF/ WWTP	Recycled Water Classification	Design Capacity (mgd)	Quantity Produced (mgd)	Current Reuse Amount (mgd)	Available Capacity (mgd)
Grand Hyatt WWRF	R-2	0.25	N/R	0.11	0.14
Poʻipū WRF	R-1	0.8	N/R	0.30	0.50

N/R: Not Reported

Desalination

Desalination of brackish ground water is a potential alternative; however, due to its high capital and operational costs, it likely would not be considered when other potable water sources are readily available.

20101-5.2.2 Demand-Side Management

Development Density Control

The full build-out demand for the Kōloa ASYA based on County Zoning is 10.42 mgd, which is 36 percent of the sustainable yield. This indicates that there are adequate water resources to sustain the level of development that is allowed by law. In the Kōloa ASYA, the average number of dwelling units allowed by County Zoning is 5.40 dwelling units per acre in residential districts and 13.72 dwelling units per acre in resort districts.

The full build-out demand for the Kōloa ASYA based on the General Plan is 19.37 mgd, which is 67 percent of sustainable yield. The full build-out demand based on the General Plan refined by the South Kauaʻi Community Plan is 19.32 mgd, which is also 67 percent of sustainable yield. Although it is highly unlikely that full build-out will occur within the time frame of these plans, these full build-out demands are sustainable; there are adequate water resources to sustain the long-range land use vision for this area. Therefore, development density control may not be necessary. However, the County Planning Department could consider development density control for areas where there is the flexibility to do so, such as areas that are not yet zoned as residential or resort, and promote sustainable development. Further, it is noted that these full build-out scenarios are unlikely to occur since it assumes all land is developed to the maximum extent.

20101-5.3 Recommended Alternatives

To optimize appropriate use of water resources, the quality of the water source should be matched to the quality of water required. The highest quality of water shall be reserved for the most valuable end use. Potable water is considered the highest quality water, and the sustenance of life is the most valuable end use. Recycled water, brackish water, untreated surface water, and other lower quality water sources should be used for landscaping and agriculture when available, thereby reserving potable water for human consumption. If there is a practical alternative water source available, that alternative source should be used in lieu of ground water or surface water. With this in mind, the following recommendations are made for the Kōloa ASYA:

<u>Alternative Water Resources</u>

Alternative water sources, such as recycled water generated from wastewater reclamation facilities, should be used where available to reduce demands on both ground and surface water resources and to conserve water resources as a whole. Recycled water is available from the Poʻipū WRF and Grand Hyatt WWRF; however, as discussed previously, successfully increasing use of recycled water is dependent on several factors, including the number of viable users within close proximity to the facilities.

<u>Conservation</u>

Water resources are a finite resource that should be managed and used wisely. It should be conserved and not wasted. Implementation of conservation measures should continue to be encouraged.

<u>Ground Water</u>

Meeting future demands at a reasonable cost is a planning objective, and conventional sources, such as ground water, are typically the most cost-effective means for meeting projected water demands. Projected potable water needs are within the sustainable yield for this area. Therefore, ground water resources could continue to be used and developed to meet potable water needs now and into the future. However, as noted above, development of conventional water resource measures can have challenges, and water supply reliability and quality, feasibility, environmental and cultural impacts, and water rights shall be considered as projects and programs develop.

Development of ground water resources is the primary strategy to serve future potable demands in the Kōloa ASYA.

<u>Surface Water</u>

Surface water, where available, should be used to meet non-potable demands if alternative water resources are not available. To achieve this, it will be critical to maintain and improve existing irrigation systems. Making surface waters more readily available to meet non-potable water demands has the potential to minimize future dependence on the use of ground water. It is therefore recommended that the AWUDP provide information on the rehabilitation and maintenance needs of large irrigation systems.

Demand-Side Management

Full build-out demand based on the General Plan and the South Kaua'i Community Plan is 67 percent of sustainable yield. At this projection, implementation of development density control by the County Planning Department is not needed since it is highly unlikely that full build-out will occur within the time frame of these plans.

Although the projection is sustainable, the County Planning Department should exercise caution and consider potential impacts on available water resources when considering any future zoning modifications. Modifications that may result in increased development density within the area will increase demands on water resources.

Chapter 20102

Hanamāʻulu Aquifer System Area

CHAPTER 20102 - TABLE OF CONTENTS

FIGURES

TABLES

20102 HANAMĀʻULU AQUIFER SYSTEM AREA

20102-1 SYSTEM AREA PROFILE

20102-1.1 General

The Hanamāʻulu [20102] Aquifer System Area (ASYA) is roughly bound on the north by the South Fork of Wailua River and Kilohana Crater, on the east by the Pacific Ocean, and on the south by the Hāʻupu Mountain Range. The Hanamāʻulu ASYA lies almost entirely within the Līhuʻe Planning District and includes the communities of Līhuʻe, Hanamāʻulu, and Puhi. As the main urbanized area on Kauaʻi, the Līhuʻe District is planned to accommodate approximately half of Kauaʻi's future growth.

Average annual rainfall ranges from 50 inches per year along the coast to 160 inches in the mountains. The sustainable yield is 27 mgd.

20102-1.2 Economy and Population

20102-1.2.1 Economy

Līhuʻe is the largest business center on the island and is considered the "heart" of Kauaʻi with nearly 45 percent of Kauaʻi's working population working in Līhuʻe. Major employment centers in the Hanamāʻulu ASYA include the Līhuʻe Civic Center, the Hawaiʻi State Judiciary Building, police station and sports complex, Kauaʻi Marriott Resort, Kukui Grove Shopping Center, Walmart, and Kauaʻi Community College. Wilcox Hospital, which is the primary medical care facility for Kauaʻi, is also located in Līhuʻe. In addition, the Hanamāʻulu ASYA is home to Līhuʻe Airport and Nāwiliwili Harbor which are Kauaʻi's primary airport and primary commercial harbor.

20102-1.2.2 Population

The population contributing to the demand within the Hanamāʻulu ASYA is almost completely from the Līhuʻe Planning District. In accordance with the outlook and policies of the Kauaʻi General Plan as well as general community sentiment, the Līhuʻe Planning District is expected to have the highest growth rate and accommodate nearly half of Kauaʻi's population growth through 2035. As a result, the Hanamāʻulu ASYA has the highest projected growth of all the aquifer systems on Kauaʻi. Historical population data for the Hanamāʻulu ASYA is summarized in **Table 20102-1**.

Population projections are summarized through the year 2035 in **Table 20102-2a**. For planning purposes, a range of values (low, medium and high estimates) is provided. As shown in **Table 20102-2b**, it is estimated that the area will continue to experience growth rates between 15 and 21 percent per decade.

Table 20102-1: Historical Population – Hanamāʻulu ASYA

	Year		
	1990	2000	2010
Population	11,184	12,523	14,701
Percent Change		16.0	11.8

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report. Data redistributed and evaluated for Hanamāʻulu ASYA.

Table 20102-2a: Population Projection – Hanamāʻulu ASYA

Growth Rate	Population by Year								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
A – Low	16,141	16,420	16,700	16,981	17,263	17,546	18,978	20,440	21,929
B – Med.	16,331	16,669	17,008	17,349	17,693	18,038	19,798	21,618	23,481
C – High	16,364	16,711	17,060	17,412	17,766	18,122	19,938	21,821	23,750

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report. Data redistributed and evaluated for Hanamāʻulu ASYA.

Table 20102-2b: Population Projection – Percent Change – Hanamāʻulu ASYA

Growth Rate	2015-2025 % Change	2025-2035 % Change
A – Low	17.6	15.6
B – Medium	21.2	18.6
C – High	21.8	19.1

20102-1.3 Land Use

20102-1.3.1 2000 Kauaʻi General Plan

The 2000 Kauaʻi County General Plan Land Use Designation Map for the Hanamāʻulu ASYA is shown on **Figure 20102-1**. The estimated land use allocation acreage for each land use designation within the system area is listed in **Table 20102-3**.

Table 20102-3: General Plan Estimated Land Use Allocation Acreage – Hanamāʻulu ASYA

General Plan Land Use Designation	Acreage	Percent of Total
Agricultural	14,456	41.4
Military	0	0
Open	15,385	44.1
Park	340	1.0
Residential Community	982	2.8
Resort	264	0.8
Transportation	947	2.7
Urban Center	2,113	6.1
DHHL	400	1.1
TOTAL	**34,887**	**100.0**

20102-1.3.2 Kauaʻi Zoning

Kauaʻi County Zoning Map for the Hanamāʻulu ASYA is shown on **Figure 20102-2**. The estimated land use allocation acreage for each zoning district within the system area is listed in **Table 20102-4**.

Table 20102-4: County Zoning Estimated District Allocation Acreage – Hanamāʻulu ASYA

Zoning District	Acreage	Percent of Total
Agriculture	14,202	42.2
Commercial – General	415	1.2
Commercial - Neighborhood	25	0.1
Conservation	7,362	21.9
Industrial – General	1,113	3.3
Industrial - Limited	145	0.4
Open	7,982	23.7
Residential	1,494	4.4
Resort	121	0.4
Project Development	0	0
Special Planning Area	0	0
Special Treatment	36	0.1
No Zoning	266	0.8
DHHL	524	1.5
TOTAL	**33,685**	**100.0**

The number of dwelling units allowed in residential and resort districts varies by the type of residential or resort district. The average number of dwelling units allowed in residential districts in the Hanamāʻulu ASYA is 7.41 dwelling units per acre. The average number of dwelling units allowed in resort districts in the Hanamāʻulu ASYA is 18.97 dwelling units per acre.

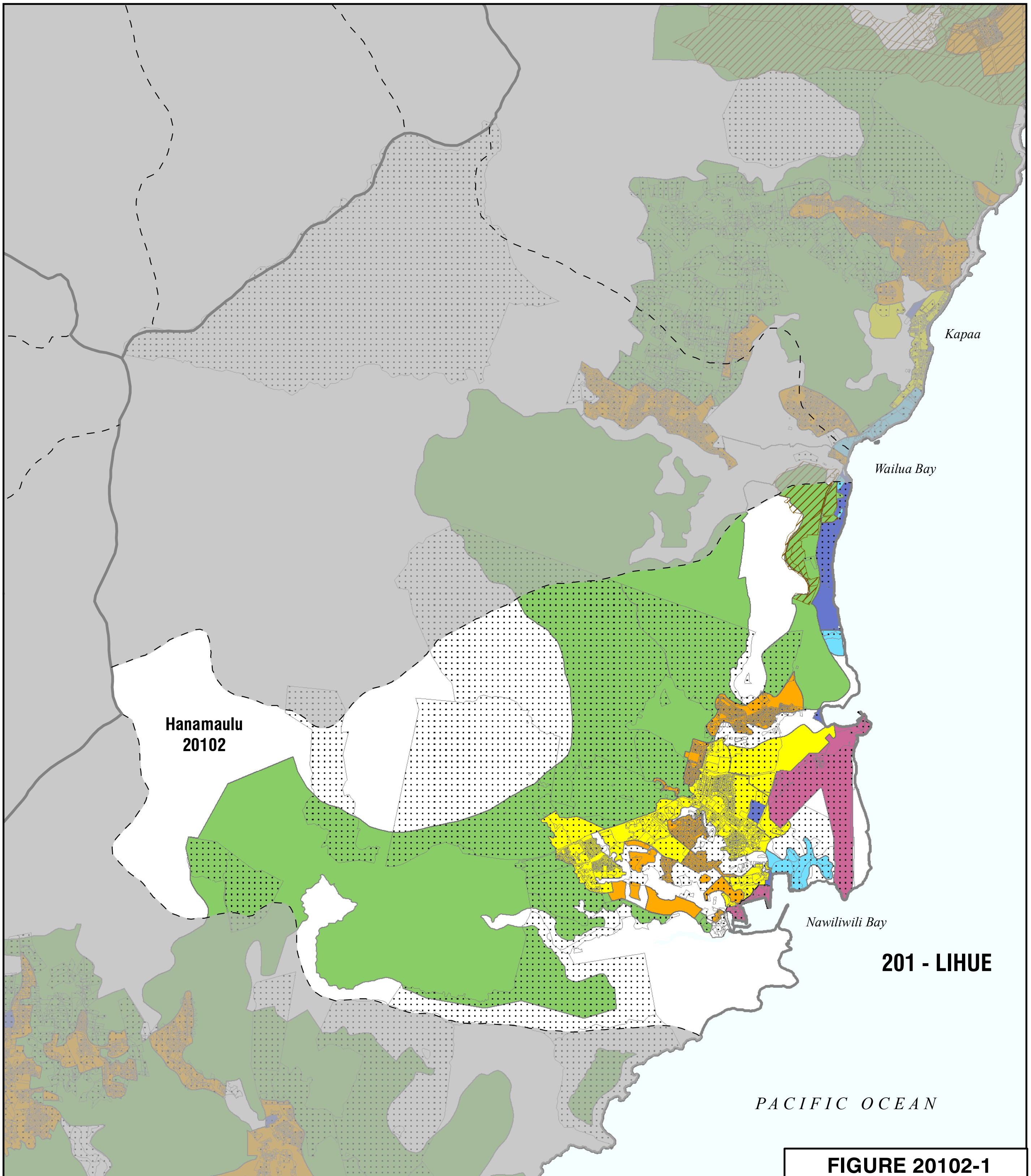
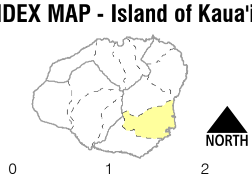


FIGURE 20102-1

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- Hawaiian Home Lands
- Developed Properties

Land Use Allocation Guide

- Agricultural
- Open
- Park
- Military
- Residential Community
- Resort
- Transportation
- Urban Center

GENERAL PLAN
LAND USE MAP
Aquifer Sector: LIHUE - 201
Aquifer System:
HANAMAULU - 20102

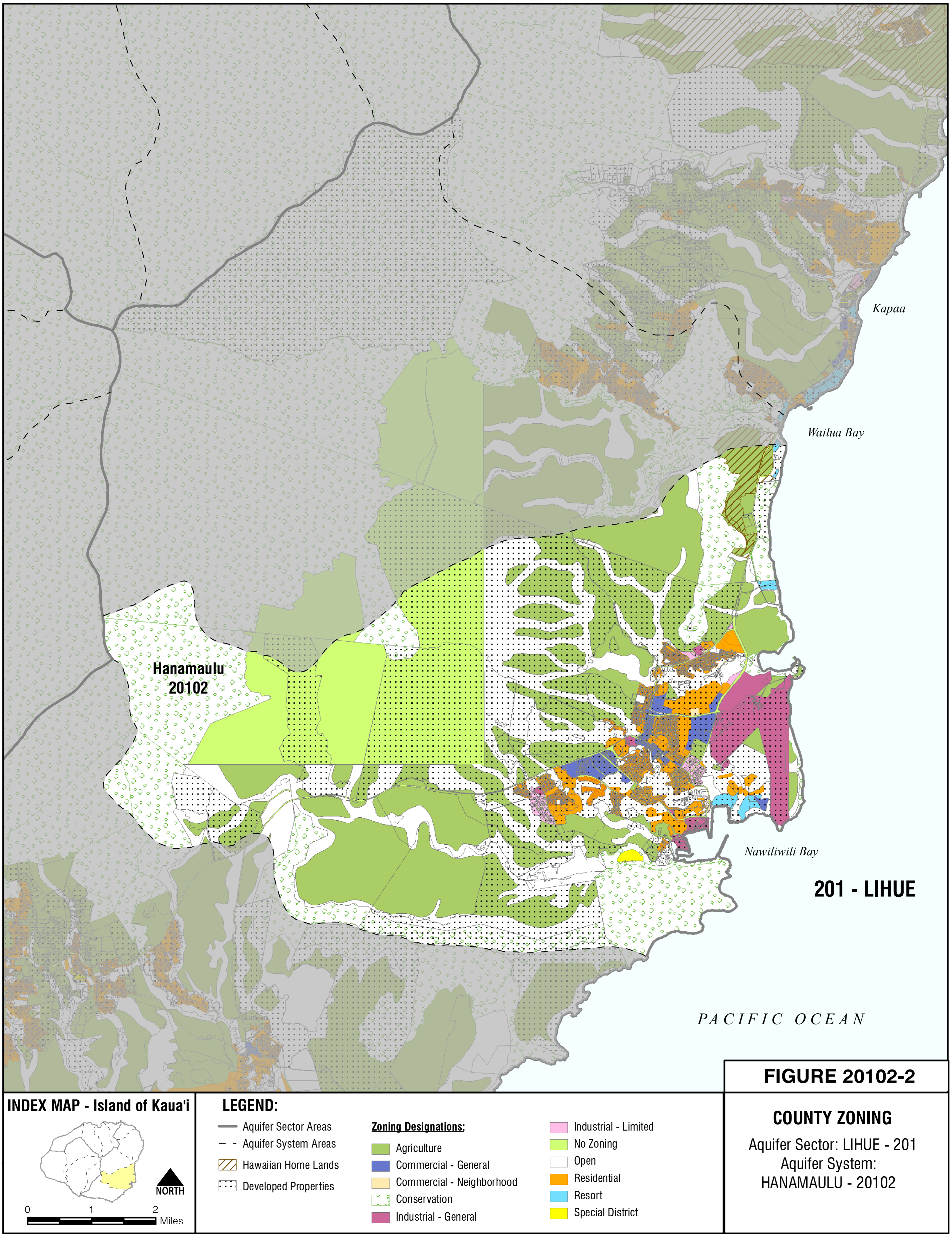


FIGURE 20102-2

COUNTY ZONING

Aquifer Sector: LIHUE - 201
Aquifer System:
HANAMAULU - 20102

20102-2 EXISTING WATER RESOURCES

20102-2.1 Ground Water

The Hanamāʻulu ASYA has a sustainable yield of 27 mgd. According to the 2014 CWRM database, there are 27 production wells in the system, 1 agriculture, 13 municipal, 2 domestic, 3 industrial, and 8 irrigation wells. There are also 19 wells drilled and categorized as "unused". Refer to **Appendix A** for the 2014 database. **Figure 20102-3** shows the well locations.

Ground water levels in the Līhuʻe Basin showed declining trends in the late 1990s and early 2000s. The declines in water level resulted in diminished productivity of some wells and tunnels and generated concern about the future reliability of ground water resources. Due to these concerns, the U.S. Geological Survey (USGS) in cooperation with the County of Kauaʻi Department of Water (DOW) developed reports on the effects of irrigation, drought, and ground water withdrawals on ground water recharge and ground water levels in the Līhuʻe Basin.

A report titled "Effects of Irrigation and Rainfall Reduction on Ground-Water Recharge in the Līhuʻe Basin, Kauaʻi, Hawaiʻi" by Scot K. Izuka, Delwyn S. Oki, and Chien-Hwa Chen found that the effect of drought was greater than the effect of reduced irrigation on ground water recharge. However, the report also noted that the effects of droughts are temporary conditions whereas decreases in irrigation may be permanent and have a greater long-term effect.

A report titled "Effects of Irrigation, Drought, and Ground-Water Withdrawals on Ground-Water Levels in the Southern Līhuʻe Basin, Kauaʻi, Hawaiʻi" by Scot K. Izuka describes the results of a numerical ground-water-flow model that was used to assess the effects of drought, irrigation changes, and ground-water withdrawals on ground-water levels. The results indicated that the primary cause of the observed decline in ground-water levels in the 1990s and early 2000s was irrigation reduction. The study also found that ground-water withdrawal had a long-duration but small-magnitude effect, while drought had a widespread, high-magnitude but short-duration effect. Also, since irrigation is unlikely to return to the same levels as during the period of peak sugarcane agriculture, the decline in ground-water levels resulting from the reduction and ultimate end of sugarcane irrigation can be considered permanent.

20102-2.2 Surface Water

There are 5 streams classified as perennial in the Hanamāʻulu ASYA, of which 4 are considered continuous and 1 is considered intermittent. Hanamāʻulu Stream, Nāwiliwili Stream, Pūʻali Stream, and Huleʻia Stream are classified as continuous streams, and Kawailoa Stream is classified as an intermittent stream. The USGS has 1 active surface water gage in the system area. The gage is located on Huleʻia Stream, which was previously listed in **Table 1-19**.

In accordance with the Code, the CWRM must establish and administer instream flow standards (IFS) on a stream-by-stream basis as necessary to protect public interests. IFS is defined as "a quantity or flow of water or depth of water which is required to be present at a specific location in a stream system at certain specified times of the year to protect fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses." Considerably more research and study needs to be completed to accumulate the data and perspective necessary to conduct a thorough and meaningful assessment of IFS. Until permanent IFS are established, interim IFS have been adopted. The interim IFS are defined as the amount of water flowing in each stream at the time the administrative rules governing them were adopted in 1988 and 1989. In order to assess surface water sustainability, this KWUDP assumes that no additional diversions will be allowed from any stream without amendment of the interim IFS.

There are 39 declared stream diversions in the Hanamāʻulu ASYA identified in the CWRM database shown on **Figure 20102-4**, which accounts for 13 percent of the 292 declared stream diversions on the island. The declared stream diversions are listed in **Appendix B**. The total declared flow for the Hanamāʻulu ASYA is 6.87 mgd.

The East Kauaʻi Irrigation System (EKIS) is a complex system of interconnecting ditches, tunnels, flumes, and reservoirs and consists of three sections: the Kapaʻa Section, the Kālepa Section, and the Hanamāʻulu-Līhuʻe Section.

The Kapaʻa Section of EKIS is the northernmost section. It is primarily located in and serving the Anahola ASYA and will therefore be discussed in **Section 20104**.

The Kālepa Section of EKIS is the middle section. The Hanalei Tunnel previously diverted water from Hanalei River to a tributary of the North Fork of Wailua River. According to the 2004 AWUDP, there is a blockage in the Hanalei Tunnel, and as a result, the Hanalei Watershed no longer contributes water to EKIS. Stable Storm Ditch previously diverted water from the North Fork of the Wailua River; however, the Stable Storm Ditch is now abandoned and no longer in use. West of the Stable Storm Ditch, the ʻIliʻiliʻula-North Wailua Ditch diverts water from the North Fork of Wailua River, Waikoko Stream, and ʻIliʻiliʻula Stream to the Upper Waiahi Hydropower Plant. South of the ʻIliʻiliʻula-North Wailua Ditch, the North Intake Ditch diverts water from the ʻIliʻiliʻula Stream and Waiahi Stream to the Lower Waiahi Hydropower Plant. The Hanamāʻulu Ditch Intake diverts flow from both the ʻIliʻiliʻula-North Wailua Ditch and the South Fork of Wailua River into the Hanamāʻulu Ditch. The Hanamāʻulu Ditch contributes flow to Kapaia Reservoir. Water from the Kapaia Reservoir is treated by a private treatment plant and purchased by the DOW as a water source for DOW's Līhuʻe-Kapaʻa Water System. The Kālepa Section serves the Hanamāʻulu ASYA and the Wailua ASYA.

The Hanamāʻulu-Līhuʻe Section of EKIS is the southernmost section and is within the Hanamāʻulu ASYA. It consists of the Upper and Lower Līhuʻe Ditches. The Upper Līhuʻe Ditch diverts water at the Lower Waiahi Hydropower Plant. The Lower Līhuʻe Ditch is abandoned and is not operable. The Upper and Lower Līhuʻe Ditch system originally served former Līhuʻe Plantation Company's sugarcane fields in and around Līhuʻe and Hanamāʻulu. Currently, the ditch system is operated by Grove Farm Company and is maintained by an independent contractor. The Upper Līhuʻe Ditch diverts water to Demello Reservoir which is the water source for the State of Hawaiʻi's non-potable irrigation system.

The Upper Haʻikū Ditch system was formerly owned by Grove Farm Plantation to irrigate sugarcane fields in Haʻikū, Puhi, Nāwiliwili, and Kōloa. Currently, the system is owned and managed by Grove Farm Company, and diverts headwaters of Huleʻia Stream. A condition assessment on the ditch system was not performed as part of the 2019 draft AWUDP update. However, portions are known to be non-operational or abandoned.

20102-2.3 Water Conservation

Water conservation increases the amount of water available and helps to ensure the long-term viability of water resources. Water conservation measures for this ASYA are as described in **Section 1.5.7** of this report. There are no ASYA-specific conservation measures in place at this time.

20102-2.4 Rainwater Catchment

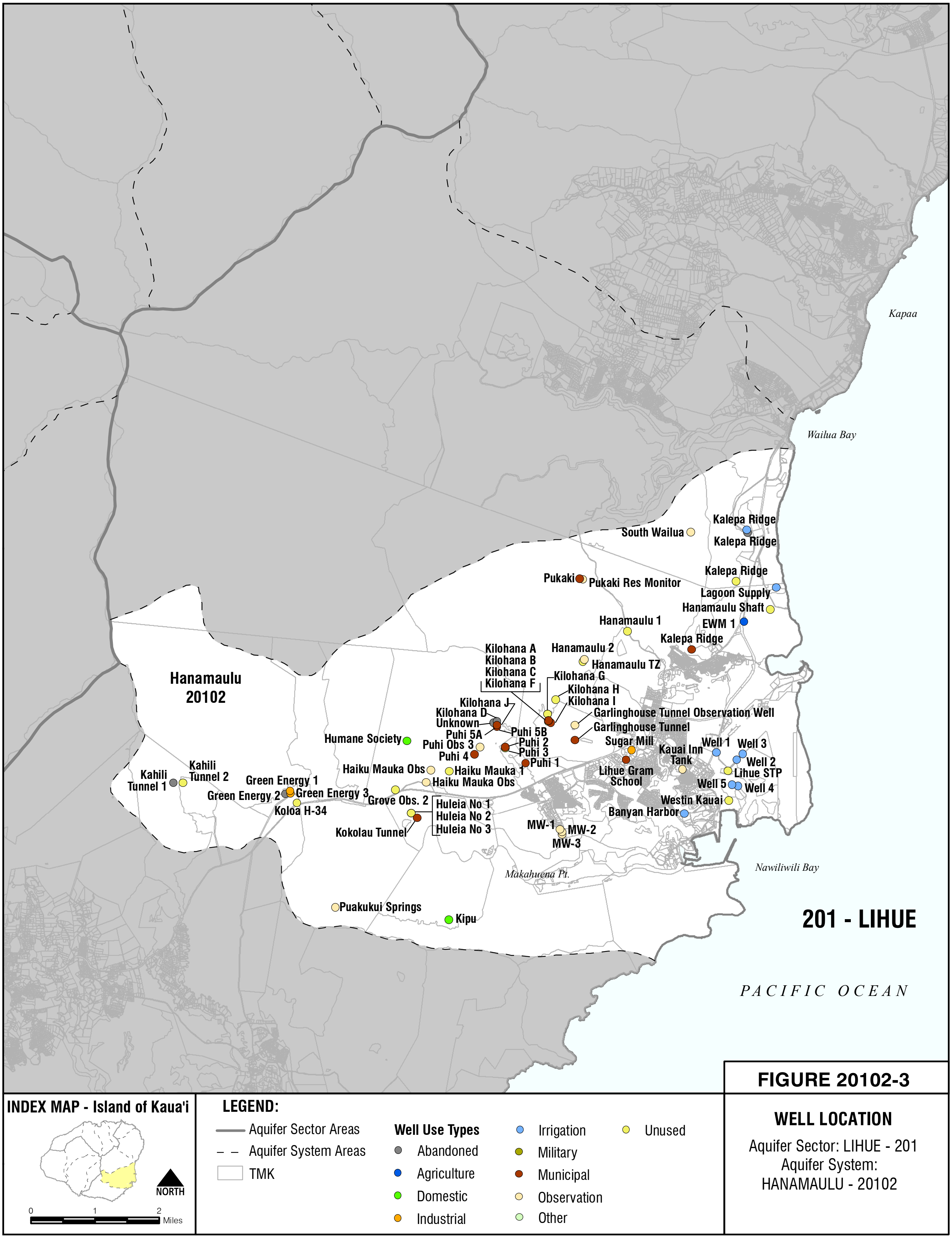
Rainwater catchment is a viable resource for areas that are not served by ground water or surface water. **Figure 20102-5** shows the possible catchment areas, or parcels with a building value greater than $20,000 and assumed to be developed but without a ground water or surface water source.

20102-2.5 Recycled Water

There are 3 wastewater reclamation facilities in the Hanamāʻulu ASYA. **Table 20102-5** lists the wastewater facilities, reclaimed water classification, facility treatment capacity, current reuse amount, facility type, and current application. **Figure 20102-6** shows the facility locations.

Table 20102-5: Wastewater Reclamation Facilities – Hanamāʻulu ASYA

WWRF/ WWTP	Recycled Water Classification	Design Capacity (mgd)	Quantity Produced (mgd)	Current Reuse Amount (mgd)	Owner	Irrigation Application
Līhuʻe WWRF	R-1	2.5	1.2	0.79	Public	Kauaʻi Lagoons Resort – golf course irrigation, roadway landscape irrigation
Līhuʻe-Puhi WWTP	R-1	1.0	0.4	0.37	Private	Puakea Golf Course, Costco, Kukui Market Place, Pikake Circle
Wailua WWRF	R-2	1.5	0.5	0.19	Public	Wailua Golf Course, Lydgate Park (athletic field irrigation)



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KAUA'I WATER USE AND DEVELOPMENT PLAN UPDATE

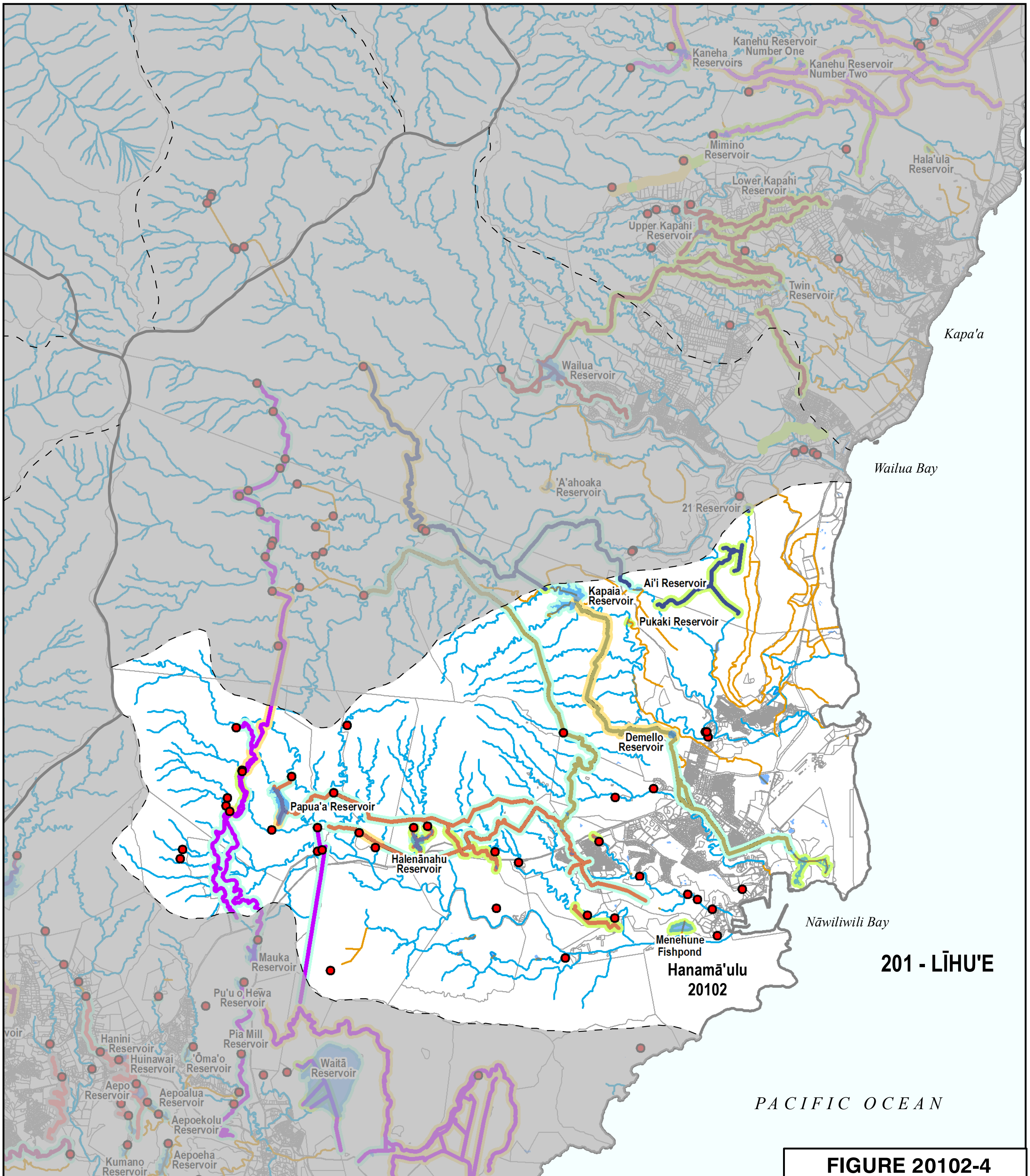
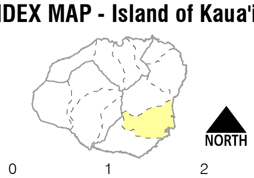


FIGURE 20102-4

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- Perennial Streams
- Irrigation Systems
- Diversions
- Reservoirs, Ponds
- TMK

Irrigation Systems

- Hanamā'ulu System
- Upper and Lower Ha'ikū Ditches
- Waiahi-Kuia AQ, Waiahi-Ili'ili'ula, Kōloa-Wilcox
- Upper and Lower Līhu'e Ditches

Status

- Active
- Inactive
- Unknown
- Abandoned

STREAMS & DIVERSIONS

Aquifer Sector: LĪHU'E - 201
Aquifer System:
HANAMĀ'ULU - 20102

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KAUA'I WATER USE AND DEVELOPMENT PLAN UPDATE

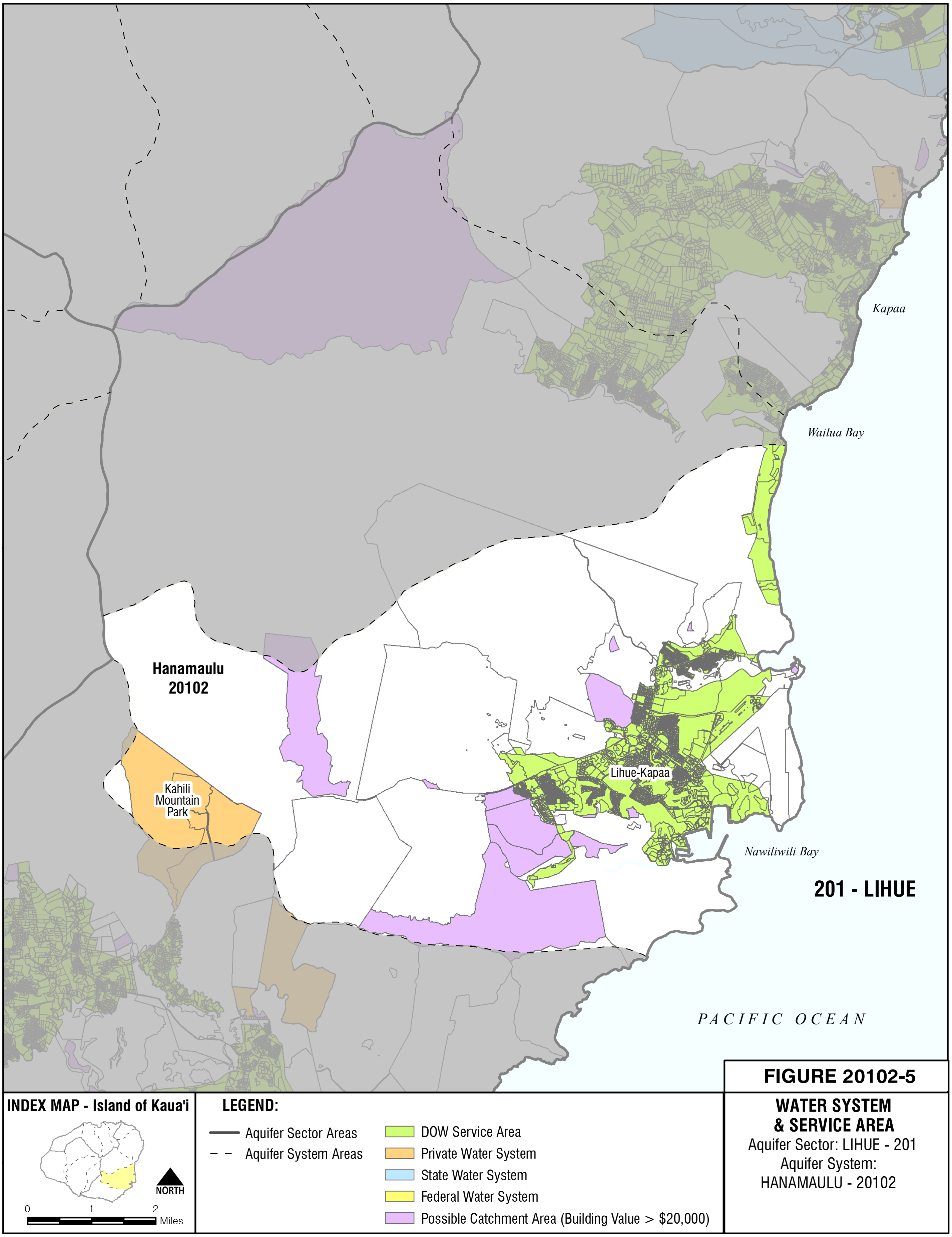


FIGURE 20102-5

WATER SYSTEM & SERVICE AREA

Aquifer Sector: LIHUE - 201
Aquifer System: HANAMAULU - 20102

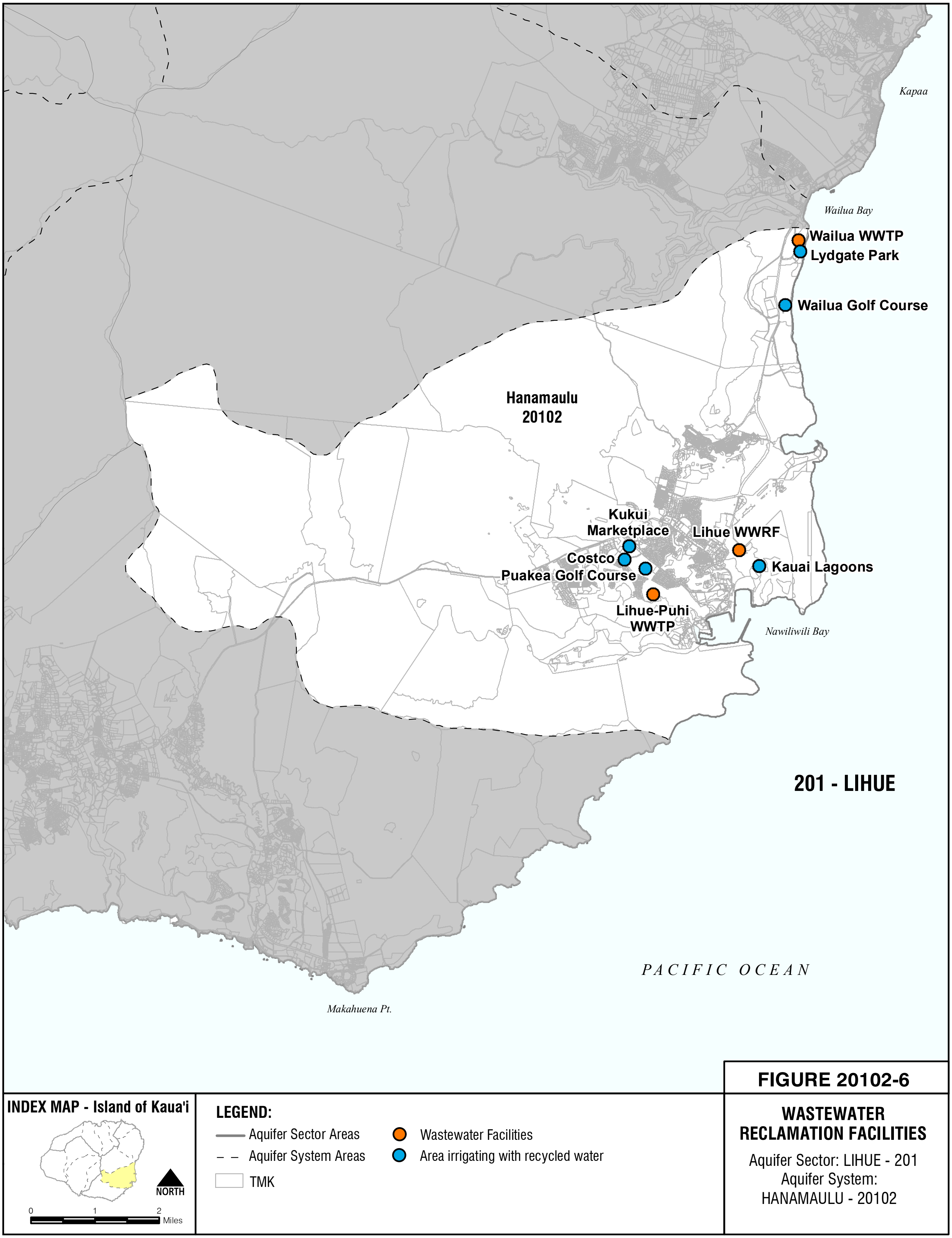


FIGURE 20102-6

WASTEWATER RECLAMATION FACILITIES

Aquifer Sector: LIHUE - 201
Aquifer System: HANAMAULU - 20102

20102-3 EXISTING WATER USE

20102-3.1 General

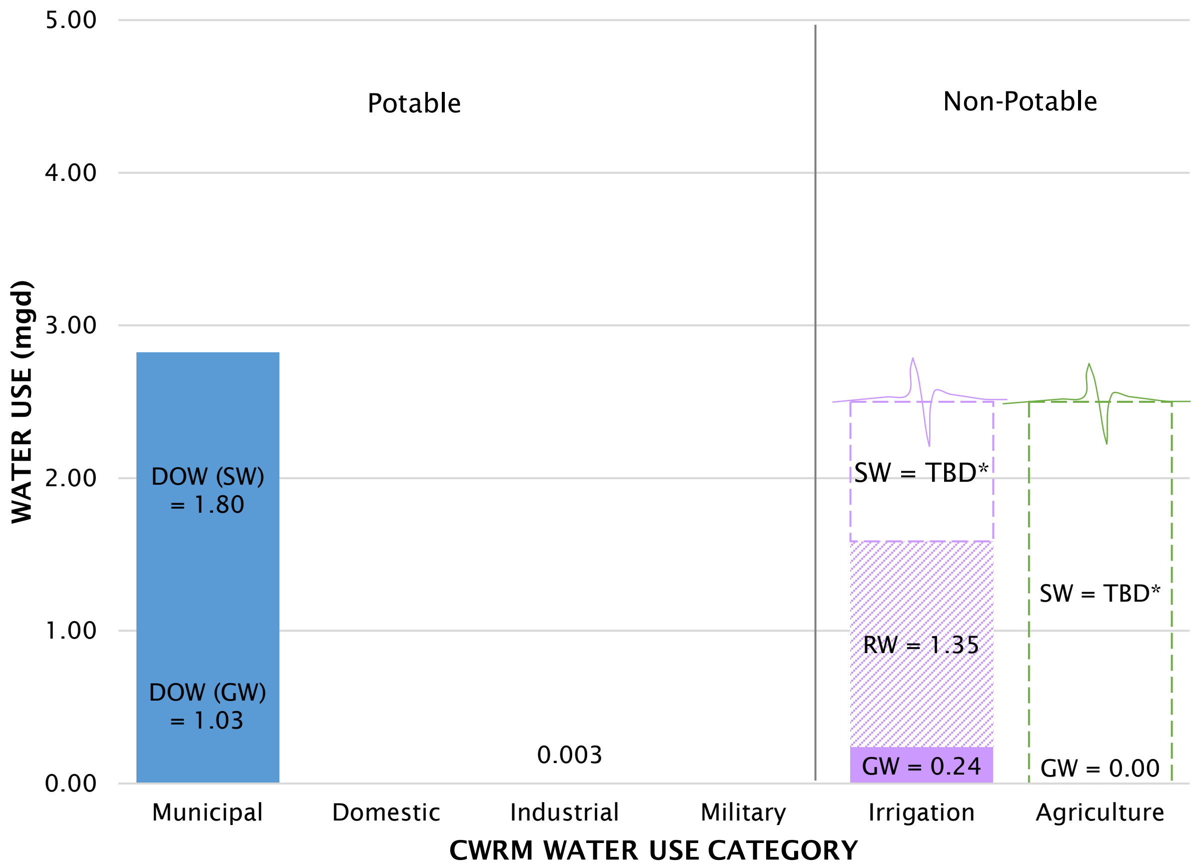
The following section presents the total estimated average water use within the Hanamāʻulu ASYA. The total estimated average water use was based on data from CWRM (well pumpage) and DOH (Sanitary Surveys for Public Water Systems and estimated recycled water usage) for the year of 2014. Well classification changes since 2014 are noted in the sub-sections below. **Table 20102-6** and **Figure 20102-7** summarize the water use in accordance with CWRM categories.

Table 20102-6: Existing Water Use by Category – Hanamāʻulu ASYA

CWRM Category	Ground Water (mgd)	Other Sources (mgd)	Total (mgd)	Percent of Total
Domestic	0.00		0.00	0.0
Industrial	0.003		0.00	0.0
Irrigation	0.24	1.35[1]	1.59	36.0
Agriculture	0.00	TBD[2]	0.00	0.0
Military			0.00	0.0
Municipal				
DOW System	1.03	1.80[3]	2.83	64.0
Private-Public WS	0.00		0.00	0.0
TOTAL	**1.27**	**2.18**	**4.42**	**100.0**

[1] Recycled Water
[2] Surface Water – TBD from AWUDP
[3] Surface Water – Estimated

Figure 20102- 7: Existing Water Use by Category – Hanamāʻulu ASYA



*Values to be determined by other components of the Hawaiʻi Water Plan

20102-3.2 Domestic Use

There are two wells classified as "Domestic" in the CWRM database; however, neither has reported pumpage.

20102-3.3 Industrial Use

There are three wells classified as "Industrial" in the CWRM database. Two are owned by Green Energy Team LLC and have reported pumpage totaling 0.003 mgd. One is owned by LPC corporation and does not have reported pumpage.

20102-3.4 Irrigation Use

Irrigation use has been divided into ground water, recycled water, and surface water.

20102-3.4.1 Ground Water

There are eight wells classified as "Irrigation" in the CWRM database. Five wells are owned by Kauaʻi Lagoons Resort and have reported pumpage totaling 0.22 mgd for golf course irrigation. One well is owned by Banyan Harbor and has reported pumpage totaling 0.02 mgd for landscape irrigation. One well is owned by the County of Kauaʻi. It is classified for non-domestic, non-agriculture irrigation and does not have reported pumpage. One well is owned by Aqua Kauaʻi Beach Resort. It is classified for hotel irrigation and does not have reported pumpage.

20102-3.4.2 Recycled Water

There are three golf courses in the Hanamāʻulu ASYA, all of which are irrigated with recycled water.

The Kauaʻi Lagoons Resort receives R-1 water from the Līhuʻe WWRF and has been irrigating its Kiele golf courses since 1986. The R-1 water is stored in two irrigation ponds on resort property and during summer months, irrigation is blended with brackish water to meet the high demands.

The Puakea Golf Course uses a blend of R-1 water from the Līhuʻe-Puhi WWTP and stream water for irrigation. The blend of R-1 water from the Līhuʻe-Puhi WWTP and surface water is also used for irrigation at Costco, Kukui Market Place, and the Pikake Circle.

The Wailua Golf Course receives R-2 water from the Wailua WWRF and has been irrigating its golf course since 1969. Similar to the Kauaʻi Lagoons Resort, brackish water is typically blended with the R-2 water for to supplement demands.

Lydgate Park also receives R-2 water from Wailua WWRF, but needs to supplement it with potable water as the R-2 water's high nutrient content clogs the irrigation subsurface drip system.

20102-3.4.3 Surface Water

Information on surface water use for irrigation is to be determined by the AWUDP. However, typically, due to the location of parks and other landscaped areas within communities, it is assumed that it is unlikely for landscaping to be irrigated with surface water. In the Hanamāʻulu ASYA, there is a non-potable irrigation line that delivers approximately 0.36 mgd from Demello Reservoir to three users: Līhuʻe Airport, the Kauaʻi Police Department, the Kauaʻi Judiciary Complex, the Līhuʻe Gateway project, and the Vidinha Soccer Fields. Also, as noted in **Section 20102-3.4.2**, some stream water is blended together with R-1 water from the Līhuʻe-Puhi WWTP to irrigate Puakea Golf Course, Costco, Kukui Market Place, and the Pikake Circle.

20102-3.5 Agricultural Use

Agricultural use has been divided into ground water, recycled water, and surface water.

20102-3.5.1 Ground Water

There is one well classified as "Agriculture" in the CWRM database; however, it has not reported pumpage. It is owned by EWM Kauaʻi LLC and is subcategorized as Agriculture - Livestock & Processing and Pasture.

20102-3.5.2 Recycled Water

There are no agriculture demands served by recycled water in the Hanamā‘ulu ASYA.

20102-3.5.3 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP.

Several irrigation systems deliver surface water for agricultural use in the Hanamā‘ulu ASYA, and description and status of the irrigation systems are discussed in **Section 20102-2.2**.

11,206 acres of agricultural lands owned by Grove Farm Company, Inc. are designated as IAL and are located predominantly within the Hanamā‘ulu ASYA. Irrigation water for the IAL is provided by rainwater and the Ha‘ikū and Līhu‘e Ditch systems. The area receives 60 to 100 inches of rainfall annually and is adequate for rain-fed production of many crops. The IAL are used for cattle ranching, diversified agriculture, biomass production (for renewable energy), and bioenergy crops such as trees and grasses.[1]

20102-3.6 Military Use

There is no military use in the Hanamā‘ulu ASYA.

20102-3.7 Municipal Use

There are 13 wells in the CWRM database classified as "Municipal" (MUNCO – Municipal County). Municipal can be subcategorized into the other water use categories: Domestic, Industrial, Agricultural, Military, and Municipal.

20102-3.7.1 County Water Systems

The DOW has one major water system that services the Hanamā‘ulu ASYA. The Līhu‘e-Kapa‘a water system is DOH Public Water System (PWS) No. 400 and is the largest water system on Kaua‘i. This water system serves 31,337 people through 9,560 service connections with a demand of 6.12 mgd, per the 2014 DOH Sanitary Survey. This water system was created after a merger of the Līhu‘e-Hanamā‘ulu water system (PWS 410), Puhi water system (PWS 412), and the Wailua-Kapa‘a water system (PWS 413) in 2006. The Līhu‘e-Kapa‘a water system services areas in three ASYAs and consists of three subsystems – 1) Līhu‘e-Hanamā‘ulu subsystem, 2) Puhi subsystem, and 3) Wailua-Kapa‘a subsystem. The Līhu‘e-Hanamā‘ulu and Puhi subsystems are entirely within the Hanamā‘ulu ASYA and are discussed below. The Wailua-Kapa‘a subsystem services areas in the Hanamā‘ulu ASYA, Wailua ASYA, and Anahola ASYA; however, the majority of the service area is within the Anahola ASYA and will therefore be discussed with the Anahola ASYA in **Section 20104**.

[1] DR12-48 Grove Farm Company, Incorporated – Findings of Fact, Conclusions of Law, and Decision and Order, dated February 2013

Līhuʻe-Hanamāʻulu Subsystem

The Līhuʻe-Hanamāʻulu Subsystem serves Hanamāʻulu, the port complex at Nāwiliwili and the adjoining Niumalu residences, Kauaʻi High School and Chiefess Kamakahelei Middle School, Wilcox Hospital, Līhuʻe Airport, and the surrounding residential, commercial, and industrial communities/districts. Water for this subsystem is supplied by 8 wells, 1 tunnel, and the Waiahi surface water treatment plant (WTP). **Table 20102-7a** lists the water sources, well number, pumping capacity, pressure zone, and pumpage amount.

Table 20102- 7a: DOW Līhuʻe-Hanamāʻulu Subsystem Water Sources

WELL NAME	WELL NUMBER	PUMPING CAPACITY (gpm)	PRESSURE ZONE (ft)	PUMPAGE (mgd)
Kilohana Well A	2-5923-001	420	393	0.13
Kilohana Well B	2-5923-002	700	393	0.00
Kilohana Well I	2-5923-007	700	393	0.23
Garlinghouse Tunnel	2-5823-001	800	393	0.25
Waiahi WTP	N/A	N/A	393	N/A
Hanamāʻulu Well No. 3*	2-0124-002	160	510	0.00**
Hanamāʻulu Well No. 4*	2-0124-003	160	510	0.03
Pukaki Well	2-0023-002	120	393	0.01**
Kālepa Well	2-5921-001	120	319	0.04
Līhuʻe Grammar School Well	2-5822-002	150	295	0.02**

* Well located in Wailua ASYA

** Well currently inactive

There are 5 primary pressure zones (510', 393', 319', 295', and 173') and 8 storage tanks in the Līhuʻe-Hanamāʻulu subsystem. The water sources are primarily located in the upper pressure zones and feed the lower zones through pressure reducing valves.

Source water for the Waiahi WTP is from the 75 acre Kapaia Reservoir, adjacent to the WTP. The WTP is rated for a capacity of 3 mgd and has a maximum capacity of 4 mgd. Finished water from the WTP and the 0.1 MG Hanamāʻulu 510' Tank are combined at the Control Valve Station (CVS), which is owned by Grove Farm and operated by the DOW. By agreement between the DOW and Grove Farm, the DOW is required to accept a minimum of 2 mgd from the Grove Farm WTP. Water from the CVS can reach the entire Līhuʻe-Kapaʻa water system.

The Hanamāʻulu Booster Station originally boosted water from the Wailua-Kapaʻa subsystem to the Līhuʻe-Hanamāʻulu subsystem on an "as needed" basis. When the Grove Farm WTP went online, the booster station was no longer needed. Now, water flows in the opposite direction via gravity from the Līhuʻe-Hanamāʻulu subsystem to the Wailua-Kapaʻa service areas. The flow rate is regulated by a valve.

Puhi Subsystem

The Puhi Subsystem serves the Kaua'i Community College (KCC) campus and small commercial and residential areas directly below KCC. Water for this subsystem is supplied by 5 wells, summarized in **Table 20102-7b.**

Table 20102- 7b: DOW Puhi Subsystem Water Sources

WELL NAME	WELL NUMBER	PUMPING CAPACITY (gpm)	PRESSURE ZONE (ft)	PUMPAGE (mgd)
Puhi Well No. 1 (KCC Deep Well)	2-5824-001	200	510	0.00*
Puhi Well No. 3	2-5824-005	300	510	0.10
Puhi Well No. 4	2-5824-006	200	510	0.04
Puhi Well No. 5A	2-5824-008	400	510	0.21
Puhi Well No. 5B	2-5824-009	700	510	0.01

* Well currently inactive

There is one primary pressure zone (510') and two storage tanks for the Puhi subsystem.

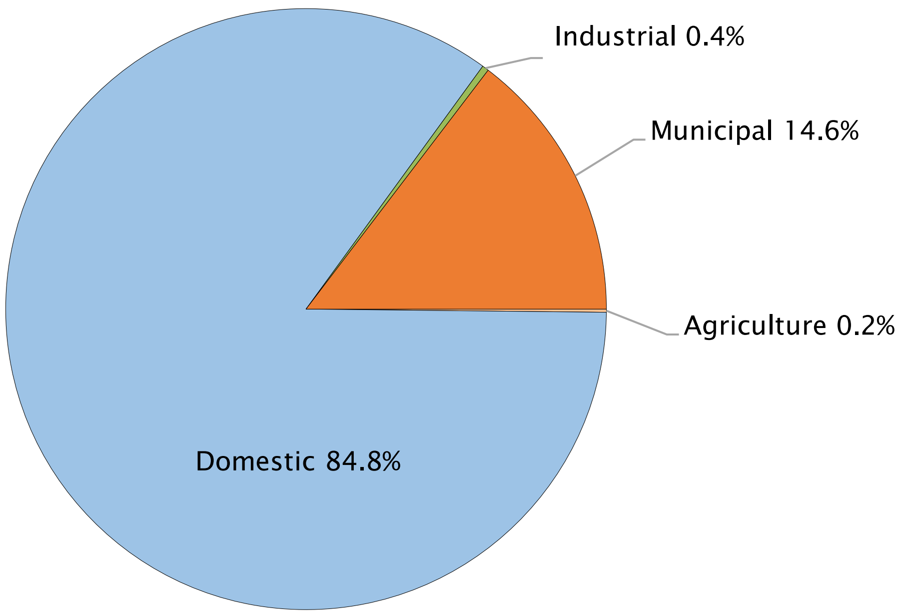
DOW Water Use by Category

DOW water use is subcategorized in **Table 20102-8** to the extent possible based on available meter data and is depicted in **Figure 20102-8**.

Table 20102-8: DOW Existing Water Use by Category – Hanamā'ulu ASYA

CWRM Water Use Category	DOW Metered Water Use (mgd)	Percent of Total
Agricultural	0.005	0.2
Domestic	2.402	84.8
Industrial	0.010	0.4
Military	0.000	0.0
Municipal	0.414	14.6
Total	**2.831**	**100.0**

Figure 20102-8: DOW Existing Water Use by Category – Hanamāʻulu ASYA



20102-3.7.2 State Water Systems

There are no State water systems in the Hanamāʻulu ASYA regulated by the DOH.

20102-3.7.3 Federal Water Systems

There are no Federal water systems in the Hanamāʻulu ASYA regulated by the DOH.

20102-3.7.4 Private-Public Water Systems

The Kāhili Mountain Park Water System (PWS 422) is the only private-public water system in the Hanamāʻulu ASYA regulated by the DOH. The water system is owned by Knudsen Trust and diverts water from Knudsen Trust's Kōloa water system (PWS 421), whose principal water source is Kāhili Tunnel #1. When water is diverted into the Kāhili Mountain Park tank, flow into the Kōloa water system stops entirely. The Kāhili Mountain Park water system is a non-transient, non-community water system that serves 150 people through 38 service connections and has average daily water consumption is 0.03 mgd.

20102-3.7.5 Per Capita Use

The per capita existing water use consumption based on domestic DOW metered water use and private-public water system use is presented in **Table 20102-9**. The per capita use in the Hanamāʻulu ASYA is approximately 15.8% lower than the overall County of Kauaʻi per capita use.

Table 20102-9: Per Capita Use – Hanamāʻulu ASYA

	DOW Metered Water Use – Domestic (mgd)	Private-Public Water System (mgd)	90% of 2015 Population	Per Capita Use (gpd)
Hanamāʻulu ASYA	2.402	0	14,698	163
County of Kauaʻi	**9.360**	**2.951**	**63,462**	**194**

20102-3.8 Existing Water Use by Resource

20102-3.8.1 Ground Water

Table 20102-10 summarizes the current production, sustainable yield (SY), and percentage of SY for the current production. Current production is represented by the 2014 average yield calculated from the actual pumping data.

Table 20102-10: Pumpage – Hanamāʻulu ASYA

Pumpage (mgd)	SY (mgd)	Pumpage Portion of SY
1.27	27	4.7%

Based on available information from the CWRM database, the current ground water use is 4.7 percent of the sustainable yield.

20102-3.8.2 Surface Water

The Kapaia Reservoir is the water source for the Grove Farm Waiahi Surface Water Treatment Plant (WTP). The WTP is rated for a capacity of 3 mgd and has a maximum production rate of 4 mgd. Currently, the WTP is typically set to produce 1700 gpm, or 2.45 mgd.

The Demello Reservoir is the water source for Grove Farm's non-potable irrigation line. Current demand is approximately 0.36 mgd.

Information on surface water use for agriculture is to be determined by the AWUDP.

20102-3.8.3 Water Conservation

Water conservation, including water loss management, may reduce water use. See **Section 20102-2.3** for existing conservation efforts.

20102-3.8.4 Rainwater Catchment

Developed parcels that are not supplied by ground water or surface water are assumed to be supplied by rainwater catchment.

20102-3.8.5 Recycled Water

Recycled wastewater from the three wastewater treatment facilities is used for golf course, landscape, and athletic field irrigation. Refer to **Table 20102-5** presented earlier.

20102-4 FUTURE WATER USE

20102-4.1 Full Build-Out Water Demand Projections

The full build-out water demand projections based on the General Plan and County Zoning for the Hanamāʻulu ASYA is listed in **Table 20102-11a** and **20102-12**, respectively. Each land use class is associated with the most appropriate CWRM water use category.

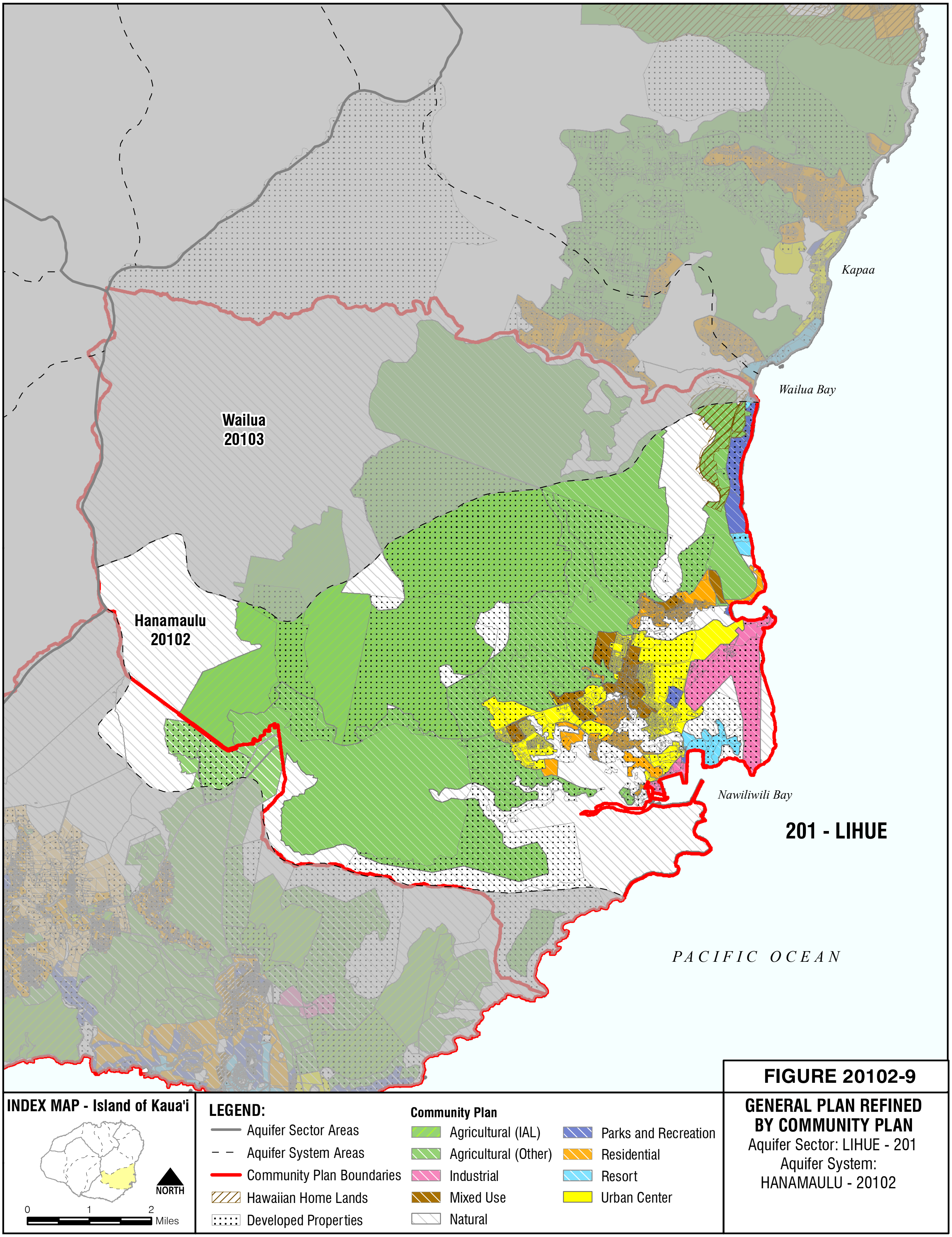
Table 20102-11a: General Plan Full Build-Out Water Demand Projection – Hanamāʻulu ASYA

General Plan Category	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	0.94
Open	Domestic	0.08
Military	Military	0.00
Park	Irrigation	1.36
Residential	Domestic/Municipal	3.64
Resort	Domestic/Irrigation/Municipal	3.51
Transportation	Municipal	0.00
Urban Center	Domestic/Industrial/Municipal	10.57
DHHL	Domestic	0.60
	TOTAL	**20.69**

The General Plan was further refined by replacing the portion of the General Plan that coincides with the Līhuʻe Community Plan and its associated demand with the Līhuʻe Community Plan and its associated demand as shown in **Figure 20102-9**. **Table 20102-11b** is the full build-out water demand projection based on the Līhuʻe Community Plan.

Table 20102-11b: Līhuʻe Community Plan Full Build-Out Water Demand Projection – Hanamāʻulu ASYA

Community Plan Category	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	0.00
Industrial	Industrial	0.00
Open	Domestic	0.00
Military	Military	0.00
Mixed Use	Domestic/Municipal	5.03
Park	Irrigation	1.40
Residential	Domestic/Municipal	3.95
Resort	Domestic/Irrigation/Municipal	0.18
Urban Center	Domestic/Industrial/Municipal	9.39
DHHL	Irrigation/Municipal	0.00
	TOTAL	**19.95**



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The full build-out water demand projection for the General Plan refined by the Līhuʻe Community Plan is 23.32 mgd. See calculation below:

(1) General Plan full build-out water demand projection = 20.69 mgd
(2) Portion of General Plan full build-out water demand projection that coincides with the Līhuʻe Communtiy Plan = 17.32 mgd
(3) Līhuʻe Community Plan full build-out water demand projection = 19.95 mgd

Refined General Plan full build-out water demand projection = (1) – (2) + (3)
= 20.69 – 17.32 + 19.95
= **23.32 mgd**

Estimated full build-out projected water demands for the Hanamāʻulu ASYA are summarized by zoning class in **Table 20102-12**.

Table 20102-12: Zoning Full Build-Out Water Demand Projection – Hanamāʻulu ASYA

Zoning Class	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	0.94
Commercial	Municipal	2.20
Industrial	Industrial/Municipal	5.03
Open	Domestic	0.08
Residential	Domestic/Municipal	4.83
Resort	Domestic/Irrigation/Municipal	1.61
DHHL	Domestic	0.60
	TOTAL	**15.29**

20102-4.1.1 Refined Land Use Based Water Projection

State Water Projects Plan

Table 20102-13 lists future State water projects reported in the 2021 SWPP update. The total projected demand to the year 2034 for these 10 State water projects within the Hanamāʻulu ASYA is 0.15 mgd, 0.09 mgd using potable and 0.06 mgd non-potable using potable sources.

Table 20102-13: Future State Water Projects – Hanamāʻulu ASYA

Project Name	State of Hawaiʻi Department	Primary Use	Water Development Strategy	2034 Demand (mgd)
Kauaʻi Community Correctional Center New Segregation Housing	DAGS (Planning Branch)	Potable	REMAIN	0.0030
Kauaʻi Community Correctional Center Restroom and Shower Improvements	DAGS (Planning Branch)	Potable	REMAIN	0.0045
Kauaʻi Community Correctional Center New Medium Security Housing	DAGS (Planning Branch)	Potable	REMAIN	0.0105
King Kaumualiʻi Elementary School Administration Building	DOE	Potable	REMAIN	0.0003
Līhuʻe 1 New School (Non-Potable using Potable)	DOE	Non-potable using Potable	REMAIN	0.0600
LIH ConRAC	DOT (Airport Div.)	Potable	REMAIN	0.0530
Nāwiliwili Hawaii Gas	DOT (Harbors Div.)	Potable	REMAIN	0.0101
Nāwiliwili Kauaʻi Petroleum Fuel Terminal	DOT (Harbors Div.)	Potable	REMAIN	0.0079
Kauaʻi Community College – Food Innovation Center	University of Hawaiʻi	Potable	REMAIN	0.0021
Kauaʻi Community College – Imu	University of Hawaiʻi	Potable	REMAIN	0.0021
			TOTAL REMAIN	0.1500
			TOTAL HANAMĀʻULU ASYA SWPP 2034 DEMAND	0.1500

As mentioned in **Section 2.2.2.5.1**, State water projects with the water development strategy of REMAIN are located within the service areas of County water systems which need to be coordinated with the respective County water departments. All 10 of the State water projects within the Hanamāʻulu ASYA were assigned the REMAIN water development strategy and results in a total 2034 demand of 0.1500 mgd. This accounts for 0.56 percent of the 27 mgd sustainable yield for the Hanamāʻulu ASYA.

State Department of Hawaiian Home Lands

A portion of DHHL's Wailua Tract is located within the Hanamāʻulu ASYA. The State Water Projects Plan – DHHL Update (SWPP), dated May 2017, discusses the projected water demands for DHHL and the proposed water development strategies to meet these water demands. According to the 2017 SWPP, the projected potable water demand for the portion of the Wailua Tract located within the Hanamā'ulu ASYA is 0.60 mgd. The 2017 SWPP suggests that this demand be met by a new State well in the Wailua ASYA.

The 2017 SWPP also discussed non-potable demands. It projects that non-potable demand for the Wailua Tract will be 0.34 mgd, and that the need will be met by the East Kaua'i Irrigation System.

Agricultural Water Use and Development Plan

The AWUDP dated 2003 (revised 2004) was limited in scope. More recent, comprehensive information on agricultural lands is available in the County of Kaua'i Important Agricultural Lands (IAL) Study.

In 2019, a public review draft of the AWUDP was released and it is anticipated that the next phase of the AWUDP will provide agricultural water demand projections in greater detail and will supersede information in the KWUDP when it becomes available.

County of Kaua'i Important Agricultural Lands Study

11,520 acres of agricultural lands within the Hanamā'ulu ASYA received a score of 28 or better in the County of Kaua'i Important Agricultural Lands (IAL) Study. Lands that receive a score of 28 or better were determined to have met all eight IAL criteria to some degree. Only a subset of lands with a score of 28 or better is expected to be designated as IALs. **Table 20102-14** compares these lands that received a score of 28 or better to the declared surface water use from diversions and to the diversified water use rate of 3,400 gallons per acre per day (gpad) estimated in the 2004 AWUDP.

Table 20102-14: Irrigation of Agricultural Lands

(1) Declared Surface Water Use from Diversions (mgd)	6.87
(2) Agricultural Lands with a Score ≥ 28 (Acres)	11,520
- How many acres can be sustained by **(1)** at a water rate of 3,400 gpad? (Acres)	2,021
- What percent of **(2)** can be sustained with a water rate of 3,400 gpad?	18%
- If all of **(2)** were to be irrigated, what is the water unit rate? (gpad)	596

In 2013, 11,206 acres of agricultural lands owned by Grove Farm Company, Inc. were designated as IAL and are located predominantly within the Hanamaulu ASYA. The IAL is served by rainwater and surface water. Grove Farm Company, Inc. noted that the area receives 60 to 100 inches of rainfall annually and is adequate for rain-fed production of many crops.

20102-4.1.2 Water Use Unit Rates

Water use unit rates are based on the *Water System Standards* (WSS), as discussed in Chapter 2.

The General Plan provides only broad density guidelines for residential and resort designations. For these designations, under the assumption that most residents would like their communities, including the development density, to remain similar in the future, the average number of dwelling units as allowed by zoning was used as the density (i.e., 7.41 dwelling units per acre for residential designation and 18.97 dwelling units per acre for resort designation).

20102-4.2 Water Demand Projections to the Year 2035

The following section presents water demand projections to the year 2035 for the Hanamāʻulu ASYA. The projected low, medium, and high growth rates are listed in **Table 20102-15** and are graphed in **Figure 20102-10**. Potable (domestic, industrial, municipal, and military water uses) and non-potable (irrigation) water demands are also differentiated.

Table 20102-15: Water Demand Projection – Hanamāʻulu ASYA

Water Use Category	Water Demand by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
GROWTH RATE C (HIGH)									
TOTAL	**4.42**	**4.51**	**4.60**	**4.69**	**4.78**	**4.87**	**5.35**	**5.85**	**6.36**
Potable	2.83	2.89	2.95	3.01	3.07	3.13	3.44	3.76	4.09
Non-Potable	1.59	1.62	1.65	1.68	1.71	1.74	1.91	2.09	2.27
GROWTH RATE B (MEDIUM)									
TOTAL	**4.42**	**4.51**	**4.60**	**4.69**	**4.78**	**4.87**	**5.35**	**5.85**	**6.35**
Potable	2.83	2.89	2.95	3.01	3.07	3.13	3.44	3.76	4.08
Non-Potable	1.59	1.62	1.65	1.68	1.71	1.74	1.91	2.09	2.27
GROWTH RATE A (LOW)									
TOTAL	**4.42**	**4.50**	**4.58**	**4.66**	**4.74**	**4.82**	**5.21**	**5.61**	**6.02**
Potable	2.83	2.88	2.93	2.98	3.03	3.08	3.33	3.59	3.85
Non-Potable	1.59	1.62	1.65	1.68	1.71	1.74	1.88	2.02	2.17

Figure 20102-10: Water Demand Projection Summary – Hanamāʻulu ASYA

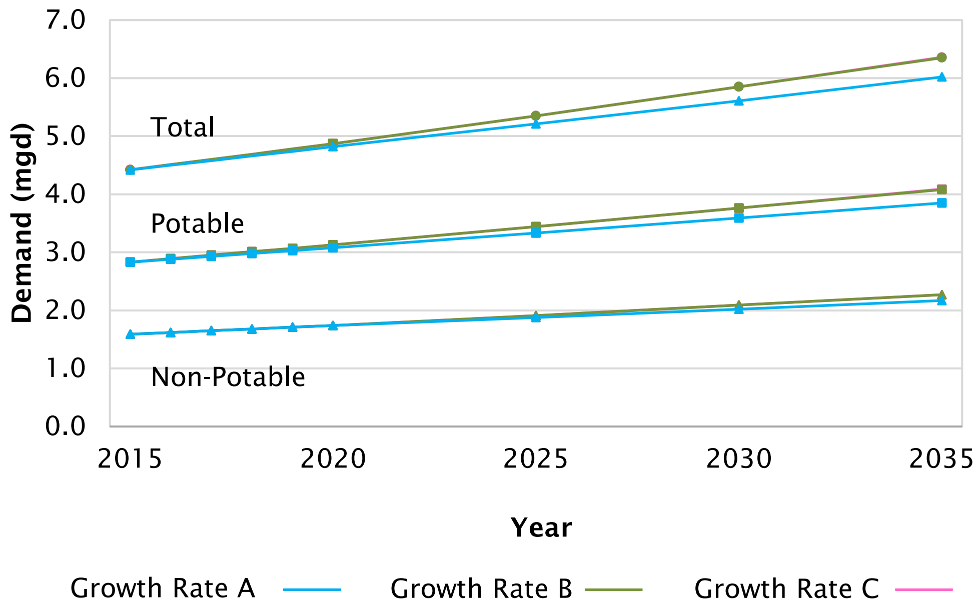


Figure 20102-11 shows the breakdown of water demand projections for a medium growth rate by CWRM categories through the year 2035. **Table 20102-16** summarizes this figure.

Figure 20102-11: Medium Growth Rate B Water Demand Projection by Category – Hanamā‘ulu ASYA

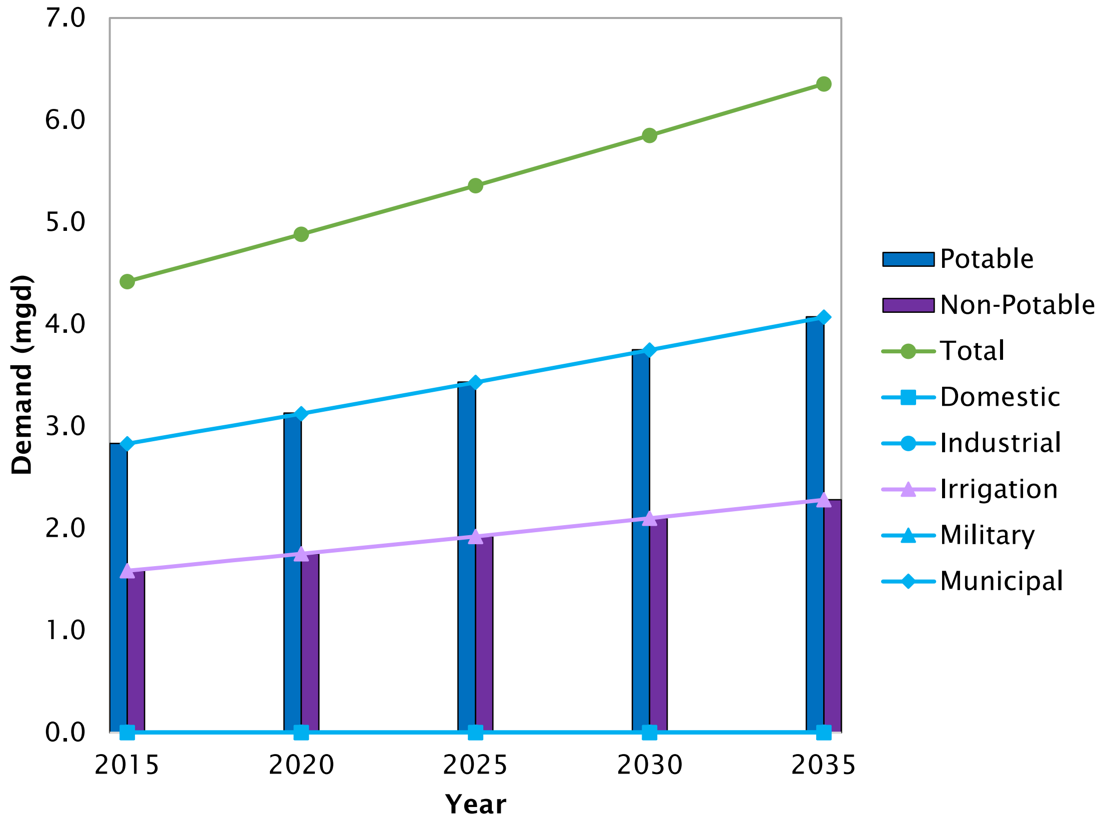


Table 20102-16: Medium Growth Rate B Water Demand Projection by Category – Hanamā‘ulu ASYA

Water Use Category	Water Use by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
Total	**4.42**	**4.51**	**4.60**	**4.69**	**4.79**	**4.88**	**5.36**	**5.85**	**6.35**
Potable	2.83	2.89	2.95	3.01	3.07	3.13	3.43	3.75	4.07
Non-Potable	1.59	1.62	1.65	1.68	1.72	1.75	1.92	2.10	2.28
Domestic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Irrigation	1.59	1.62	1.65	1.68	1.72	1.75	1.92	2.10	2.28
Military	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Municipal	2.83	2.89	2.95	3.01	3.07	3.13	3.43	3.75	4.07
DOW	2.83	2.89	2.95	3.01	3.07	3.13	3.43	3.75	4.07

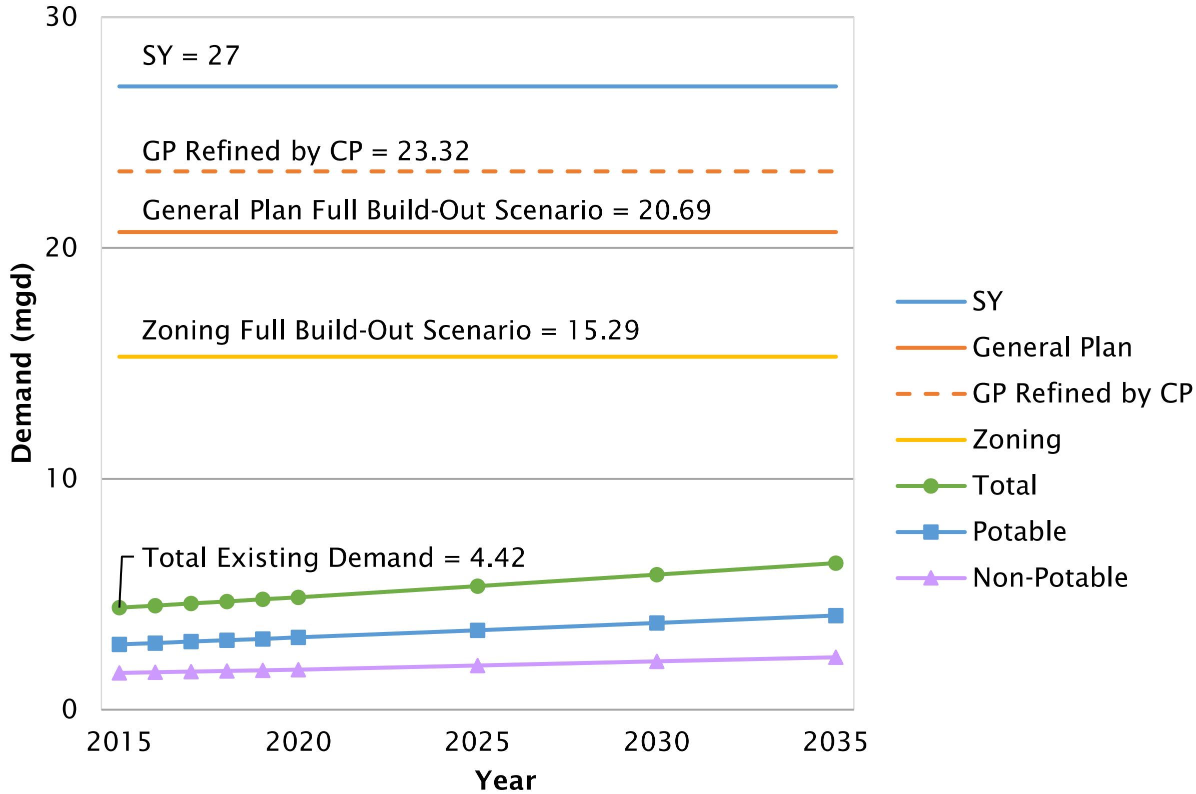
20102-4.3 Summary

Figure 20102-12 illustrates the magnitude of the sustainable yield, both General Plan and Zoning full build-out water use projections, and water use projection through the year 2035 focusing on Medium Growth Rate B. **Table 20102-17** summarizes the General Plan, Zoning, and 20-year water demand projection scenarios for the Hanamāʻulu ASYA. The sustainable yield is presented to draw comparisons. All demands are in mgd.

Table 20102-17: Summary of Demand Projections

SY (mgd)	FBO (mgd)		Medium Growth Rate Demand by Year (mgd)								
	GP	Zoning	2015	2016	2017	2018	2019	2020	2025	2030	2035
27	20.69	15.29	4.42	4.51	4.60	4.69	4.79	4.88	5.36	5.85	6.35

Figure 20102-12: Medium Growth Rate B Water Demand Projections and Full Build-Out – Hanamāʻulu ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use. For future agricultural water use analysis, please see Section 20102-4.1.1 County of Kaua'i Important Agricultural Lands Study.

20102-5 RESOURCE AND FACILITY RECOMMENDATIONS

20102-5.1 Water Source Adequacy

20102-5.1.1 Full Build-Out

Development to the highest extent allowed by the General Plan and County Zoning within the Hanamāʻulu ASYA is sustainable, with General Plan and County Zoning full build-out water demands requiring 77 and 57 percent of the 27 mgd sustainable yield (SY), respectively.

20102-5.1.2 Twenty-Year Projection

The 2035 water demand projection for the Hanamāʻulu ASYA is sustainable, requiring only 24 percent of the 27 mgd sustainable yield.

20102-5.2 Source Development Requirements

20102-5.2.1 Supply-Side Management

Supply-side management, including conventional water resource measures, water conservation, and alternative water resource measures, were evaluated to meet projected water demands.

Conventional Water Resource Measures

Ground Water

The Hanamāʻulu ASYA contains basal, perched, and high level ground water resources. Most reported pumpage is from the perched zone, followed by from the basal zone. Little to no high level water is removed.

The 2035 water demand projection for the Hanamāʻulu ASYA is only 24 percent of the 27 mgd sustainable yield. This indicates that theoretically, more water could be pumped from the aquifer without impairing the utility or quality of the water resource if wells are optimally placed and the proper due diligence with regard to traditional and customary rights and impacts has been completed. However, it is noted that the sustainable yield does not consider the feasibility of developing the ground water resources, and that the safe yield of an individual production well may be limited by localized ground water behavior near the well as a result of pumpage. As discussed in **Section 20102-2.1**, ground water levels in the Līhuʻe Basin showed declining trends in the late 1990s and early 2000s. The declines in water level resulted in diminished productivity of some wells and tunnels and generated concern about the future reliability of ground water resources. Water supply reliability and quality, feasibility, environmental and cultural impacts, and water rights shall be considered as projects and programs develop. More detailed and site-specific evaluation of these impacts shall be required and accomplished through the environmental review process (HRS Chapter 343) for source development projects and programs utilizing public funding, and CWRM could consider requiring compliance with the environmental review process for private source development projects and programs also. **Section 1.5.3.1** provides additional information regarding the protection of traditional and customary rights.

The DOW's Puhi-Līhuʻe-Hanamāʻulu system serves Hanamāʻulu, the port complex at Nāwiliwili and the adjoining Niumalu residences, Kauaʻi High School and Chiefess Kamakahelei Middle School, Wilcox Hospital, Līhuʻe Airport, and the surrounding residential, commercial, and industrial communities/districts. This system will need to accommodate growth as the Līhuʻe Planning District is expected to accommodate nearly half of Kauaʻi's population growth through 2035. The DOW's Water Plan 2020 identified water supply projects to meet the growing demand of its service areas. For DOW's Puhi-Līhuʻe- Hanamāʻulu system, several well projects were proposed and completed. The completed wells are included in **Table 20102-7a** and **Table 20102-7b**. A project to drill and develop horizontal wells was also proposed, but the project is currently on hold indefinitely. As demand continues to grow, additional water sources will need to be identified. DOW will need to consider the past well productivity concerns mentioned above if additional ground water wells are considered. Further study and monitoring may assist in determining if more ground water development is viable.

The DOW's Water Plan 2020 also identified potential storage and distribution system upgrades. As a result of the Water Plan 2020, a number of existing tanks in the Puhi-Līhuʻe-Hanamāʻulu system were rehabilitated, and a few water mains were replaced. An additional fifteen water main replacement projects are proposed, including replacement of a 16-inch water main in Kūhiō Highway that is currently being designed.

Surface Water

The Hanamāʻulu ASYA has 39 declared diversions. Until permanent instream flow standards are established, interim instream flow standards have been adopted. According to Section 13-169-46, Hawaiʻi Administrative Rules, "Interim Instream Flow Standard for all streams on Hawaiʻi, as adopted by the commission on water resource management on June 15, 1988, shall be that amount of water flowing in each stream on the effective date of this standard, and as that flow may naturally vary throughout the year and from year to year without further amounts of water being diverted offstream through new or expanded diversions, and under the stream conditions existing on the effective date of the standard, except as may be modified [by the commission]." Therefore, for the purposes of assessing surface water availability, it is assumed that no additional diversions will be allowed without amendment of the interim IFS.

The existing declared diversions have the potential to meet additional demands. However, a challenge with developing surface water is transmission of these resources from source to location of need. Farmers generally grow what is feasible for the area; therefore, it is anticipated that agricultural water use will follow the availability of irrigation water. Increase in the availability of surface water would likely promote additional usage and could thereby minimize ground water being used for irrigation.

There are a few existing irrigation systems in the Hanamāʻulu ASYA, including the East Kauaʻi Irrigation System (EKIS) and the Upper and Lower Haʻikū Ditch system. Due to the cessation of sugarcane cultivation, many of these irrigation systems may not be functioning as efficiently as they once were. The Agricultural Water Use and Development Plan (AWUDP) should include an inventory of large irrigation systems and provide information on their rehabilitation and maintenance needs. The AWUDP should also include a more detailed assessment of agricultural water demand projections that will supersede information in the KWUDP when it becomes available.

Surface water in the Hanamāʻulu ASYA also serves potable uses due to difficulties with ground water well production in the area. The Kapaia Reservoir is the water source for the Waiahi Surface Water Treatment Plant. Expansion of the surface water treatment plant is proposed by Grove Farm to meet the projected demands of its Līhuʻe-Hanamāʻulu Master Planned Community.

Water Transfer

Some existing irrigation systems have the capability to transfer surface water to adjacent ASYAs. The AWUDP should study irrigation system services areas and provide information on irrigation systems' water transfer.

Water can also be transferred between ASYAs through public water systems. The DOW's Līhuʻe-Hanamāʻulu subsystem, located completely within the Hanamāʻulu ASYA, is interconnected with the DOW's Wailua-Kapaʻa subsystem, which services areas in the Hanamāʻulu ASYA, Wailua ASYA, and Anahola ASYA. Currently, there is some water transfer from the Līhuʻe-Hanamāʻulu subsystem to the Wailua-Kapaʻa subsystem. Flow between these subsystems is regulated by a valve. In the past, water from the Wailua-Kapaʻa subsystem was boosted into the Līhuʻe-Hanamāʻulu system by the Hanamāʻulu Booster Station. To meet future demands, DOW could utilize the interconnection between these two subsystems to transfer any surplus supply from one system to the other.

Water Conservation

The per capita use in the Hanamāʻulu ASYA is approximately 15.8% lower than the overall County of Kauaʻi per capita use. There are no ASYA-specific conservation measures in place at this time; however, there are general water conservation programs that are described in **Section 1.5.7**. Water conservation, including water loss management, can increase the amount of water available and help to ensure the long-term viability of water resources.

Alternative Water Resource Measures

Rainwater Catchment

Rainwater can be utilized as a water resource in several ways.

Rainwater can be harvested in rainwater catchment systems which can be utilized to supply domestic potable water needs. These systems are viable in areas that receive abundant rainfall and are a suitable source of potable water for individual domestic users in areas outside the limits of municipal water systems. Generally, these are remote areas and are not expected to expand significantly because most development is anticipated to be concentrated within existing urban areas. Therefore, use of rainwater catchment systems is not anticipated to increase significantly.

Rainwater can also be used to supplement or satisfy agricultural non-potable water needs through ambient rainfall.

See the Storm Water Reuse section below to see how rainwater as storm water runoff can be reclaimed and reused.

Storm Water Reuse

Rainfall can turn into storm water runoff. Storm water runoff from impervious surfaces in urban areas can be significant. This water could be captured, treated, and used as a source of non-potable water (e.g., irrigation), integrated with recycled water, or even as potable and/or non-potable ground water recharge. However, due to the lack of storm water reuse standards, the high initial infrastructure costs, and the treatment requirements, storm water reclamation and reuse on a small or large scale may not be feasible and requires further assessment as noted in the Water Resource Protection Plan.

The U.S. Department of the Interior, Bureau of Reclamation published An Appraisal of Stormwater Reclamation and Reuse Opportunities in Hawaiʻi (Storm Water Report) in 2008 that identified two areas in the Hanamāʻulu ASYA that has the opportunity to use storm water reclamation and reuse:

1) Nāwiliwili Diversion
2) Līhuʻe Airport

The Nāwiliwili Diversion opportunity involves diverting storm water before or after entering Nāwiliwili Stream for the purposes of recharging ground water and reducing the pollutant levels in Hanamāʻulu Bay and the impaired waters of Nāwiliwili Stream and Bay. Diversion structures, surface spreading basins or infiltration trenches, and pipelines will need to be constructed with the assistance and cooperation from the KDOW, KDPW, DOH, and CWRM. Permits would also need to be obtained from the CWRM for the Nāwiliwili Stream diversion(s). The Storm Water Report estimated this opportunity would cost $2.8 million (2008 dollars).

The Līhuʻe Airport opportunity involves collecting storm water runoff from the Līhuʻe Airport for ground water recharge and reuse as irrigation of the airport green space and the Hōkūala Golf Course. A storm water conveyance system and recharge trench will need to be constructed with the assistance and cooperation from the DOT Airports Division and Hōkūala Golf Course. The Storm Water Report estimated this opportunity would cost $13.9 million (2008 dollars) and was indicated to be less feasible than the Nāwiliwili Diversion opportunity.

Recycled Water

Recycled water is a valuable resource; an increase in its use may lower the dependence on potable sources. There are three wastewater reclamation facilities (WWRFs) in the Hanamāʻulu ASYA. Līhuʻe WWRF and Līhuʻe-Puhi WWTP produces R-1 water; Wailua WWRF produces R-2 water. Comparing the current reuse amount to the design capacity of each facility, it appears that there is recycled water available to meet additional demands, see **Table 20102-18** below. However, the actual additional recycled water use will depend on several factors, including the quantity of wastewater generated (which may be significantly less than the design capacity), the demand for recycled water, and the number of viable users within close proximity to the facility.

Table 20102-18: Wastewater Reclamation Facilities Available Capacity – Hanamāʻulu ASYA

WWRF/ WWTP	Recycled Water Classification	Design Capacity (mgd)	Quantity Produced (mgd)	Current Reuse Amount (mgd)	Available Capacity (mgd)
Līhuʻe WWRF	R-1	2.5	1.2	0.79	1.71
Līhuʻe-Puhi WWTP	R-1	1.0	0.4	0.37	0.63
Wailua WWRF	R-2	1.5	0.5	0.19	1.31

Desalination

Desalination of brackish ground water is a potential alternative; however, due to its high capital and operational costs, it likely would not be considered when other potable water sources are readily available.

20102-5.2.2 Demand-Side Management

Development Density Control

The full build-out demand for the Hanamāʻulu ASYA based on County Zoning is 15.29 mgd, which is 57 percent of the sustainable yield. This indicates that there are adequate water resources to sustain the level of development that is allowed by law. In the Hanamāʻulu ASYA, the average number of dwelling units allowed by County Zoning is 7.41 dwelling units per acre in residential districts and 18.97 dwelling units per acre in resort districts.

The full build-out demand for the Hanamāʻulu ASYA based on the General Plan is 20.69 mgd which is 77 percent of sustainable yield. The full build-out demand based on the General Plan refined by the Līhuʻe Community Plan is 22.73 mgd, which is 84 percent of sustainable yield. Although it is highly unlikely that full build-out will occur within the time frame of these plans, these full build-out demands are sustainable; there are adequate water resources to sustain the long-range land use vision for this area. Therefore, development density control may not be necessary. However, the County Planning Department could consider development density control for areas where there is the flexibility to do so, such as areas that are not yet zoned as residential or resort, and promote sustainable development. Further, it is noted that these full build-out scenarios are unlikely to occur since it assumes all land is developed to maximum extent.

Nevertheless, with full build-out demand based on the General Plan and the General Plan refined by the Līhuʻe Community Plan at 77 and 84 percent of sustainable yield, respectively, the County Planning Department should promote sustainable development and exercise caution when making land use decisions that cannot easily be undone. Development density control could be considered for areas where there is the flexibility to do so, such as areas that are not yet zoned as residential or resort. Growth beyond the vision of the General Plan and Līhuʻe Community Plan may be possible, but impacts on water resources should be considered and reevaluated.

20102-5.3 Recommended Alternatives

To optimize appropriate use of water resources, the quality of the water source should be matched to the quality of the water required. The highest quality of water shall be reserved for the most valuable end use. Potable water is considered the highest quality water, and the sustenance of life is the most valuable end use. Recycled water, brackish water, untreated surface water, and other lower quality water sources should be used for landscaping and agriculture when available, thereby reserving potable water for human consumption. If there is a practical alternative water source available, that alternative source should be used in lieu of ground water or surface water. With this in mind, the following recommendations are made for the Hanamāʻulu ASYA:

Alternative Water Resources

Alternative water sources, such as recycled water generated from wastewater reclamation facilities, should be used where available to reduce demands on both ground and surface water resources and to conserve water resources as a whole. Recycled water is available from the Līhuʻe WWRF, Līhuʻe-Puhi WWTP, and Wailua WWRF; however, as discussed previously, successfully increasing use of recycled water is dependent on several factors, including the number of viable users within close proximity to the facilities.

Conservation

Water resources are a finite resource that should be managed and used wisely. It should be conserved and not wasted. Implementation of conservation measures should continue to be encouraged.

Ground Water

Ground water is typically the preferred source for drinking water and for meeting other potable water needs. However, developing ground water in this area has been difficult historically, and there have been concerns about the future reliability of ground water resources. Further study and monitoring could assist in determining if more ground water development is viable to meet potable water demands. In addition, environmental and cultural impacts and water rights shall be considered as projects and programs develop.

Development of ground water resources, where feasible, is the primary strategy to serve future potable demands in the Hanamāʻulu ASYA. However, as noted above, there has historically been difficulty with developing ground water in this area.

Surface Water

Surface water requires treatment before being used to meet potable water needs. One source for the DOW's Līhuʻe-Hanamāʻulu subsystem is surface water that is treated at the Waiahi Surface Water Treatment Plant and purchased by DOW. Expansion of the surface water treatment plant is proposed by Grove Farm to meet the projected demands of its Līhuʻe-Hanamāʻulu Master Planned Community.

Due to well productivity concerns, development of surface water resources is the secondary strategy to serve future potable demands in the Hanamāʻulu ASYA.

Surface water, where available, should be used to meet non-potable demands if alternative water resources are not available. To achieve this, it will be critical to maintain and improve existing irrigation systems. Making surface waters more readily available to meet non-potable water demands has the potential to minimize future dependence on the use of ground water. It is therefore recommended that the AWUDP provide information on the rehabilitation and maintenance needs of large irrigation systems.

Demand-Side Management

Full build-out demand based on the General Plan and the General Plan refined by the Līhuʻe Community Plan are 77 and 84 percent of sustainable yield, respectively. At these projections, implementation of development density control by the County Planning Department is not needed since it is highly unlikely that full build-out will occur within the time frame of these plans.

Although these projections are sustainable, the County Planning Department should exercise caution and consider potential impacts on available water resources when considering any future zoning modifications. Modifications that may result in increased development density within the area will increase demands on water resources.

Chapter 20103

Wailua Aquifer System Area

CHAPTER 20103 - TABLE OF CONTENTS

FIGURES

TABLES

20103 WAILUA AQUIFER SYSTEM AREA

20103-1 SYSTEM AREA PROFILE

20103-1.1 General

The Wailua [20103] Aquifer System Area (ASYA) is roughly bound on the east by the Pacific Ocean, and roughly along the south by the South Fork Wailua River. The northwest boundary approximately follows along the south ridge above the Hanalei River to the Makaleha Mountains and the northern boundary extends along the ridge on the south side of Konohiki Stream.

The Wailua AYSA includes the Wailua River and encompasses most of the Wailua Homesteads subdivision.

Average annual rainfall ranges from about 46 inches per year along the coast to about 380 inches in the mountains. The sustainable yield is 51 mgd.

20103-1.2 Economy and Population

20103-1.2.1 Economy

Developed areas within the Wailua ASYA are primarily residential neighborhoods located within the makai half of the ASYA. Small business areas within the Wailua ASYA are primarily located along the shoreline area. The largest industries in Wailua are accommodation and food service, healthcare and social assistance, and educational services.

20103-1.2.2 Population

Historical population data for the Wailua ASYA is summarized in **Table 20103-1**. Population projections are summarized through the year 2035 in **Table 20103-2a**. As shown in **Table 20103-2b**, it is estimated that the area will continue to experience growth rates between 4 and 8 percent per decade.

Table 20103-1: Historical Population – Wailua ASYA

	Year		
	1990	2000	2010
Population	4,094	4,749	5,038
Percent Change		16.0	11.8

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report.
Data redistributed and evaluated for Wailua ASYA.

Table 20103-2a: Population Projection – Wailua ASYA

Growth Rate	Population by Year								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
A – Low	5,432	5,454	5,476	5,498	5,521	5,544	5,665	5,795	5,935
B – Med.	5,474	5,511	5,549	5,588	5,627	5,667	5,878	6,106	6,355
C – High	5,481	5,521	5,561	5,603	5,645	5,688	5,914	6,159	6,428

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report. Data redistributed and evaluated for Wailua ASYA.

Table 20103-2b: Population Projection – Percent Change – Wailua ASYA

Growth Rate	2015-2025 % Change	2025-2035 % Change
A – Low	4.3	4.8
B – Medium	7.4	8.1
C – High	7.9	8.7

20103-1.3 Land Use

20103-1.3.1 2000 Kauaʻi General Plan

The 2000 Kauaʻi County General Plan Land Use Designation Map for the Wailua ASYA is shown on **Figure 20103-1**. The estimated land use allocation acreage for each land use designation within the system area is listed in **Table 20103-3**.

Table 20103-3: General Plan Estimated Land Use Allocation Acreage – Wailua ASYA

General Plan Land Use Designation	Acreage	Percent of Total
Agricultural	5,818	18.0
Military	0	0.0
Open	25,521	78.8
Park	7	0.0
Residential Community	871	2.7
Resort	23	0.1
Transportation	0	0.0
Urban Center	0	0.0
DHHL	145	0.4
TOTAL	**32,386**	**100.0**

20103-1.3.2 Kauaʻi Zoning

Kauaʻi County Zoning Map for the Wailua ASYA is shown on **Figure 20103-2**. The estimated land use allocation acreage for each zoning district within the system area is listed in **Table 20103-4**.

Table 20103-4: County Zoning Estimated District Allocation Acreage – Wailua ASYA

Zoning District	Acreage	Percent of Total
Agriculture	9,011	26.5
Commercial – General	0	0
Commercial - Neighborhood	0	0.0
Conservation	22,746	66.7
Industrial – General	0	0.0
Industrial - Limited	0	0.0
Open	1,302	3.8
Residential	613	1.8
Resort	0	0.0
Project Development	0	0.0
Special Planning Area	0	0.0
Special Treatment	0	0.0
No Zoning	384	1.1
DHHL	24	0.1
TOTAL	**34,079**	**100.0**

The number of dwelling units allowed in residential and resort districts varies by the type of residential or resort district. The average number of dwelling units allowed in residential districts in the Wailua ASYA is 3.08 dwelling units per acre.

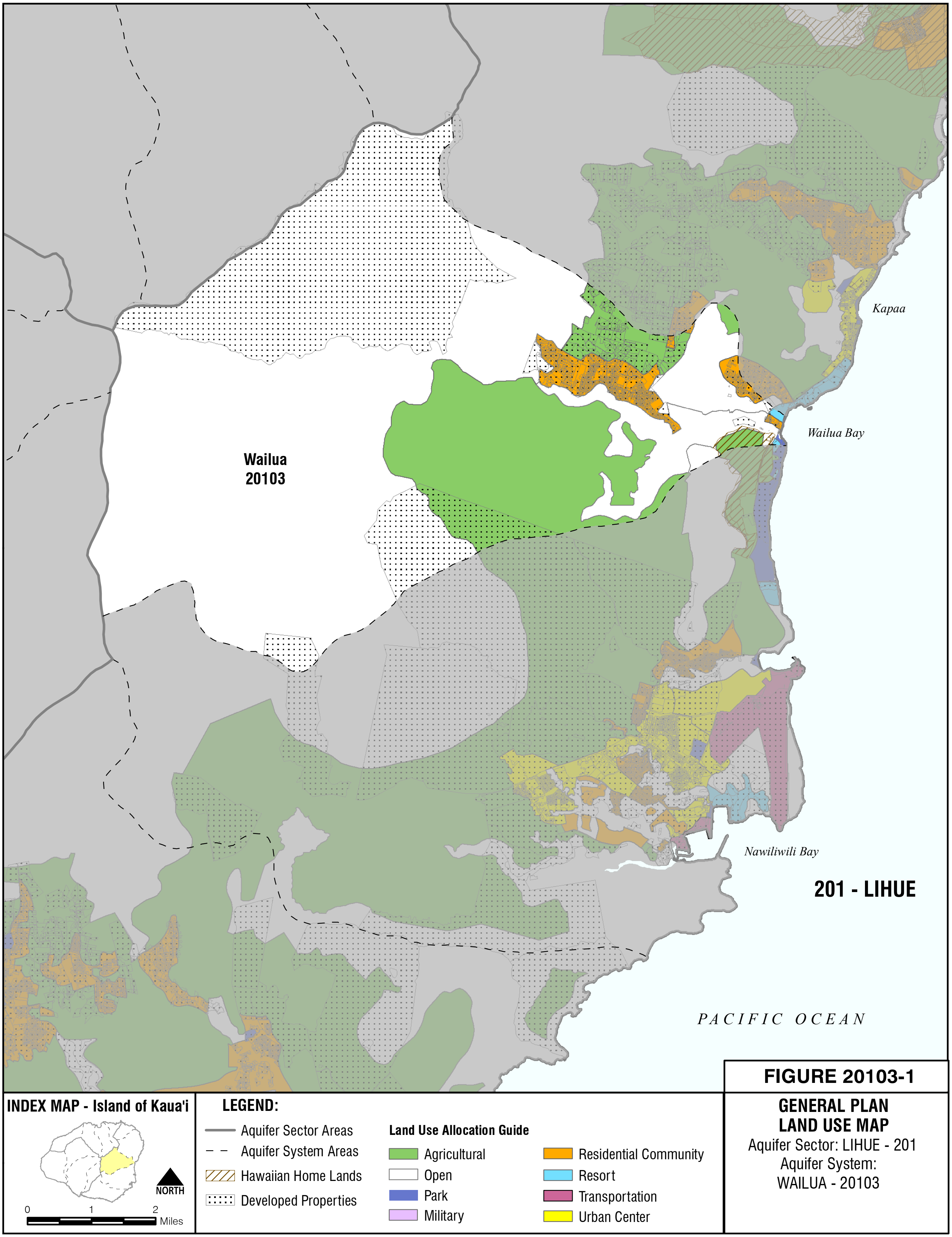


FIGURE 20103-1

GENERAL PLAN LAND USE MAP

Aquifer Sector: LIHUE - 201

Aquifer System: WAILUA - 20103

Fukunaga & Associates, Inc.
Consulting Engineers

Kaua'i County - Department of Water

KAUA'I WATER USE AND DEVELOPMENT PLAN UPDATE

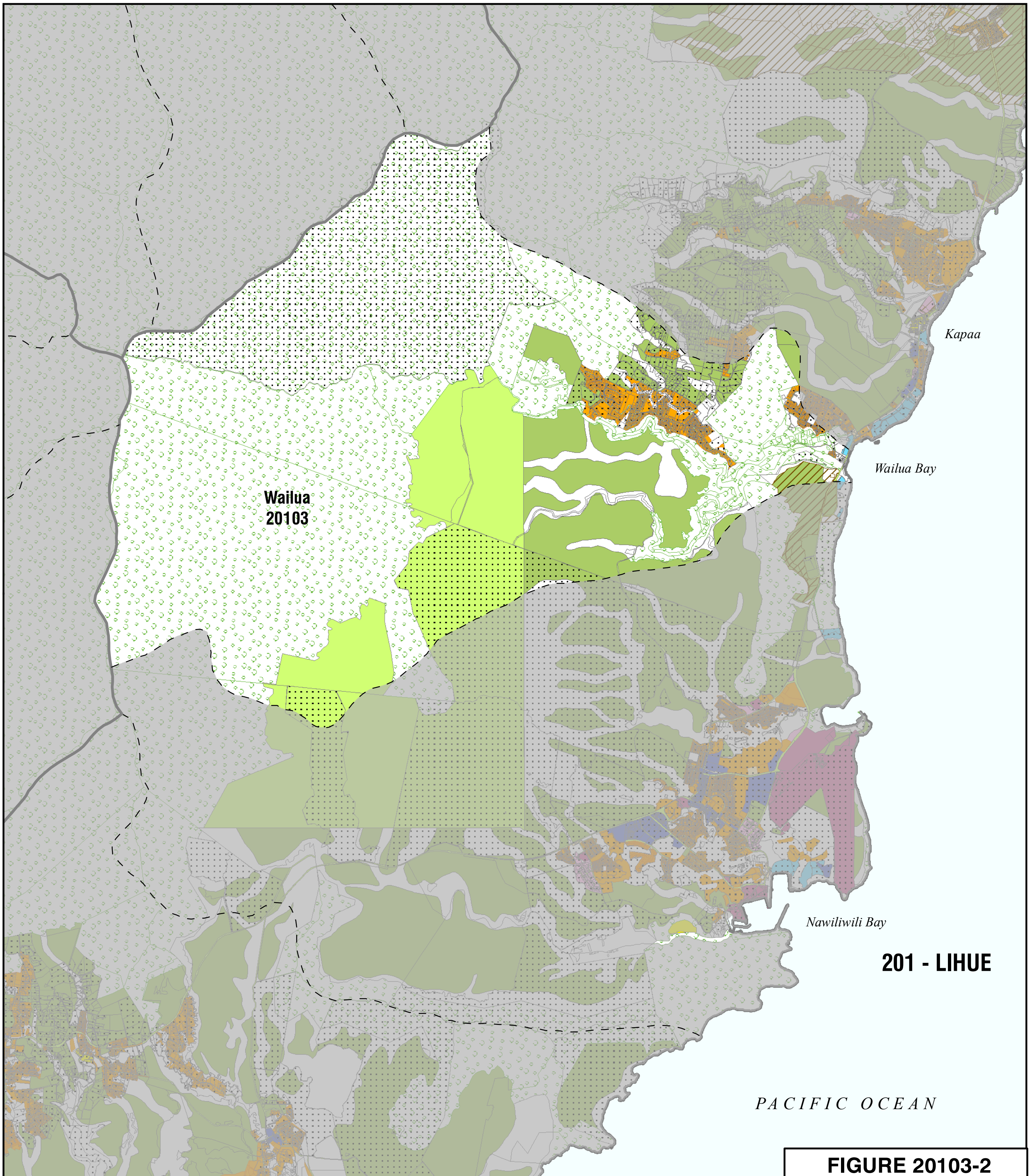
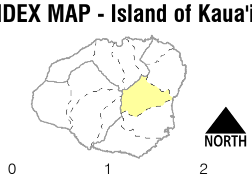


FIGURE 20103-2

COUNTY ZONING

Aquifer Sector: LIHUE - 201
Aquifer System:
WAILUA - 20103

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- Hawaiian Home Lands
- Developed Properties

Zoning Designations:

- Agriculture
- Commercial - General
- Commercial - Neighborhood
- Conservation
- Industrial - General
- Industrial - Limited
- No Zoning
- Open
- Residential
- Resort
- Special District

20103-2 EXISTING WATER RESOURCES

20103-2.1 Ground Water

The Wailua ASYA has a sustainable yield of 51 mgd. According to the 2014 CWRM database, there are 9 production wells in the system, 5 municipal, 2 domestic, 1 irrigation, and 1 well with a use type of "other". There are also 5 wells drilled and categorized as "unused". Refer to **Appendix A** for the 2014 database. **Figure 20103-3** shows the well locations.

Ground water levels in the Līhu'e Basin showed declining trends in the late 1990s and early 2000s. The declines in water level resulted in diminished productivity of some wells and tunnels and generated concern about the future reliability of ground water resources. Due to these concerns, the U.S. Geological Survey (USGS) in cooperation with the County of Kaua'i Department of Water (DOW) developed reports on the effects of irrigation, drought, and ground water withdrawals on ground water recharge and ground water levels in the Līhu'e Basin.

A report titled "Effects of Irrigation and Rainfall Reduction on Ground-Water Recharge in the Līhu'e Basin, Kaua'i, Hawai'i" by Scot K. Izuka, Delwyn S. Oki, and Chien-Hwa Chen found that the effect of drought was greater than the effect of reduced irrigation on ground water recharge. However, the report also noted that the effects of droughts are temporary conditions whereas decreases in irrigation may be permanent and have a greater long-term effect.

20103-2.2 Surface Water

The Wailua River is the only stream classified as perennial in the Wailua ASYA, and is considered continuous. The USGS does not have any active surface water gages in the system area.

In accordance with the Code, the CWRM must establish and administer instream flow standards (IFS) on a stream-by-stream basis as necessary to protect public interests. IFS is defined as "a quantity or flow of water or depth of water which is required to be present at a specific location in a stream system at certain specified times of the year to protect fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses." Considerably more research and study need to be completed to accumulate the data and perspective necessary to conduct a thorough and meaningful assessment of IFS. Until permanent IFS are established, interim IFS have been adopted. The interim IFS are defined as the amount of water flowing in each stream at the time the administrative rules governing them were adopted in 1988 and 1989. In order to assess surface water sustainability, this KWUDP assumes that no additional diversions will be allowed from any stream without amendment of the interim IFS.

There are 30 declared stream diversions in the Wailua ASYA identified in the CWRM database shown on **Figure 20103-4**, which accounts for 10 percent of the 292 declared stream diversions on the island. The declared stream diversions are listed in **Appendix B**. The total declared flow for the Wailua ASYA is 7.56 mgd.

The East Kaua'i Irrigation System (EKIS) is a complex system of interconnecting ditches, tunnels, flumes, and reservoirs and consists of three sections: the Kapa'a Section, the Kālepa Section, and the Hanamā'ulu-Līhu'e Section. The Kapa'a Section is primarily located in the Anahola ASYA and will therefore be discussed in **Section 20104**. The Kālepa Section and Hanamā'ulu-Līhu'e Section are primarily located in the Hanamā'ulu ASYA and will therefore be discussed in **Section 20102**.

20103-2.3 Water Conservation

Water conservation increases the amount of water available and helps to ensure the long-term viability of water resources. Water conservation measures for this ASYA are as described in **Section 1.5.7** of this report. There are no ASYA specific special conservation measures in place at this time.

20103-2.4 Rainwater Catchment

Rainwater catchment is a viable resource for areas that are not served by ground water or surface water. **Figure 20103-5** shows the possible catchment areas, or parcels with a building value greater than $20,000 and assumed to be developed but without a ground water or surface water source.

20103-2.5 Recycled Water

There are no wastewater reclamation facilities in the Wailua ASYA.

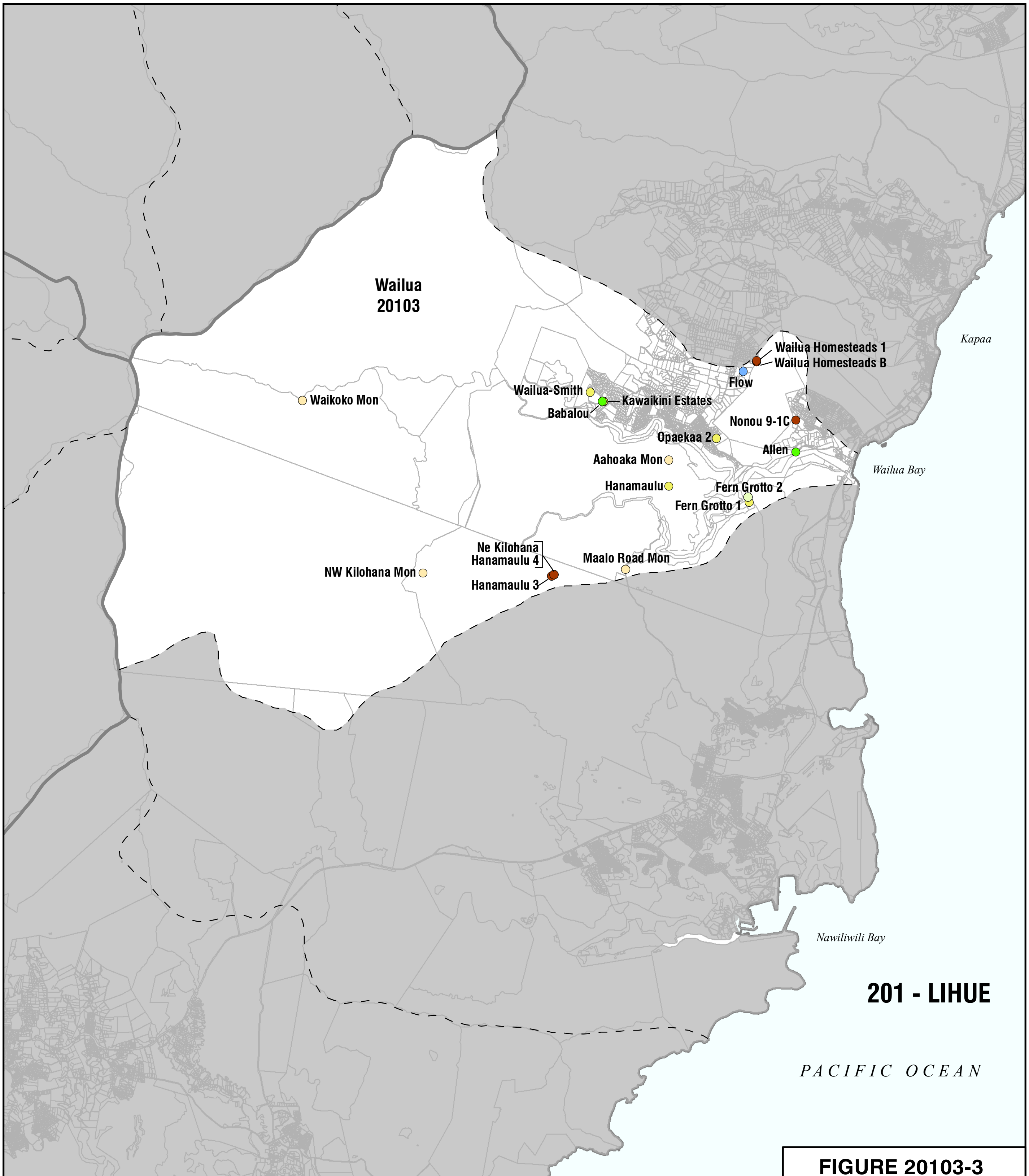
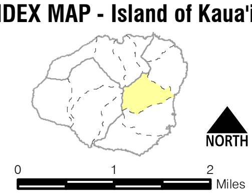


FIGURE 20103-3

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- TMK

Well Use Types

- Abandoned
- Agriculture
- Domestic
- Industrial
- Irrigation
- Military
- Municipal
- Observation
- Other
- Unused

WELL LOCATION

Aquifer Sector: LIHUE - 201
Aquifer System:
WAILUA - 20103

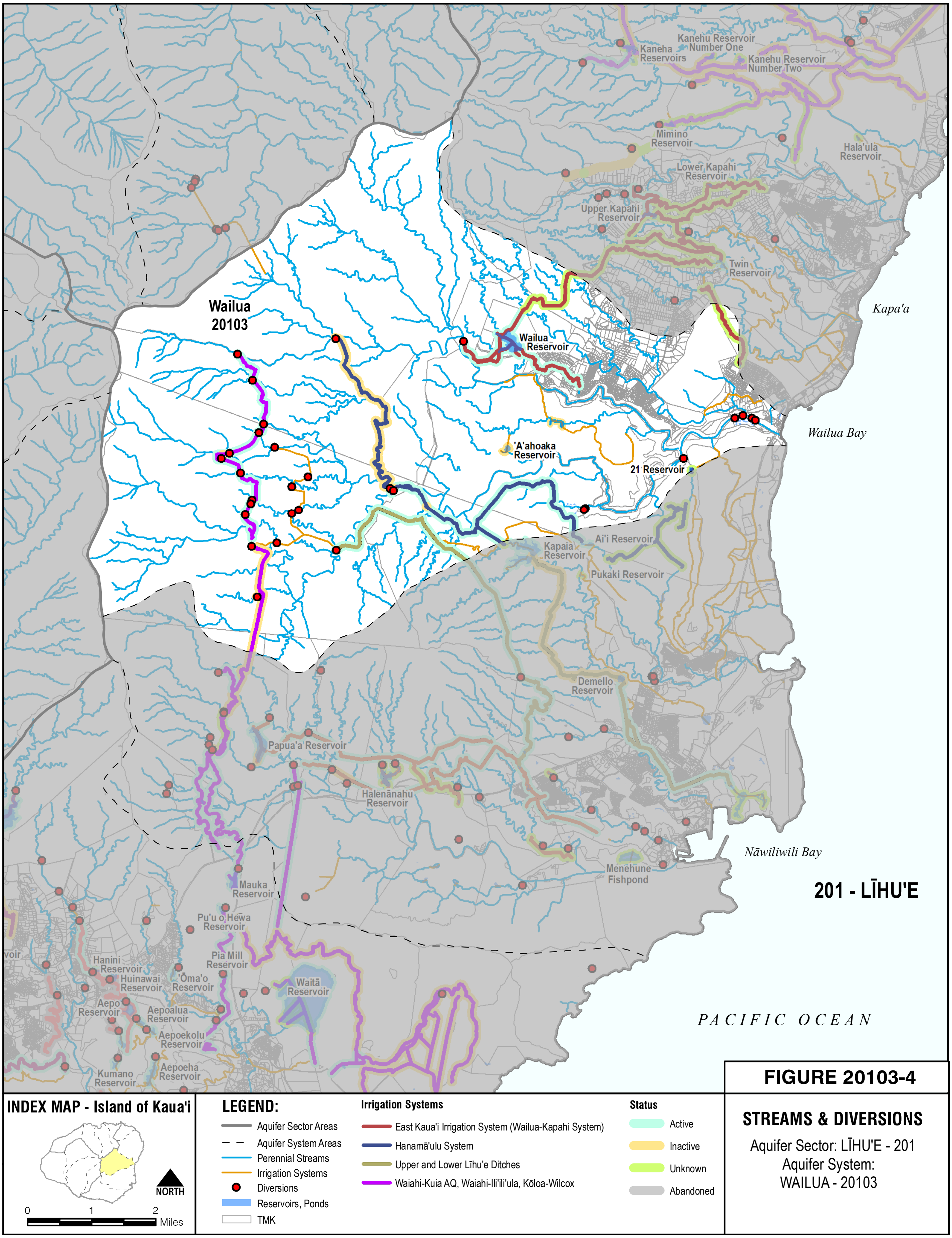


FIGURE 20103-4

STREAMS & DIVERSIONS

Aquifer Sector: LĪHU'E - 201
Aquifer System:
WAILUA - 20103

Fukunaga & Associates, Inc.
Consulting Engineers

Kaua'i County - Department of Water

KAUA'I WATER USE AND DEVELOPMENT PLAN UPDATE

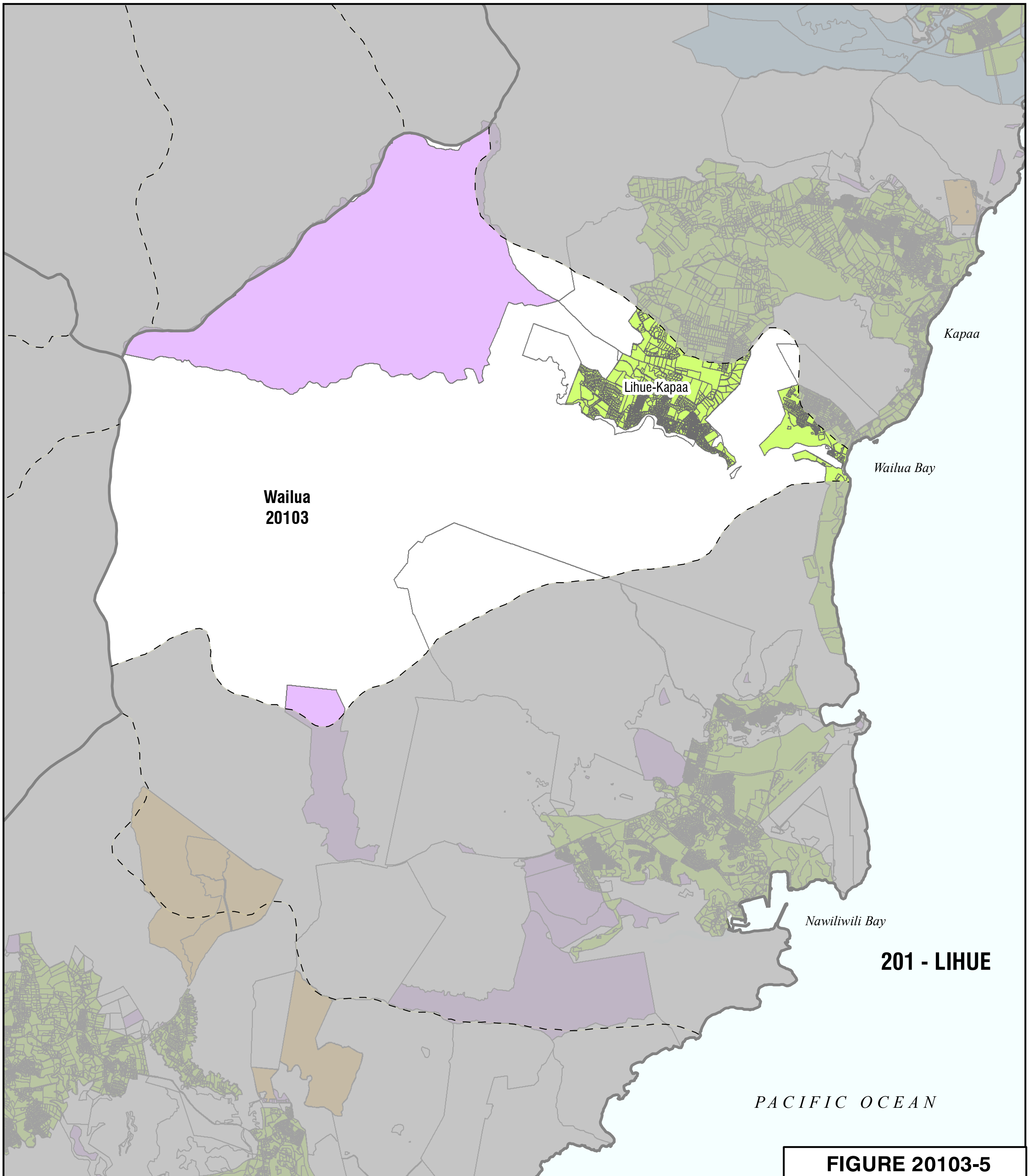


FIGURE 20103-5

LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- DOW Service Area
- Private Water System
- State Water System
- Federal Water System
- Possible Catchment Area (Building Value > $20,000)

WATER SYSTEM & SERVICE AREA

Aquifer Sector: LIHUE - 201
Aquifer System:
WAILUA - 20103

Fukunaga & Associates, Inc.
Consulting Engineers

Kaua'i County - Department of Water

KAUA'I WATER USE AND DEVELOPMENT PLAN UPDATE

20103-3 EXISTING WATER USE

20103-3.1 General

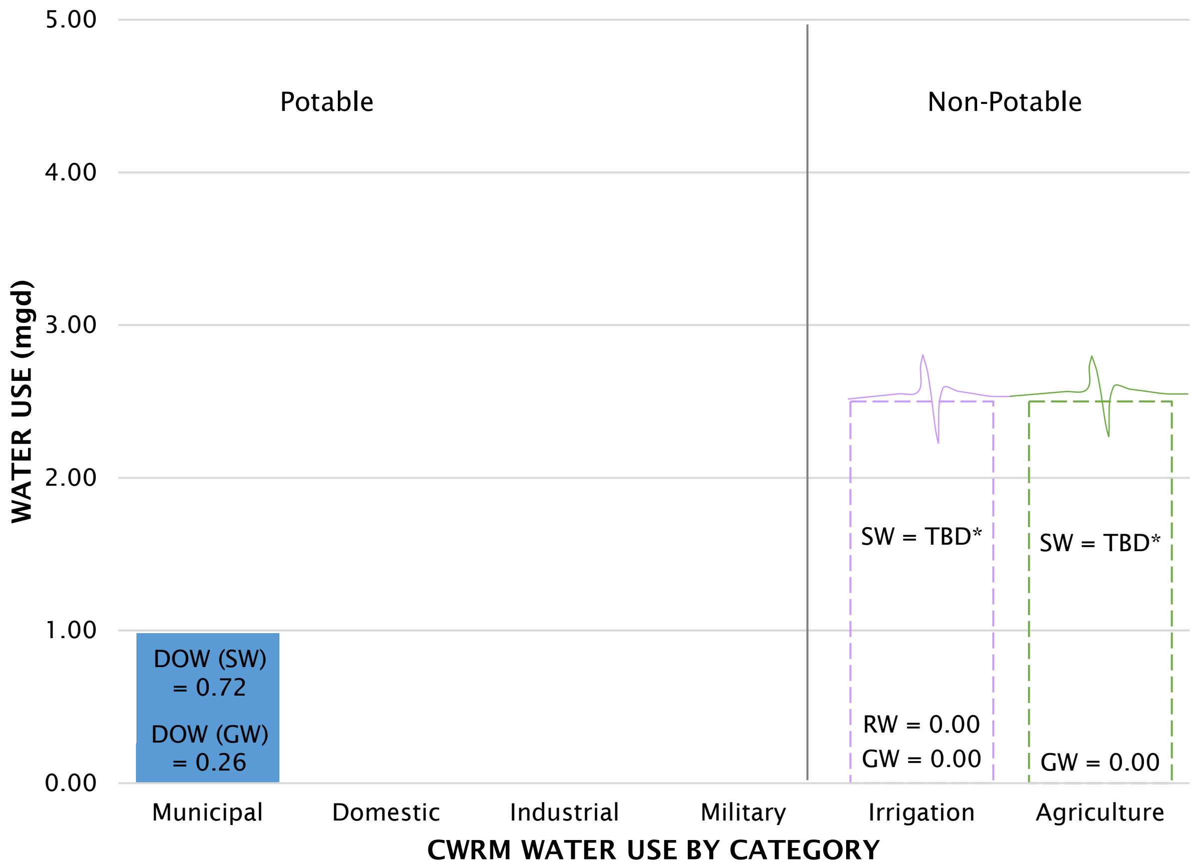
The following section presents the total estimated average water use within the Wailua ASYA. The total estimated average water use was based on data from CWRM (well pumpage) and DOH (Sanitary Surveys for Public Water Systems and estimated recycled water usage) for the year of 2014. Well classification changes since 2014 are noted in the sub-sections below. **Table 20103-5** and **Figure 20103-6** summarize the water use in accordance with CWRM categories.

Table 20103-5: Existing Water Use by Category – Wailua ASYA

CWRM Category	Ground Water (mgd)	Other Sources (mgd)	Total (mgd)	Percent of Total
Domestic	0.00		0.00	0.0
Industrial			0.00	0.0
Irrigation	0.00	0.00	0.00	0.0
Agriculture		TBD[1]	0.00	0.0
Military			0.00	0.0
Municipal				
DOW System	0.26	0.72[2]	0.98	100.0
Private-Public WS			0.00	0.0
TOTAL	**0.26**	**0.72**	**0.98**	**100.0**

[1] Surface Water – TBD from AWUDP
[2] Surface Water – Estimated

Figure 20103-6: Existing Water Use by Category – Wailua ASYA



*Values to be determined by other components of the Hawai'i Water Plan

20103-3.2 Domestic Use

There are two wells classified as "Domestic" in the CWRM database; however, neither has reported pumpage.

20103-3.3 Industrial Use

There are no wells classified as "Industrial" in the CWRM database.

Kaua'i Island Utility Cooperative (KIUC), Kaua'i's member-owned electric utility, owns and operates the Upper and Lower Waiahi Hydropower Plants, which generate 0.7 MW and 0.8 MW of electricity, respectively. The electricity is then sold to their customers. The Board of Land and Natural Resources issued a revocable permit (to be renewed annually) to KIUC in 2002 to divert water from the North Fork Wailua River diversion and the Waikoko Stream diversion. In 2018, KIUC was diverting approximately 4 mgd of surface water from the North Fork Wailua River diversion and 0.8 mgd is from the Waikoko stream diversion[1], but has since stopped diverting water

[1] KIUC Waiahi Hydropower Fact Sheet

from these diversions pending repairs to a portion of the siphon. As a result, the hydropower plant is not currently operating at full capacity. These hydropower plants were originally built in the 1920s by the Līhuʻe Plantation Company for their sugar operations and were later sold to KIUC when Līhuʻe Plantation closed.

20103-3.4 Irrigation Use

Irrigation use has been divided into ground water, recycled water, and surface water.

20103-3.4.1 Ground Water

There is one well classified as "Irrigation" in the CWRM database owned by a private landowner; however, it has not reported pumpage.

20103-3.4.2 Recycled Water

There is no recycled water use in the Wailua ASYA.

20103-3.4.3 Surface Water

Information on surface water use for irrigation is to be determined by the AWUDP. However, typically, due to the location of parks and other landscaped areas within communities, it is assumed that it is unlikely for landscaping to be irrigated with surface water.

20103-3.5 Agricultural Use

Agricultural use has been divided into ground water, recycled water, and surface water.

20103-3.5.1 Ground Water

There are no wells classified as "Agriculture" in the CWRM database.

20103-3.5.2 Recycled Water

There is no recycled water use in the Wailua ASYA.

20103-3.5.3 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP.

20103-3.6 Military Use

There is no military use in the Wailua ASYA.

20103-3.7 Municipal Use

There are 5 wells in the CWRM database classified as "Municipal" (MUNCO – Municipal County). Municipal can be subcategorized into the other water use categories: Domestic, Industrial, Agricultural, Military, and Municipal.

20103-3.7.1 County Water Systems

The DOW has one major water system that services the Wailua ASYA. The Līhu'e-Kapa'a water system is DOH Public Water System (PWS) No. 400 and is the largest water system on Kaua'i. This water system services areas in three ASYAs and consists of three subsystems – 1) Līhu'e-Hanamā'ulu subsystem, 2) Puhi subsystem, and 3) Wailua-Kapa'a subsystem. The Līhu'e-Hanamā'ulu and Puhi subsystems are entirely within the Hanamā'ulu ASYA and were discussed in **Section 20102**. The Wailua-Kapa'a subsystem services areas in the Hanamā'ulu ASYA, Wailua ASYA, and Anahola ASYA; however, the majority of the service area is within the Anahola ASYA and will therefore be discussed with the Anahola ASYA in **Section 20104**.

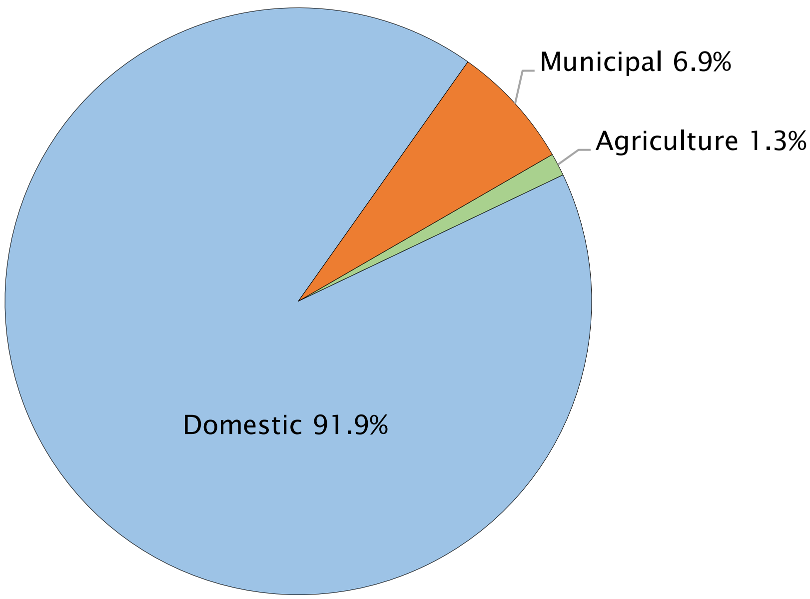
DOW Water Use by Category

DOW water use is subcategorized in **Table 20103-6** to the extent possible based on available meter data and is depicted in **Figure 20103-7**.

Table 20103-6: DOW Existing Water Use by Category – Wailua ASYA

CWRM Water Use Category	DOW Metered Water Use (mgd)	Percent of Total
Agricultural	0.005	1.1
Domestic	0.401	92.0
Industrial	0.000	0.0
Military	0.000	0.0
Municipal	0.030	6.9
Total	**0.436**	**100.0**

Figure 20103-7: DOW Existing Water Use by Category – Wailua ASYA



20103-3.7.2 State Water Systems

There are no State water systems in the Wailua ASYA regulated by the DOH.

20103-3.7.3 Federal Water Systems

There are no Federal water systems in the Wailua ASYA regulated by the DOH.

20103-3.7.4 Private-Public Water Systems

There are no private-public water systems in the Wailua ASYA regulated by the DOH.

20103-3.7.5 Per Capita Use

The per capita existing water use consumption based on domestic DOW metered water use and private-public water system use is presented in **Table 20103-7**. The per capita use in the Wailua ASYA is approximately 58.0% lower than the overall County of Kaua'i per capita use.

Table 20103-7: Per Capita Use – Wailua ASYA

	DOW Metered Water Use – Domestic (mgd)	Private-Public Water System (mgd)	90% of 2015 Population	Per Capita Use (gpd)
Wailua ASYA	0.401	0	4,927	81
County of Kaua'i	**9.360**	**2.951**	**63,462**	**194**

20103-3.8 Existing Water Use by Resource

20103-3.8.1 Ground Water

Table 20103-8 summarizes the current production, sustainable yield (SY), and percentage of SY for the current production. Current production is represented by the 2014 average yield calculated from the actual pumping data.

Table 20103-8: Pumpage – Wailua ASYA

Pumpage (mgd)	SY (mgd)	Pumpage Portion of SY
0.26	51	0.5%

Based on available information from the CWRM database, the current ground water use is 0.5 percent of the sustainable yield.

20103-3.8.2 Surface Water

The Kapaia Reservoir is the water source for the Grove Farm Surface Water Treatment Plant (WTP). The WTP is rated for a capacity of 3 mgd and has a maximum production rate of 4 mgd. Currently, the WTP is typically set to produce 1700 gpm, or 2.45 mgd, and approximately 500 gpm, or 0.72 mgd, flows into the DOW Wailua-Kapa‘a subsystem. The flow is regulated by a valve.

Information on surface water use for agriculture is to be determined by the AWUDP.

20103-3.8.3 Water Conservation

Water conservation, including water loss management, may reduce water use. See **Section 20103-2.3** for existing conservation efforts.

20103-3.8.4 Rainwater Catchment

Developed parcels that are not supplied by ground water or surface water are assumed to be supplied by rainwater catchment.

20103-3.8.5 Recycled Water

There is no recycled water use in the Wailua ASYA.

20103-4 FUTURE WATER USE

20103-4.1 Full Build-Out Water Demand Projections

The full build-out water demand projections based on the General Plan and County Zoning for the Wailua ASYA is listed in **Table 20103-9a** and **20103-10**, respectively. Each land use class is associated with the most appropriate CWRM water use category.

Table 20103-9a: General Plan Full Build-Out Water Demand Projection – Wailua ASYA

GP Category	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	0.28
Open	Domestic	0.02
Military	Military	0.00
Park	Irrigation	0.03
Residential	Domestic/Municipal	1.34
Resort	Domestic/Irrigation/Municipal	0.00
Transportation	Municipal	0.00
Urban Center	Domestic/Industrial/Municipal	0.00
DHHL	Domestic	0.11
	TOTAL	**1.78**

The General Plan was further refined by replacing the portion of the General Plan that coincides with the Līhu'e Community Plan and its associated demand with the Līhu'e Community Plan and its associated demand as shown in **Figure 20103-8**. **Table 20103-9b** is the full build-out water demand projection based on the Līhu'e Community Plan.

Table 20103-9b: Līhu'e Community Plan Full Build-Out Water Demand Projection - Wailua ASYA

CP Category	CWRM Category	Water Demand (mgd)
Agricultural (Others)	Agriculture/Domestic	0.00
Industrial	Industrial	0.00
Open	Domestic	0.00
Military	Military	0.00
Mixed Use	Domestic/Municipal	0.00
Park	Irrigation	0.03
Residential	Domestic/Municipal	0.00
Resort	Domestic/Irrigation/Municipal	0.02
Urban Center	Domestic/Industrial/Municipal	0.00
DHHL	Irrigation/Municipal	0.00
	TOTAL	**0.05**

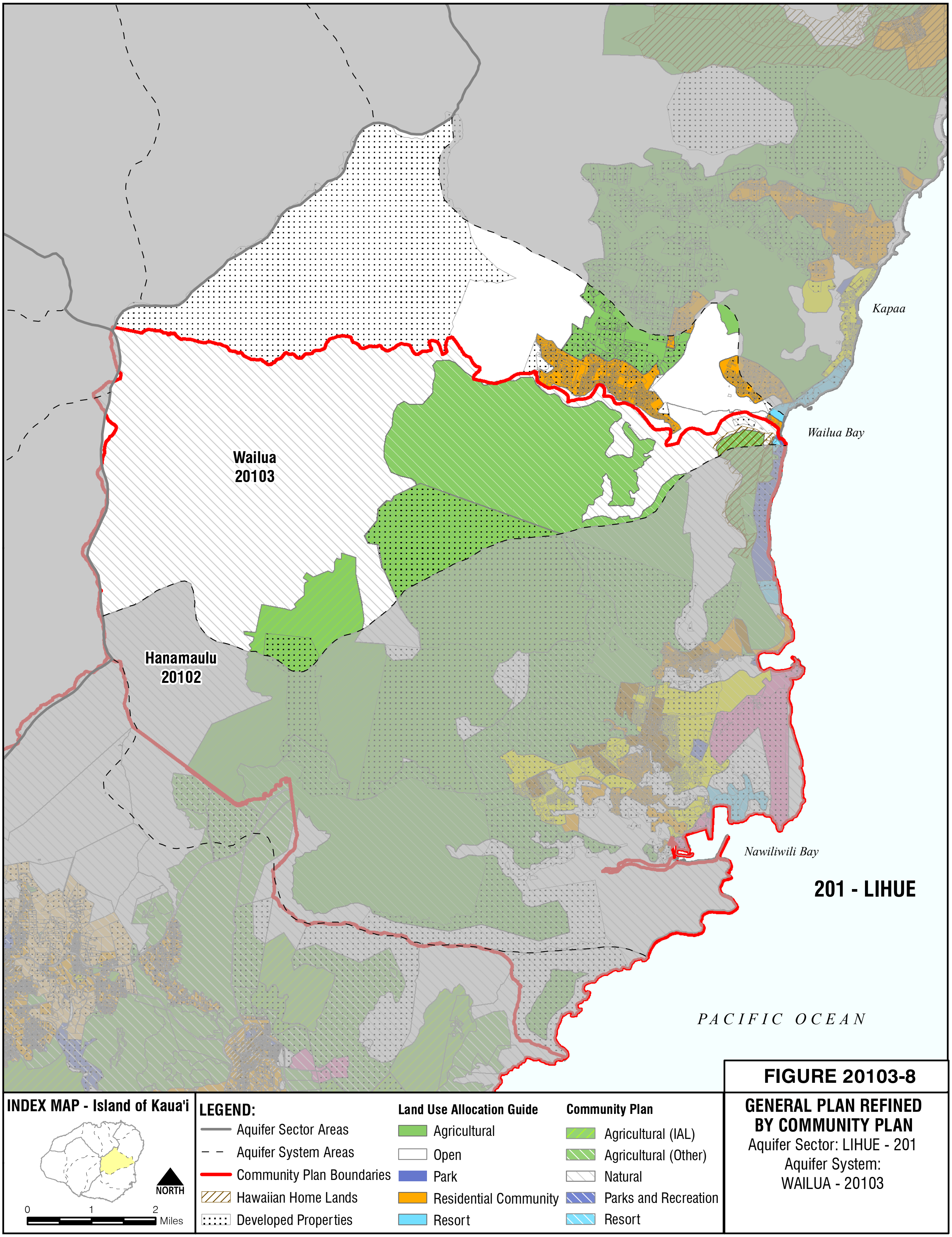


FIGURE 20103-8

GENERAL PLAN REFINED BY COMMUNITY PLAN

Aquifer Sector: LIHUE - 201

Aquifer System: WAILUA - 20103

The full build-out water demand projection for the General Plan refined by the Līhu‘e Community Plan is 1.80 mgd. See calculation below:

(1) General Plan full build-out water demand projection = 1.78 mgd

(2) Portion of General Plan full build-out water demand projection that coincides with the Līhu‘e Community Plan = 0.03 mgd

(3) Līhu‘e Community Plan full build-out water demand projection = 0.05 mgd

Refined full build-out water demand full build-out projection = (1) – (2) + (3)
= 1.78 – 0.03 + 0.05
= **1.80 mgd**

Estimated full build-out projected water demands for the Wailua ASYA are summarized by zoning class in **Table 20103-10**.

Table 20103-10: Zoning Full Build-Out Water Demand Projection – Wailua ASYA

Zoning Class	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	0.28
Commercial	Municipal	0.00
Industrial	Industrial/Municipal	0.00
Open	Domestic	0.02
Residential	Domestic/Municipal	0.95
Resort	Domestic/Irrigation/Munici-pal	0.00
DHHL	Domestic	0.11
	TOTAL	**1.36**

20103-4.1.1 Refined Land Use Based Water Projection

State Water Projects Plan

Table 20103-11 lists future State water projects reported in the 2021 SWPP update. The total projected demand to the year 2034 for these 4 State water projects within the Wailua ASYA is 1.044 mgd, 0.708 mgd using potable and 0.337 using non-potable sources.

Table 20103-11: Future State Water Projects – Wailua ASYA

Project Name	State of Hawaiʻi Department	Primary Use	Water Development Strategy	2034 Demand (mgd)
Wailua	DHHL	Potable	NEWSS	0.0250
Wailua Commercial & Resort	DHHL	Potable	NEWSS	0.2795
Wailua Residential	DHHL	Potable	NEWSS	0.4030
Wailua	DHHL	Non-potable	NEWSS	0.3366
			TOTAL REMAIN	0.0000
			TOTAL WAILUA ASYA SWPP 2034 DEMAND	1.0441

As mentioned in **Section 2.2.2.5.1**, State water projects with the water development strategy of REMAIN are located within the service areas of County water systems which need to be coordinated with the respective County water departments. None of the State water projects within the Wailua ASYA were assigned the REMAIN water development strategy.

State Department of Hawaiian Home Lands

A portion of DHHL's Wailua Tract is located within the Wailua ASYA. The State Water Projects Plan – DHHL Update (SWPP), dated May 2017, provides information related to projected DHHL water demands and the related water development strategies being proposed to meet these water demands. The DHHL demands have also been incorporated into the SWPP Update, dated May 2021. See **Table 20103-11** for a breakdown of the demands. The projected potable water demand for the portion of the Wailua Tract located within the Wailua ASYA is 0.708 mgd. The 2017 SWPP suggests that this demand be met by a new State well in the Wailua ASYA.

As mentioned in **Section 20102**, the Hanamāʻulu ASYA chapter, the 2017 SWPP also discussed non-potable demands. It projects that the non-potable demand for the Wailua Tract will be 0.337 mgd, which will be met by the East Kauaʻi Irrigation System.

Agricultural Water Use and Development Plan

The AWUDP dated 2003 (revised 2004) was limited in scope. More recent, comprehensive information on agricultural lands is available in the County of Kauaʻi Important Agricultural Lands (IAL) Study.

In 2019, a public review draft of the AWUDP was released and it is anticipated that the next phase of the AWUDP will provide agricultural water demand projections in greater detail and will supersede information in the KWUDP when it becomes available.

County of Kauaʻi Important Agricultural Lands Study

5,301 acres of agricultural lands within the Wailua ASYA received a score of 28 or better in the County of Kauaʻi Important Agricultural Lands (IAL) Study. Lands that receive a score of 28 or better were determined to have met all eight IAL criteria to some degree. Only a subset of lands with a score of 28 or better is expected to be designated as IALs. **Table 20103-12** compares these lands that received a score of 28 or better to the declared surface water use from diversions and to the diversified water use rate of 3,400 gallons per acre per day (gpad) estimated in the 2004 AWUDP.

Table 20103-12: Irrigation of Agricultural Lands

(1) Declared Surface Water Use from Diversions (mgd)	7.56
(2) Agricultural Lands with a Score ≥ 28 (Acres)	5,301
- How many acres can be sustained by **(1)** at a water rate of 3,400 gpad? (Acres)	2,224
- What percent of **(2)** can be sustained with a water rate of 3,400 gpad?	42%
- If all of **(2)** were to be irrigated, what is the water unit rate? (gpad)	1,426

20103-4.1.2 Water Use Unit Rates

Water use unit rates are based on the *Water System Standards* (WSS), as discussed in Chapter 2.

The General Plan provides only broad density guidelines for residential and resort designations. For these designations, under the assumption that most residents would like their communities, including the development density, to remain similar in the future, the average number of dwelling units as allowed by zoning was used as the density (i.e., 3.08 dwelling units per acre for residential designation).

20103-4.2 Water Demand Projections to the Year 2035

The following section presents water demand projections to the year 2035 for the Wailua ASYA. The projected low, medium, and high growth rates are listed in **Table 20103-13** and are graphed in **Figure 20103-9**. Potable (domestic, industrial, municipal, and military water uses) and non-potable (irrigation) water demands are also differentiated.

Table 20103-13: Water Demand Projection – Wailua ASYA

Water Use Category	Water Demand by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
GROWTH RATE C (HIGH)									
TOTAL	0.98	0.99	1.00	1.00	1.01	1.02	1.06	1.10	1.15
Potable	0.98	0.99	1.00	1.00	1.01	1.02	1.06	1.10	1.15
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GROWTH RATE B (MEDIUM)									
TOTAL	0.98	0.99	1.00	1.00	1.01	1.02	1.05	1.10	1.14
Potable	0.98	0.99	1.00	1.00	1.01	1.02	1.05	1.10	1.14
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GROWTH RATE A (LOW)									
TOTAL	0.98	0.99	0.99	0.99	1.00	1.00	1.02	1.05	1.07
Potable	0.98	0.99	0.99	0.99	1.00	1.00	1.02	1.05	1.07
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figure 20103-9: Water Demand Projection Summary – Wailua ASYA

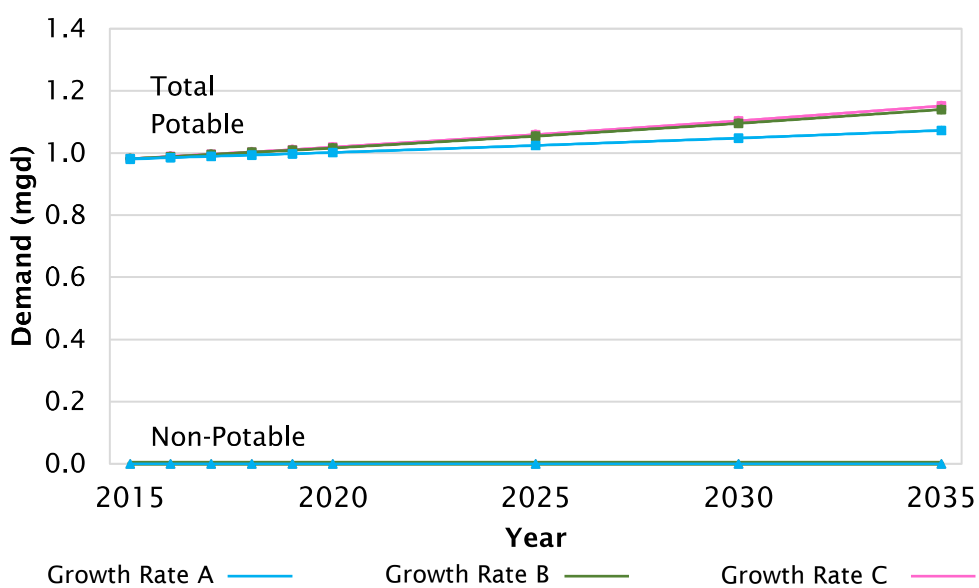


Figure 20103-10 shows the breakdown of water demand projections for a medium growth rate by CWRM categories through the year 2035. **Table 20103-14** summarizes this figure.

Figure 20103-10: Medium Growth Rate B Water Demand Projection by Category – Wailua ASYA

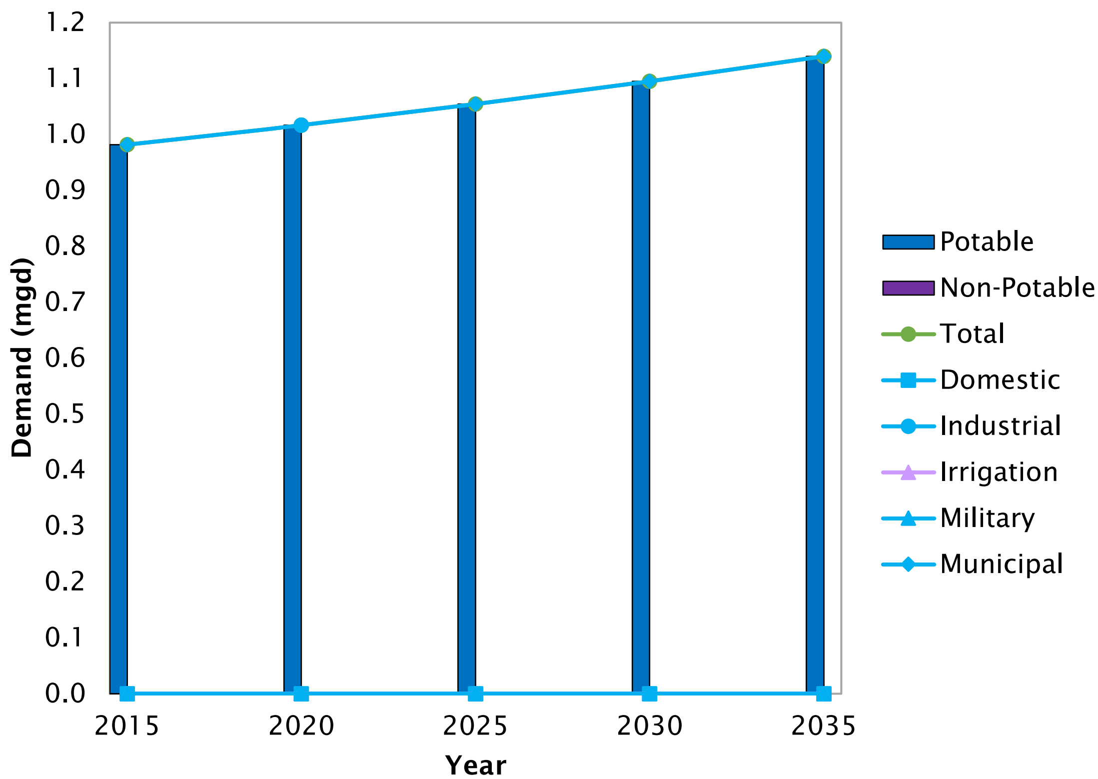


Table 20103-14: Medium Growth Rate B Water Demand Projection by Category – Wailua ASYA

Water Use Category	Water Use by Year (mgd)								
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2025**	**2030**	**2035**
Total	**0.98**	**0.99**	**1.00**	**1.00**	**1.01**	**1.02**	**1.05**	**1.10**	**1.14**
Potable	0.98	0.99	1.00	1.00	1.01	1.02	1.05	1.10	1.14
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Domestic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Irrigation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Military	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Municipal	0.98	0.99	1.00	1.00	1.01	1.02	1.05	1.10	1.14
DOW	0.98	0.99	1.00	1.00	1.01	1.02	1.05	1.10	1.14

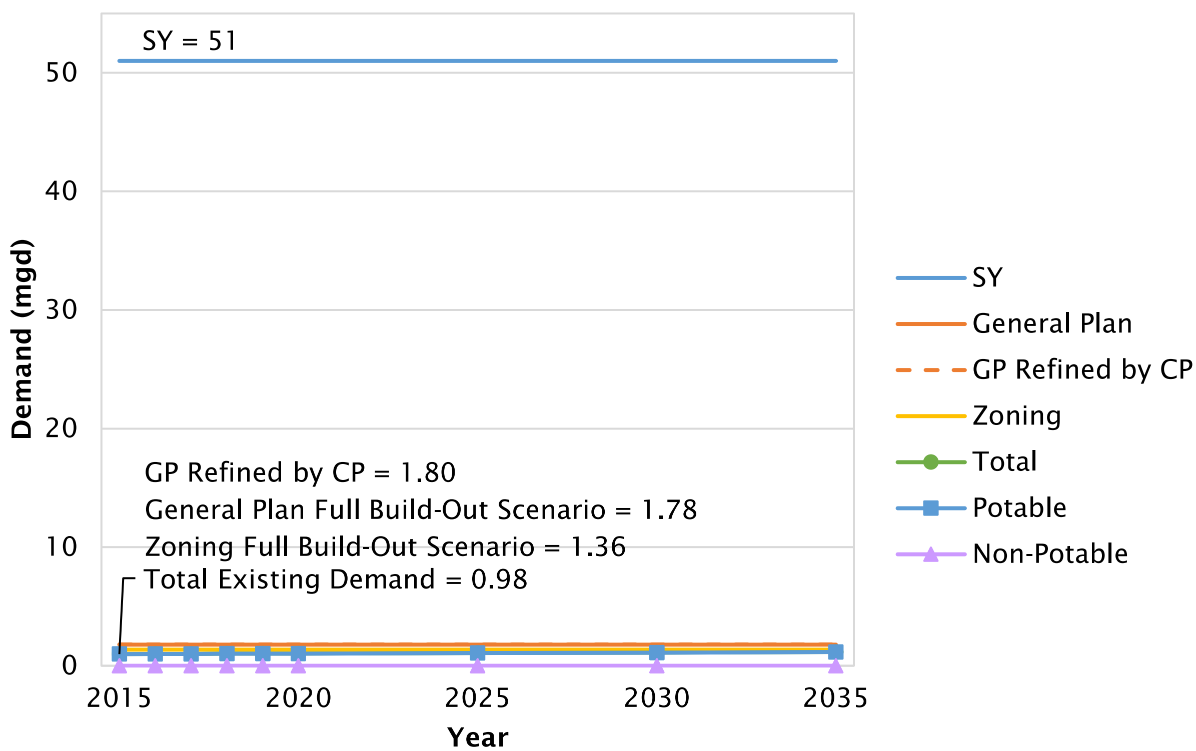
20103-4.3 Summary

Figure 20103-11 illustrates the magnitude of the sustainable yield, both General Plan and Zoning full build-out water use projections, and water use projection through the year 2035 focusing on Medium Growth Rate B. **Table 20103-15** summarizes the General Plan, Zoning, and 20-year water demand projection scenarios for the Wailua ASYA. The sustainable yield is presented to draw comparisons. All demands are in mgd.

Table 20103-15: Summary of Demand Projections

SY (mgd)	FBO (mgd)		Medium Growth Rate Demand by Year (mgd)								
	GP	Zoning	2015	2016	2017	2018	2019	2020	2025	2030	2035
51	1.78	1.36	0.98	0.99	1.00	1.00	1.01	1.02	1.05	1.10	1.14

Figure 20103-11: Medium Growth Rate B Water Demand Projections and Full Build-Out – Wailua ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use. For future agricultural water use analysis, please see Section 20103-4.1.1 County of Kaua'i Important Agricultural Lands Study.

20103-5 RESOURCE AND FACILITY RECOMMENDATIONS

20103-5.1 Water Source Adequacy

20103-5.1.1 Full Build-Out

Development to the highest extent allowed by the General Plan and County Zoning within the Wailua ASYA is sustainable, with General Plan and County Zoning full build-out water demands requiring 3 and 3 percent of the 51 mgd sustainable yield (SY), respectively.

20103-5.1.2 Twenty-Year Projection

The 2035 water demand projection for the Wailua ASYA is sustainable, requiring only 2 percent of the 51 mgd sustainable yield.

20103-5.2 Source Development Requirements

20103-5.2.1 Supply-Side Management

Supply-side management, including conventional water resource measures, water conservation, and alternative water resource measures, were evaluated to meet projected water demands.

Conventional Water Resource Measures

Ground Water

The Wailua ASYA contains basal, perched, and high level ground water resources. Most reported pumpage is from the basal zone, followed by high level and then perched.

The 2035 water demand projection for the Wailua ASYA is only 2 percent of the 51 mgd sustainable yield. This indicates that theoretically, more water could be pumped from the aquifer without impairing the utility or quality of the water resource if wells are optimally placed and the proper due diligence with regard to traditional and customary rights and impacts has been completed. However, it is noted that sustainable yield does not consider the feasibility of developing the ground water resources, and that the safe yield of an individual production well may be limited by localized ground water behavior near the well as a result of pumpage. As discussed in **Section 20103-2.1**, ground water levels in the Līhu‘e Basin showed declining trends in the late 1990s and early 2000s. This basin includes the Nonou wells that are located in the Wailua ASYA. The declines in water level resulted in diminished productivity of some wells and tunnels and generated concern about the future reliability of ground water resources. Water supply reliability and quality, feasibility, environmental and cultural impacts, and water rights shall be considered as projects and programs develop. More detailed and site-specific evaluation of these impacts shall be required and accomplished through the environmental review process (HRS Chapter 343) for source development projects and programs utilizing public funding, and CWRM could consider requiring compliance with the environmental review process for private source development projects and programs also. **Section 1.5.3.1** provides additional information regarding the protection of traditional and customary rights.

The demand projections for the Wailua ASYA are relatively low. Development within the Wailua ASYA includes Wailua Homesteads, which is served by the 538' zone of the DOW's Wailua-Kapaʻa subsystem. The DOW's Water Plan 2020 acknowledges that new water sources may be needed for this 538' zone. Also, ground water developed in this ASYA could be transferred to other ASYAs through water systems discussed in the Water Transfer section.

The 2017 SWPP proposed a new State well be developed in the Wailua ASYA to meet the projected potable demands of DHHL's Wailua tract.

Surface Water

The Wailua ASYA has 30 declared diversions. Until permanent instream flow standards are established, interim instream flow standards have been adopted. According to Section 13-169-46, Hawaiʻi Administrative Rules, "Interim Instream Flow Standard for all streams on Hawaiʻi, as adopted by the commission on water resource management on June 15, 1988, shall be that amount of water flowing in each stream on the effective date of this standard, and as that flow may naturally vary throughout the year and from year to year without further amounts of water being diverted offstream through new or expanded diversions, and under the stream conditions existing on the effective date of the standard, except as may be modified [by the commission]." Therefore, for the purposes of assessing surface water availability, it is assumed that no additional diversions will be allowed without amendment of the interim IFS.

The existing declared diversions have the potential to meet additional demands. However, a challenge with developing surface water is transmission of these resources from source to location of need. Farmers generally grow what is feasible for the area; therefore, it is anticipated that agricultural water use will follow the availability of irrigation water. Increase in the availability of surface water would likely promote additional usage and could thereby minimize ground water being used for irrigation.

The East Kauaʻi Irrigation System (EKIS) is a complex system of interconnecting ditches, tunnels, flumes, and reservoirs and extends across the Hanamāʻulu ASYA, Wailua ASYA, and Anahola ASYA. Irrigation systems may not be functioning as efficiently as they once were. The Agricultural Water Use and Development Plan (AWUDP) should include an inventory of large irrigation systems and provide information on their rehabilitation and maintenance needs. The AWUDP should also include a more detailed assessment of agricultural water demand projections that will supersede information in the KWUDP when it becomes available. The 2017 SWPP identifies EKIS as the water source for the non-potable demand of DHHL's Wailua tract.

Water Transfer

Some existing irrigation systems have the capability to transfer surface water to adjacent ASYAs. The AWUDP should study irrigation system services areas and provide information on irrigation systems' water transfer.

Water can also be transferred between ASYAs through public water systems. As mentioned above, Wailua Homesteads is served by DOW's Wailua-Kapaʻa subsystem which services areas in the Hanamāʻulu ASYA, Wailua ASYA, and Anahola ASYA. The Wailua-Kapaʻa subsystem consists of eight pressure zones. The 538' zone, located in the Wailua ASYA, can provide water to the 530' zone during an emergency when a source in the 530' zone is out of service. Also, DOW's Wailua-Kapa'a subsystem is interconnected with the Līhu'e-Hanamā'ulu subsystem. Currently, there is some water transfer from the Līhu'e-Hanamā'ulu subsystem to the Wailua-Kapa'a subsystem. Flow between these subsystems is regulated by a valve. In the past, water from the Wailua-Kapa'a subsystem was boosted into the Līhu'e-Hanamā'ulu system by the Hanamā'ulu Booster Station. To meet future demands, DOW could utilize the interconnection between these two subsystems to transfer any surplus supply from one system to the other.

Water Conservation

The per capita use in the Wailua ASYA is approximately 58.0% lower than the overall County of Kaua'i per capita use. There are no ASYA-specific conservation measures in place at this time; however, there are general water conservation programs that are described in **Section 1.5.7**. Water conservation, including water loss management, can increase the amount of water available and help to ensure the long-term viability of water resources.

Alternative Water Resource Measures

Rainwater Catchment

Rainwater can be utilized as a water resource in several ways.

Rainwater can be harvested in rainwater catchment systems which can be utilized to supply domestic potable water needs. These systems are viable in areas that receive abundant rainfall and are a suitable source of potable water for individual domestic users in areas outside the limits of municipal water systems. Generally, these are remote areas and are not expected to expand significantly because most development is anticipated to be concentrated within existing urban areas. Therefore, use of rainwater catchment systems is not anticipated to increase significantly.

Rainwater can also be used to supplement or satisfy agricultural non-potable water needs through ambient rainfall.

See the Storm Water Reuse section below to see how rainwater as storm water runoff can be reclaimed and reused.

Storm Water Reuse

Rainfall can turn into storm water runoff. Storm water runoff from impervious surfaces in urban areas can be significant. This water could be captured, treated, and used as a source of non-potable water (e.g., irrigation), integrated with recycled water, or even as potable and/or non-potable ground water recharge. However, due to the lack of storm water reuse standards, the high initial infrastructure costs, and the treatment requirements, storm water reclamation and reuse on a small or large scale may not be feasible and requires further assessment as noted in the Water Resource Protection Plan. The U.S. Department of the Interior, Bureau of Reclamation published An Appraisal of Stormwater Reclamation and Reuse Opportunities in Hawai'i (Storm Water Report) in 2008 but did not identify any storm water reclamation and reuse opportunities in the Wailua ASYA.

Recycled Water

Recycled water is a valuable resource; an increase in its use may lower the dependence on potable sources. However, there are no wastewater reclamation facilities (WWRFs) in the Wailua ASYA.

Desalination

Desalination of brackish ground water is a potential alternative; however, due to its high capital and operational costs, it likely would not be considered when other potable water sources are readily available.

20103-5.2.2 Demand-Side Management

Development Density Control

The full build-out demand for the Wailua ASYA based on County Zoning is 1.36 mgd which is 3 percent of the sustainable yield. This indicates that there are adequate water resources to sustain the level of development that is allowed by law. In the Wailua ASYA, the average number of dwelling units allowed by County Zoning is 3.08 dwelling units per acre in residential districts.

The full build-out demand for the Wailua ASYA based on the General Plan is 1.78 mgd which is 3 percent of sustainable yield. Although it is unlikely that full build-out will occur within the time frame of the General Plan, the full build-out demands are sustainable; there are adequate water resources to sustain the long-range land use vision for this area. Therefore, development density control may not be necessary. However, the County Planning Department could consider development density control for areas where there is the flexibility to do so, such as areas that are not yet zoned as residential or resort, and promote sustainable development. Further, it is noted that the full build-out scenario is unlikely to occur since it assumes all land is developed to the maximum extent.

20103-5.3 Recommended Alternatives

To optimize appropriate use of water resources, the quality of the water source should be matched to the quality of water required. The highest quality of water shall be reserved for the most valuable end use. Potable water is considered the highest quality water, and the sustenance of life is the most valuable end use. Recycled water, brackish water, untreated surface water, and other lower quality water sources should be used for landscaping and agriculture when available, thereby reserving potable water for human consumption. If there is a practical alternative water source available, that alternative source should be used in lieu of ground water or surface water. With this in mind, the following recommendations are made for the Wailua ASYA:

Alternative Water Resources

Use of alternative water sources can reduce demands on both ground and surface water resources and conserve water resources as a whole. However, aside from rainwater, there are no available alternative water sources in the area. Alternative water sources are unlikely to be developed when other water resources are readily available.

Conservation

Water resources are a finite resource that should be managed and used wisely. It should be conserved and not wasted. Implementation of conservation measures should continue to be encouraged.

Ground Water

Ground water is typically the preferred source for drinking water and for meeting other potable water needs. However, developing ground water in this area has been difficult historically and there have been concerns about the future reliability of ground water resources. Further study and monitoring could assist in determining if more ground water development is viable to meet potable water demands. In addition, environmental and cultural impacts and water rights shall be considered as projects and programs develop.

Development of ground water resources is the primary strategy to serve future potable demands in the Wailua ASYA.

Surface Water

Surface water, where available, should be used to meet non-potable demands if alternative water resources are not available. To achieve this, it will be critical to maintain and improve existing irrigation systems. Making surface waters more readily available to meet non-potable water demands has the potential to minimize future dependence on the use of ground water. It is therefore recommended that the AWUDP provide information on the rehabilitation and maintenance needs of large irrigation systems.

Demand-Side Management

Full build-out demand based on the General Plan is 3 percent of sustainable yield. At this projection, implementation of development density control by the County Planning Department is not needed as it is highly unlikely that full build-out will occur within the time frame of the General Plan. Although the projection is sustainable, the County Planning Department should exercise caution and consider potential impacts on available water resources when considering any future zoning modifications. Modifications that may result in increased development density within the area will increase demands on water resources.

Chapter 20104

Anahola Aquifer System Area

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FIGURES

TABLES

20104 ANAHOLA AQUIFER SYSTEM AREA

20104-1 SYSTEM AREA PROFILE

20104-1.1 General

The Anahola [20104] Aquifer System Area (ASYA) is roughly bound to the north by the north ridge of the Moloaʻa Stream, and extends roughly to Mount Namahana and the peak of the Makaleha Mountains to the west, Olohena Road and Konohiki Stream on the south, and the Pacific Ocean on the east. The Anahola ASYA encompasses the town of Kapaʻa, and includes the DHHL Anahola and Moloaʻa tracts.

Average annual rainfall ranges from about 50 inches per year along the coast to about 140 inches in the upper mountain elevations. The sustainable yield for the Anahola ASYA is 21 mgd.

20104-1.2 Economy and Population

20104-1.2.1 Economy

Kapaʻa town is the largest town on the island and is one of the main shopping areas on the island. The largest industries in Kapaʻa are related to accommodations and food services, health care and social assistance, and retail trade. The higher concentration of commercial and hotel/condominium facilities are typically located along the coast, bordering Kūhiō Highway. The areas further mauka (west) of Kūhiō Highway are primarily comprised of residential communities.

Anahola is a smaller more rural area, as compared to Kapaʻa and much of the land is owned by DHHL. Like Kapaʻa, the higher portion of commercial facilities are located nearer to the coast, boarding Kūhiō Highway. Residential areas, including DHHL homesteads, are located in areas mauka of Kūhiō Highway.

20104-1.2.2 Population

This ASYA is home to the largest portion of the population on the island, comprising over 20 percent of the island's population. Historical population data for the Anahola ASYA is summarized in **Table 20104-1**. Population projections through the year 2035 are summarized in **Table 20104-2a**. As shown in **Table 20104-2b**, it is estimated that the area will continue to experience growth rates between 4 and 8 percent per decade.

Table 20104-1: Historical Population – Anahola ASYA

	Year		
	1990	2000	2010
Population	12,086	14,021	15,669
Percent Change		16.0	11.8

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report. Data redistributed and evaluated for Anahola ASYA.

Table 20104-2a: Population Projection – Anahola ASYA

Growth Rate	Population by Year								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
A – Low	16,031	16,095	16,159	16,225	16,291	16,359	16,713	17,094	17,504
B – Med.	16,155	16,264	16,376	16,489	16,605	16,722	17,340	18,010	18,743
C – High	16,175	16,293	16,412	16,534	16,658	16,784	17,447	18,167	18,957

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report. Data redistributed and evaluated for Anahola ASYA.

Table 20104-2b: Population Projection – Percent Change – Anahola ASYA

Growth Rate	2015-2025 % Change	2025-2035 % Change
A – Low	4.3	4.7
B – Medium	7.3	8.1
C – High	7.9	8.7

20104-1.3 Land Use

20104-1.3.1 2000 Kaua'i General Plan

The 2000 Kaua'i County General Plan Land Use Designation Map for the Anahola ASYA is shown on **Figure 20104-1**. The estimated land use allocation acreage for each land use designation within the system area is listed in **Table 20104-3**.

Table 20104-3: General Plan Estimated Land Use Allocation Acreage – Anahola ASYA

General Plan Land Use Designation	Acreage	Percent of Total
Agricultural	11,045	33.9
Military	0	0.0
Open	15,103	46.4
Park	36	0.1
Residential Community	1,429	4.4
Resort	149	0.5
Transportation	0	0.0
Urban Center	374	1.2
DHHL	4,403	13.5
TOTAL	**32,539**	**100.0**

20104-1.3.2 Kaua'i Zoning

Kaua'i County Zoning Map for the Anahola ASYA is shown on **Figure 20104-2**. The estimated land use allocation acreage for each zoning district within the system area is listed in **Table 20104-4**.

Table 20104-4: County Zoning Estimated District Allocation Acreage – Anahola ASYA

Zoning District	Acreage	Percent of Total
Agriculture	8,473	25.7
Commercial – General	42	0.1
Commercial - Neighborhood	7	0.0
Conservation	12,690	38.6
Industrial – General	1	0.0
Industrial - Limited	25	0.1
Open	5,843	17.7
Residential	1,110	3.4
Resort	113	0.3
Project Development	0	0.0
Special Planning Area	26	0.1
Special Treatment	0	0.0
No Zoning	197	0.6
DHHL	4,420	13.4
TOTAL	**32,947**	**100.0**

The number of dwelling units allowed in residential and resort districts varies by the type of residential or resort district. The average number of dwelling units allowed in residential districts in the Anahola ASYA is 4.83 dwelling units per acre. The average number of dwelling units allowed in resort districts in the Anahola ASYA is 20.00 dwelling units per acre.

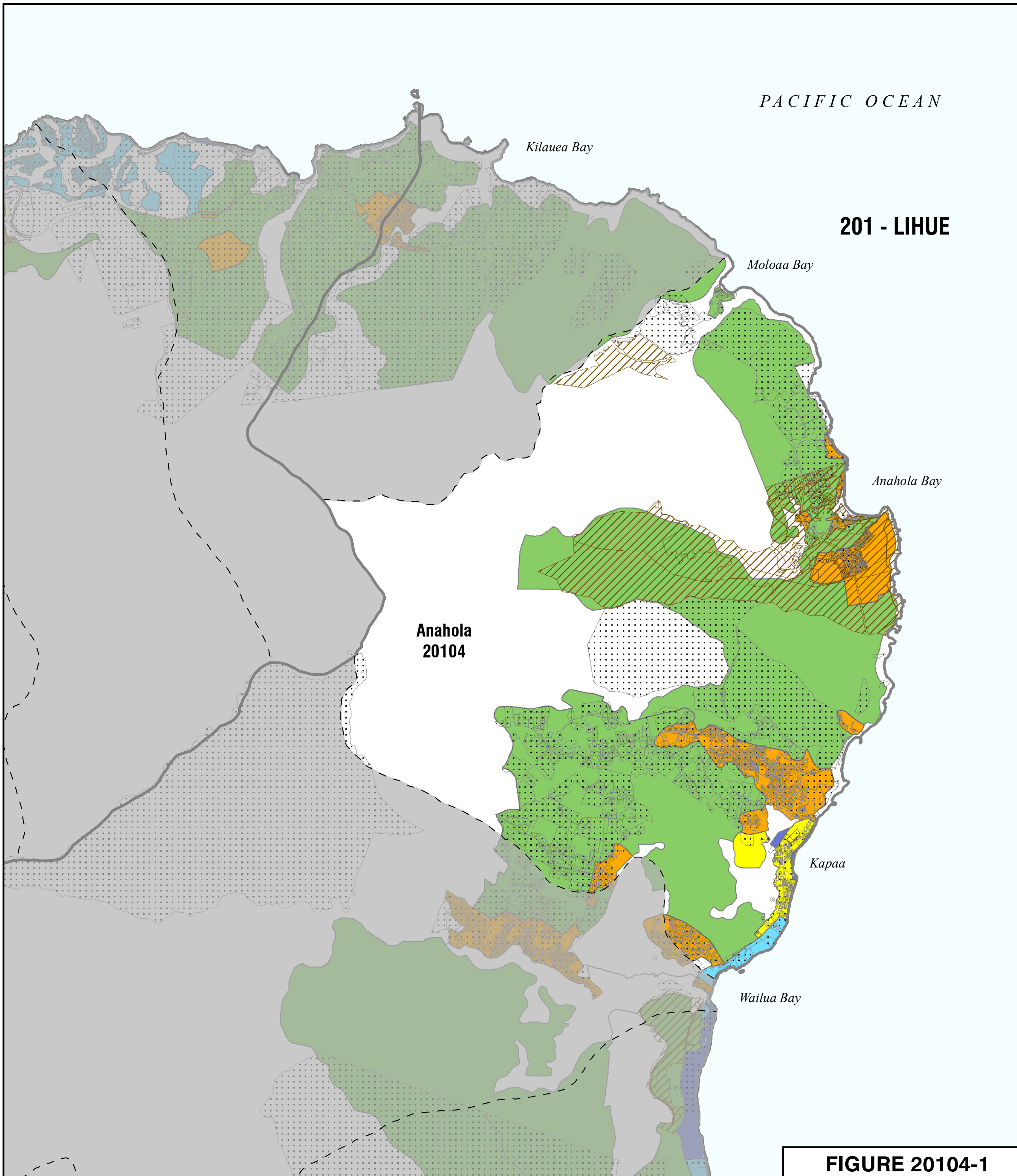
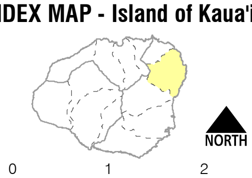


FIGURE 20104-1

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- Hawaiian Home Lands
- Developed Properties

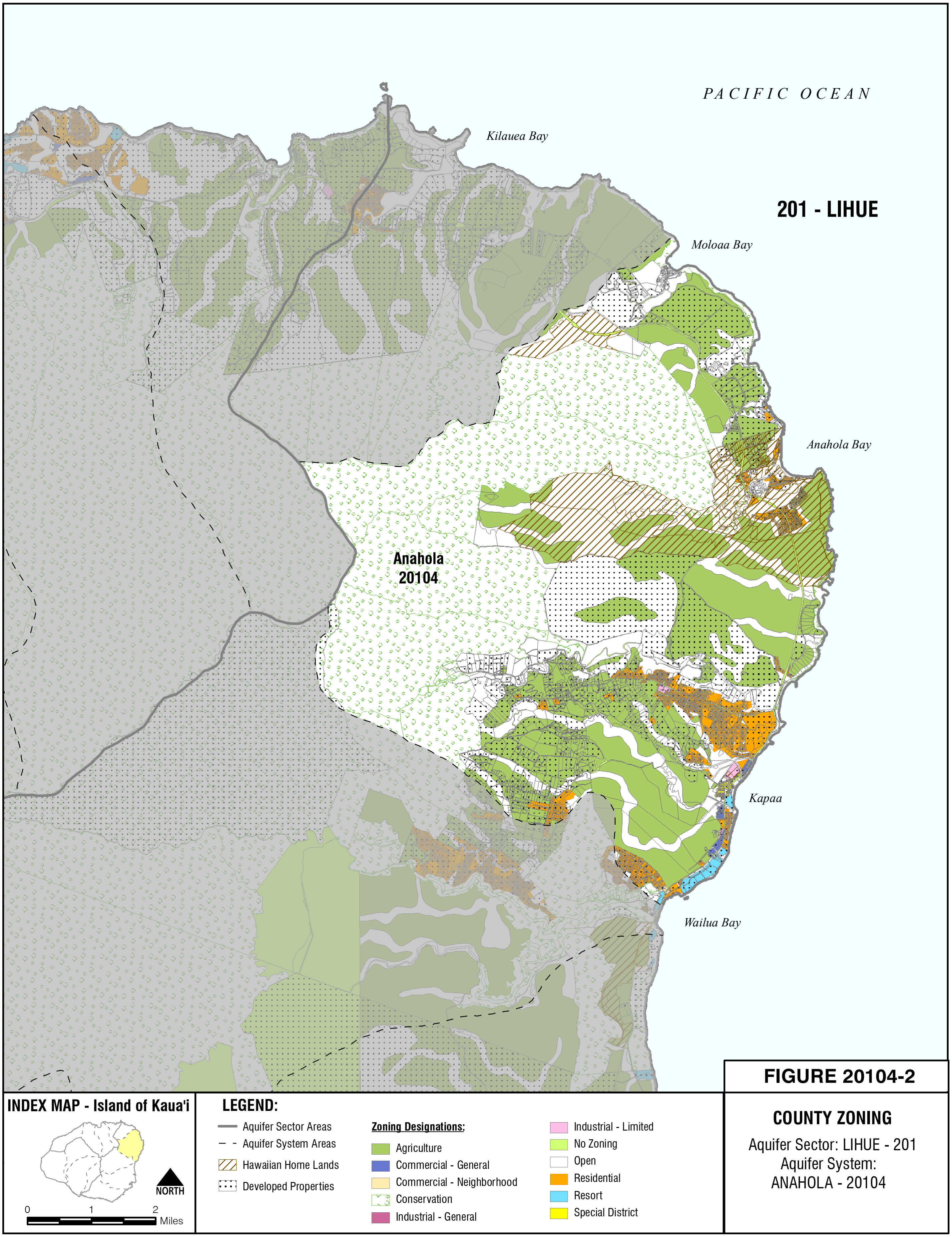
Land Use Allocation Guide

- Agricultural
- Open
- Park
- Military
- Residential Community
- Resort
- Transportation
- Urban Center

GENERAL PLAN LAND USE MAP

Aquifer Sector: LIHUE - 201

Aquifer System: ANAHOLA - 20104



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20104-2 EXISTING WATER RESOURCES

20104-2.1 Ground Water

The Anahola ASYA has a sustainable yield of 21 mgd. According to the 2014 CWRM database, there are 86 production wells in the system, 6 agriculture, 10 municipal, 4 non-DOW municipal, 55 domestic, 1 industrial, 5 irrigation, and 5 wells with a use type of "other". There are also 26 wells drilled and categorized as "unused". Refer to **Appendix A** for this database. **Figure 20104-3** shows the well locations.

Review of available USGS ground water level data from two wells, Nonou W-B and Anahola C located in the Anahola ASYA (record years 1970 through 2018 and 1990 through 2018, respectively), shows an overall drop in ground water level of about 1.5 to 2 feet over the span of all respective record years.

20104-2.2 Surface Water

There are 8 streams classified as perennial in the Anahola ASYA, of which 6 are considered continuous and 2 are considered intermittent. Moloaʻa Stream, Pāpaʻa Stream, Anahola Stream, Kapaʻa Stream, Moikeha Canal, and Waikaena Canal are classified as continuous streams. ʻAliomanu Stream and Kumukumu Stream are classified as intermittent streams. The USGS has 9 active surface water gages in the system area. The gages are located on Kapaʻa Stream, Kapahi Ditch, Kaneha Ditch, Konohiki Stream, ʻŌpaekaʻa Stream, North Fork Wailua River, and South Fork Wailua River, which was previously listed in **Table 1-19**.

In accordance with the Code, the CWRM must establish and administer instream flow standards (IFS) on a stream-by-stream basis as necessary to protect public interests. IFS is defined as "a quantity or flow of water or depth of water which is required to be present at a specific location in a stream system at certain specified times of the year to protect fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses." Considerably more research and study need to be completed to accumulate the data and perspective necessary to conduct a thorough and meaningful assessment of IFS. Until permanent IFS are established, interim IFS have been adopted. The interim IFS are defined as the amount of water flowing in each stream at the time the administrative rules governing them were adopted in 1988 and 1989. In order to assess surface water sustainability, this KWUDP assumes that no additional diversions will be allowed from any stream without amendment of the interim IFS.

There are 34 declared stream diversions in the Anahola ASYA identified in the CWRM database shown on **Figure 20104-4**, which accounts for 12 percent of the 292 declared stream diversions on the island. The declared stream diversions are listed in **Appendix B**. The total declared flow for the Anahola ASYA is 2.96 mgd.

The Anahola Ditch was formerly owned by the Līhuʻe Plantation to irrigate the northern section of the sugarcane fields. This ditch is now under the jurisdiction of the Department of Hawaiian Home Lands (DHHL) and a private landowner. A condition assessment of the DHHL portion was performed in 2015 as part of the 2019 draft AWUDP update. The Upper Anahola Ditch from the intake to the Kaneha Reservoir was reported as active in 2015. The remainder of the Upper

Anahola Ditch is disconnected and is in poor condition. The Lower Anahola Ditch is inactive and in poor condition and may not be feasible for rehabilitation.

The East Kauaʻi Irrigation System (EKIS) is a complex system of interconnecting ditches, tunnels, flumes, and reservoirs and consists of three sections: the Kapaʻa Section, the Kālepa Section (see **Section 20102**), and the Hanamāʻulu-Līhuʻe Section (see **Section 20102**).

The Kapaʻa Section of the East Kauaʻi Irrigation System (EKIS) is the northernmost section. The Wailua Ditch Intake diverts water from the North Fork of Wailua River to the Wailua Reservoir, then to the Upper and Lower Kapahi Reservoirs in Kapaʻa. The Kapaʻa Stream Intake diverted water to the Upper and Lower Kapahi Reservoirs. Eight separate earthen ditches and control gates directed water from the Wailua Ditch to the sugarcane fields.

20104-2.3 Water Conservation

Water conservation increases the amount of water available and helps to ensure the long-term viability of water resources. Water conservation measures for this ASYA are as described in **Section 1.5.7** of this report. There are no ASYA specific special conservation measures in place at this time.

20104-2.4 Rainwater Catchment

Rainwater catchment is a viable resource for areas that are not served by ground water or surface water. **Figure 20104-5** shows the possible catchment areas, or parcels with a building value greater than $20,000 and assumed to be developed but without a ground water or surface water source.

20104-2.5 Recycled Water

There are no wastewater reclamation facilities in the Anahola ASYA.

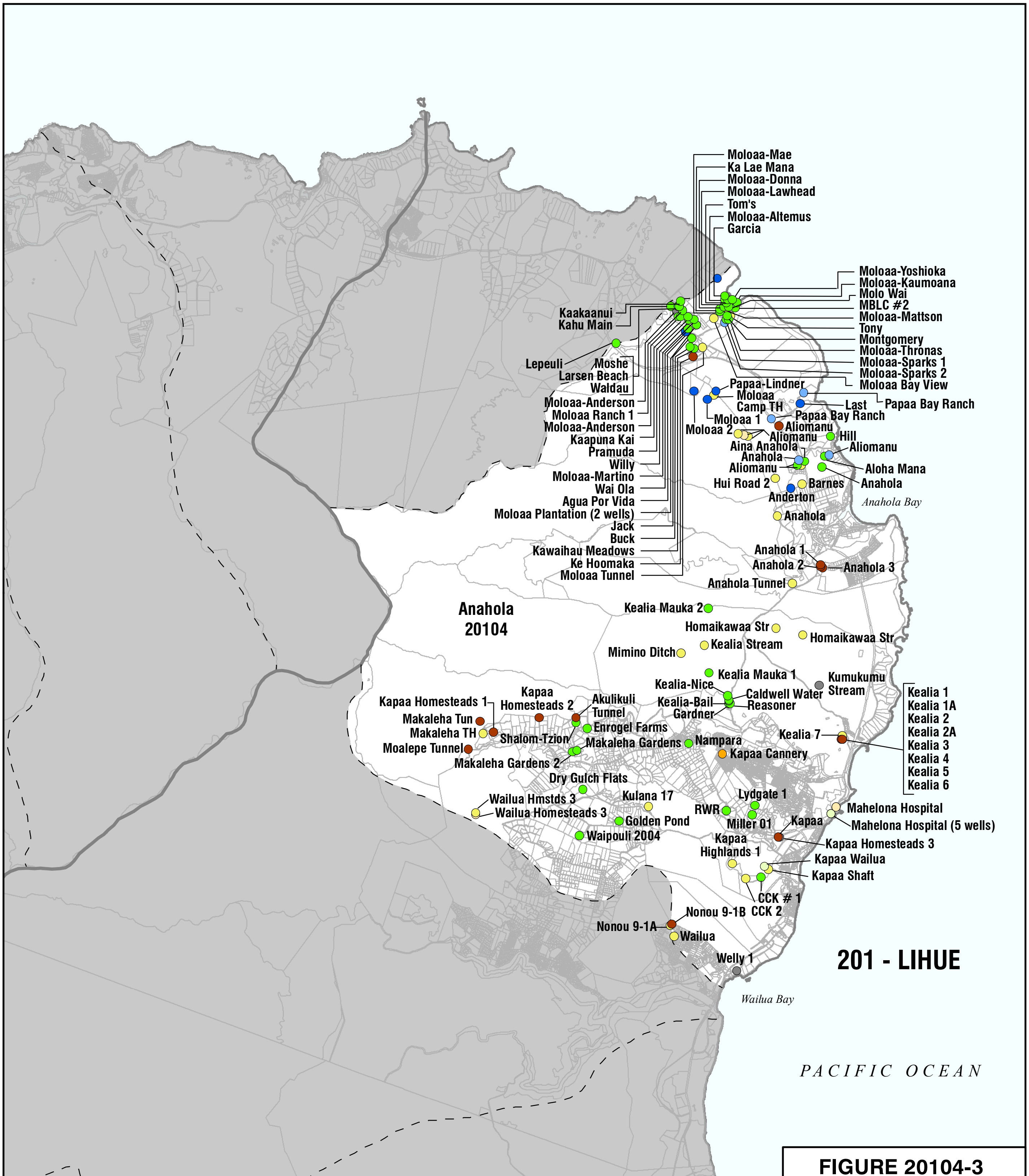
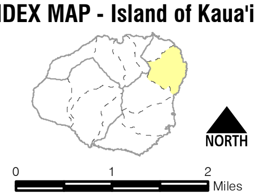


FIGURE 20104-3

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- TMK

Well Use Types

- Abandoned
- Agriculture
- Domestic
- Industrial
- Irrigation
- Military
- Municipal
- Observation
- Other
- Unused

WELL LOCATION

Aquifer Sector: LIHUE - 201
Aquifer System:
ANAHOLA - 20104

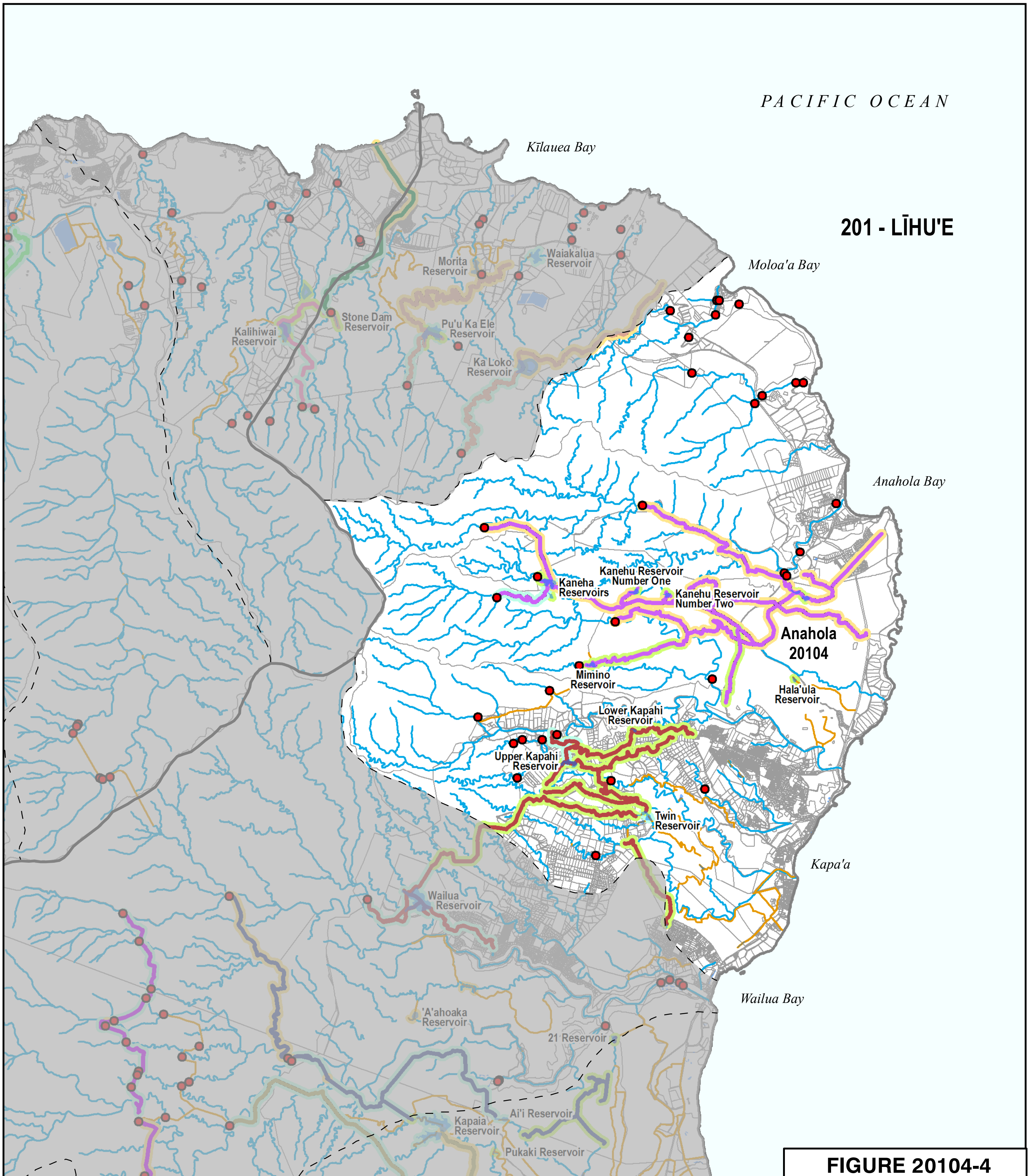
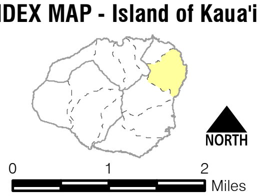


FIGURE 20104-4

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- Perennial Streams
- Irrigation Systems
- Diversions
- Reservoirs, Ponds
- TMK

Irrigation Systems

- Anahola Ditch
- East Kaua'i Irrigation System (Wailua-Kapahi System)

Status

- Active
- Inactive
- Unknown
- Abandoned

STREAMS & DIVERSIONS

Aquifer Sector: LĪHU'E - 201
Aquifer System:
ANAHOLA - 20104

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Kaua'i County - Department of Water

KAUA'I WATER USE AND DEVELOPMENT PLAN UPDATE

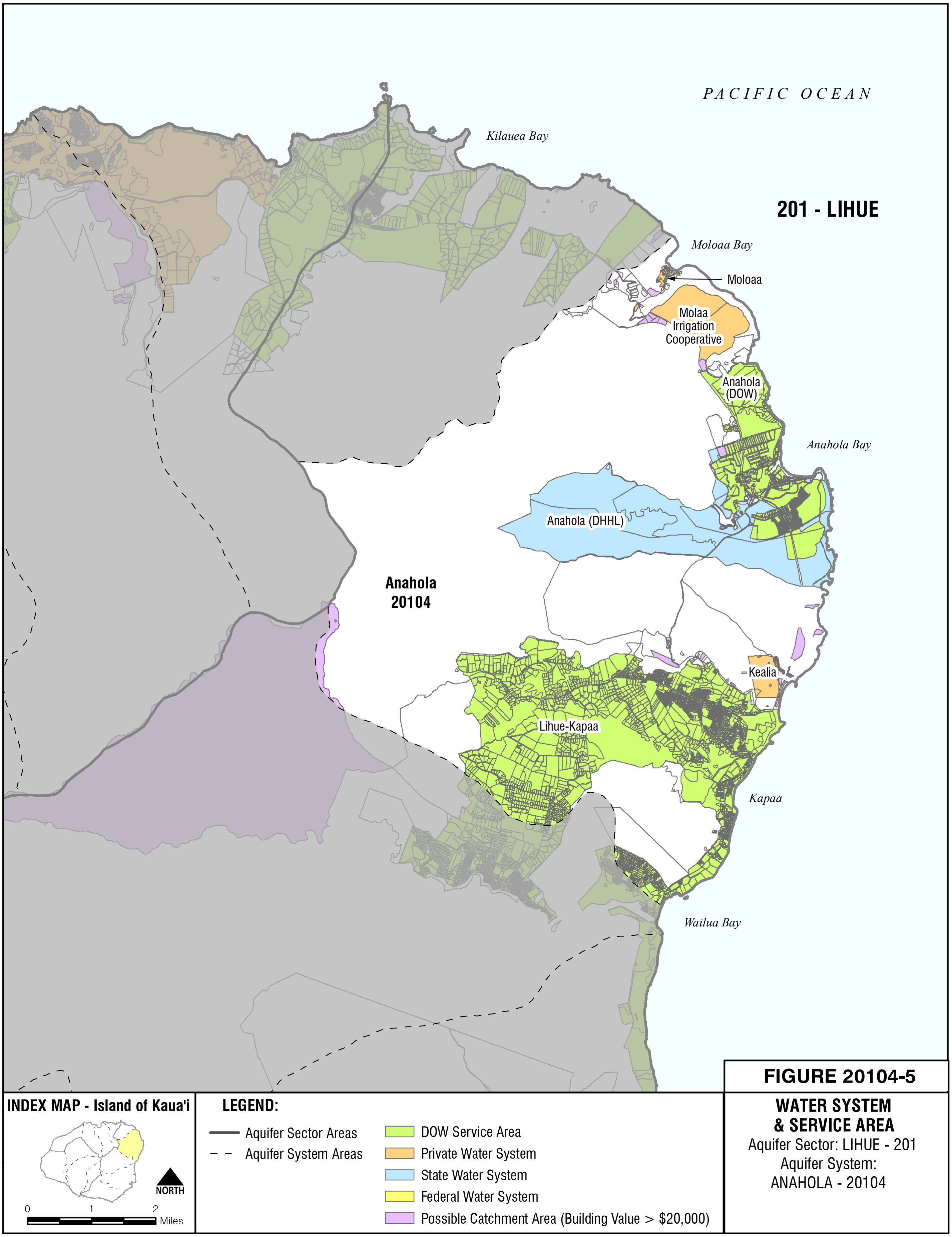

FIGURE 20104-5

WATER SYSTEM & SERVICE AREA
Aquifer Sector: LIHUE - 201
Aquifer System: ANAHOLA - 20104

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Kaua'i County - Department of Water

KAUA'I WATER USE AND DEVELOPMENT PLAN UPDATE

20104-3 EXISTING WATER USE

20104-3.1 General

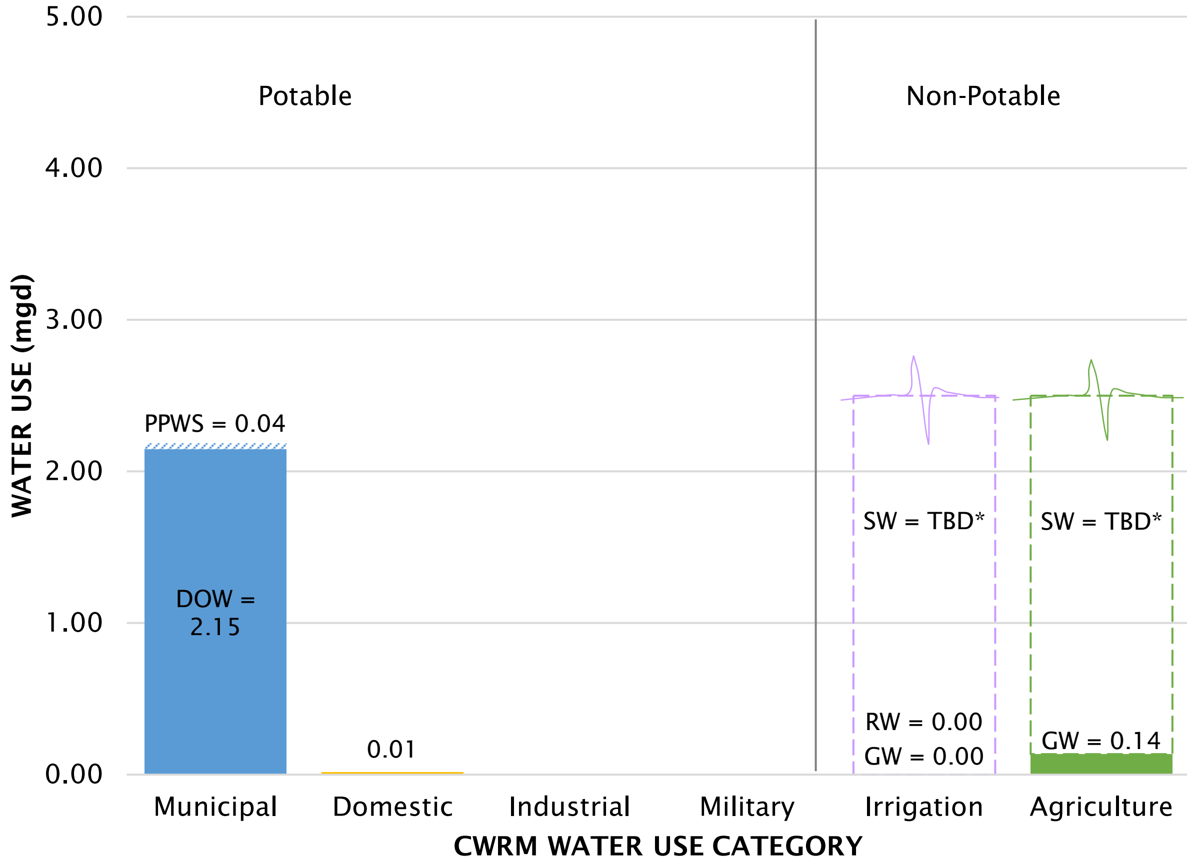
The following section presents the total estimated average water use within the Anahola ASYA. The total estimated average water use was based on data from CWRM (well pumpage) and DOH (Sanitary Surveys for Public Water Systems and estimated recycled water usage) for the year of 2014. Well classification changes since 2014 are noted in the sub-sections below. **Table 20104-5** and **Figure 20104-6** summarize the water use in accordance with CWRM categories.

Table 20104-5: Existing Water Use by Category – Anahola ASYA

CWRM Category	Ground Water (mgd)	Other Sources (mgd)	Total (mgd)	Percent of Total
Domestic	0.01		0.01	0.4
Industrial	0.00		0.00	0.0
Irrigation	0.00		0.00	0.0
Agriculture	0.14	TBD[1]	0.14	6.0
Military			0.00	0.0
Municipal				
DOW System	2.15		2.15	91.9
State System	0.00		0.00	0.0
Private-Public WS	0.04		0.04	1.7
TOTAL	**2.34**		**2.34**	**100.0**

[1] Surface Water – TBD from AWUDP

Figure 20104-6: Existing Water Use by Category – Anahola ASYA



*Values to be determined by other components of the Hawai'i Water Plan

20104-3.2 Domestic Use

There are 55 wells classified as "Domestic" in the CWRM database in 2014. The total reported pumpage is 0.01 mgd. It is noted that pumpage reporting in the Moloaa area is less than ideal; however, even though majority of the small domestic wells are not reporting their pumpage to CWRM, well pumpage reporting is relatively high with large users. Better reporting is needed for non-municipal wells.

Five additional wells were drilled and registered since then, according to the CWRM database in 2017. In addition, a well formerly owned by Makaleha Gardens was re-classified to "Irrigation," increasing the "domestic" well total to 59 wells.

20104-3.3 Industrial Use

There is one well classified as "Industrial" in the CWRM database and is owned by Kaua'i Natural Waters, LLC with no reported pumpage.

20104-3.4 Irrigation Use

Irrigation use has been divided into ground water, recycled water, and surface water.

20104-3.4.1 Ground Water

There are five wells classified as "Irrigation" in the CWRM database, with three wells further classified as IRRLA – landscape irrigation. Two of the IRRLA wells are owned by private landowners. The third IRRLA well was owned by Mandalay Properties Hawaiʻi, LLC but has changed ownership to Kauaʻi Makai, LLC as of 2017. The other two irrigation wells are separately owned by a private landowner and by Hawaiian Trust Co., Ltd. All five wells have not reported pumpage.

As mentioned in the 20104-4.2 Domestic Use section, a well that was previously classified as "Domestic" has been re-classified as IRRLA in the CWRM database as of 2017. In addition, a well also classified as IRRLA was drilled and added to the CWRM database in 2015 under the ownership of a private landowner. The addition of these two wells increases the "irrigation" well total to 7.

20104-3.4.2 Recycled Water

There is no recycled water use in the Anahola ASYA.

20104-3.4.3 Surface Water

Information on surface water use for irrigation is to be determined by the AWUDP. However, typically, due to the location of parks and other landscaped areas within communities, it is assumed that it is unlikely for landscaping to be irrigated with surface water.

20104-3.5 Agricultural Use

Agricultural use has been divided into ground water recycled water, and surface water.

20104-3.5.1 Ground Water

There are six wells classified as "Agriculture" in the CWRM database, with five wells further classified as AGRCP - crops and processing. The well classified as "agriculture" is owned by a private landowner, with reported pumpage of 0.01 mgd. Two wells classified as AGRCP are owned by DLNR and are operated by a private landowner, with reported pumpage totaling 0.13 mgd. This private landowner is the operator of the Moloaʻa water system, discussed in **Section 20104-3.7.4** below. The other three AGRCP wells are separately owned by two private landowners and LPC Corporation, with no reported pumpage.

Two wells, classified as AGRCP, were added to the 2017 CWRM Well Database, owned by Oasis Water Systems and Moloaʻa Valley, increasing the "agriculture" well total to 8.

20104-3.5.2 Recycled Water

There is no recycled water use in the Anahola ASYA.

20104-3.5.3 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP. However, it is noted that the agricultural lands from Hanamāʻulu to Anahola are only lightly used.

20104-3.6 Military Use

There is no military use in the Anahola ASYA.

20104-3.7 Municipal Use

There are 14 wells in the CWRM database classified as "Municipal." 10 are further classified as MUNCO – Municipal County, and the other 4 are further classified as MUNPR – Municipal Private. Municipal can be subcategorized into the other water use categories: Domestic, Industrial, Agricultural, Military, and Municipal.

20104-3.7.1 County Water Systems

The DOW has two major water systems that serve the Anahola ASYA: the Anahola Water System and the Līhuʻe-Kapaʻa water system (Wailua-Kapaʻa subsystem).

Anahola Water System

The Anahola water system (PWS 401) serves 2,174 people through 620 service connections with an average daily flow of 0.255 mgd per the 2013 DOH Sanitary Survey. The Anahola water system serves the DHHL residential areas in Anahola, Anahola Valley, and the ʻAliomanu areas. Water for this system is supplied by 3 wells. **Table 20104-6a** lists the water sources, well number, pumping capacity, pressure zone and pumpage amount.

Table 20104-6a: DOW Anahola Water System Water Sources

WELL NAME	WELL NUMBER	PUMPING CAPACITY (gpm)	PRESSURE ZONE (ft)	PUMPAGE (mgd)
Anahola Well A	2-0818-001	400	288	0.15
Anahola Well B	2-0818-002	200	288	0.08
Anahola Well C	2-0818-003	350	288	0.09

The 288-foot pressure zone is the only pressure zone in the Anahola water system. Two storage tanks are included in the Anahola water system. The water sources are located approximately at the same elevation as the existing storage tanks. To regulate water pressure in the distribution system, several pressure reducing valves are incorporated into the distribution system.

This water system and the Department of Hawaiian Home Lands-owned (DHHL) water system (PWS No. 432) described in **Section 20104-3.7.2** serve as backup for each other.

Wailua-Kapaʻa Subsystem

The Līhuʻe-Kapaʻa water system (PWS 400) consists of three subsystems: 1) Līhuʻe-Hanamāʻulu subsystem, 2) Puhi subsystem, and 3) Wailua-Kapaʻa subsystem. The Līhuʻe-Hanamāʻulu subsystem and Puhi subsystem are entirely within the Hanamāʻulu ASYA and are discussed in **Section 20102**.

The Wailua-Kapaʻa Subsystem services areas in the Hanamāʻulu, Wailua, and Anahola ASYAs. The largest portion of this subsystem service area is located within the Anahola ASYA. The subsystem serves the Wailua River-Waipouli Resort area, Wailua Houselots, Wailua Homesteads, Kapaʻa Town, and Kapaʻa Homesteads. Water for this subsystem is supplied by six wells and two tunnels. **Table 20104-6b** lists the water sources, well number, pumping capacity, pressure zone, and pumpage amount.

Table 20104-6b: DOW Wailua-Kapaʻa Subsystem Water Sources

WELL NAME	WELL NUMBER	PUMPING CAPACITY (gpm)	PRESSURE ZONE (ft)	PUMPAGE (mgd)
Moelepe Tunnel	2-0623-002	650	538	0.43
Makaleha Tunnel	2-0623-001		530	0.46
Wailua Homesteads Well A*	2-0421-001	500	538	0.06
Wailua Homesteads Well B*	2-0421-002	500	538	0.07
Kapaʻa Homesteads Well 1	2-0623-004	1000	530	0.38
Kapaʻa Homesteads Well 2	2-0622-002	500	530	0.21
Nonou Well B	2-0320-003	1000	214	0.07
Nonou Well C*	2-0321-001	1000	214	0.12

*Well located in Wailua ASYA

There are eight primary pressure zones (214, 233, 268, 313, 428, 530, 538, 605 feet) and seven storage tanks in the Wailua-Kapaʻa subsystem. The Puʻupilo Pump Station pumping from the 538' zone to the 605' zone is the only booster pump station in the service area. All other zones are dependent on sources that are located in that zone or by supply fed through pressure reducing valves from higher elevations.

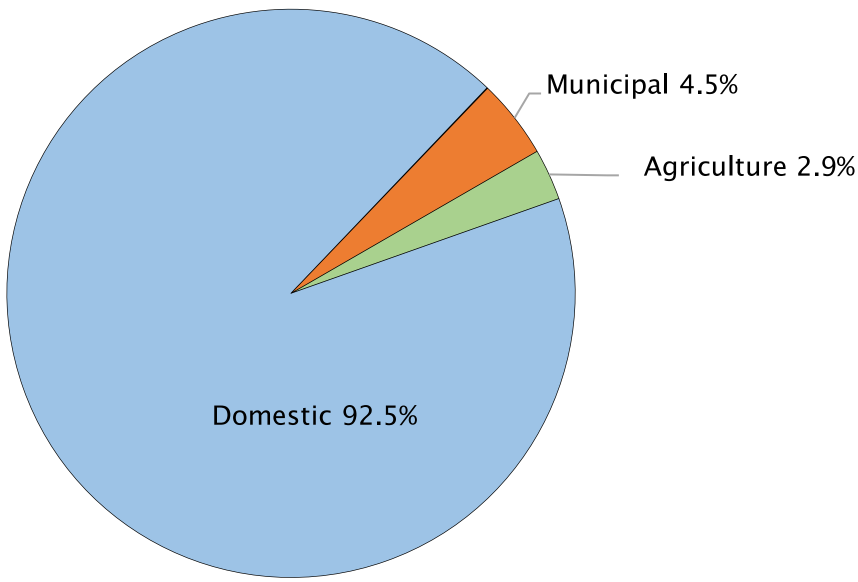
DOW Water Use by Category

DOW water use is subcategorized in **Table 20104-7** to the extent possible based on available meter data and is depicted in **Figure 20104-7**.

Table 20104-7: DOW Existing Water Use by Category – Anahola ASYA

CWRM Water Use Category	DOW Metered Water Use (mgd)	Percent of Total
Agricultural	0.054	2.9
Domestic	1.709	92.5
Industrial	0.001	0.0
Military	0.000	0.0
Municipal	0.083	4.5
Total	**1.847**	**100.0**

Figure 20104-7: DOW Existing Water Use by Category – Anahola ASYA



20104-3.7.2 State Water Systems

The Anahola Farm Lots water system (PWS 432) is the only State water system in the Anahola ASYA regulated by the DOH. The water system is owned by the State of Hawaiʻi Department of Hawaiian Home Lands (DHHL) and is operated by Aqua Engineers, Inc. The water system serves 385 people through 77 service connections with an average daily demand of 0.098 mgd per the 2017 State Water Projects Plan – DHHL Update. This water system serves 50 agricultural parcels (farm lots) and 27 base lots in the Bay View residential subdivision through its sole water source, well 2-0919-003. This well was classified as unused in 2014 but has since been reclassified as MUNST – municipal state. The DOW Anahola water system (PWS No. 401) serves as a backup for this water system, and reciprocally, this water system serves as a backup for the DOW Anahola water system.

20104-3.7.3 Federal Water Systems

There are no Federal water systems in the Anahola ASYA regulated by the DOH.

20104-3.7.4 Private-Public Water Systems

There are three private-public water systems in the Anahola ASYA regulated by the DOH: the Keālia water system (PWS 423), the Moloaʻa water system (PWS 436), and the Moloaʻa Irrigation Cooperative water system (PWS 437).

Keālia Water System

The Keālia water system (PWS 423) is owned by Keālia Water Co. Holdings, LLC and is operated by Aqua Engineers, Inc. The water system serves 260 customers through 69 service connections. Two wells serve the Keālia water system, Keālia Well 1A (2-0618-009) and Keālia Well 2A (2-0618-010) with reported pumpage of 0.04 mgd.

Moloaʻa Water System

The Moloaʻa water system (PWS 436) is owned by DLNR and operated by a private landowner. The private landowner holds a month-to-month revocable permit issued by DLNR to operate the one well that serves the water system; Moloaʻa Well No. 1 (2-1020-002). This well is classified as "agriculture" from the CWRM database and has reported pumpage is 0.13 mgd. Non-potable water from the well is treated and sold to 29 people through 3 service connections. In addition, the private landowner sells the treated water to the Moloaʻa Irrigation Cooperative for their water system (PWS 437) and up to 5,000 gallons of water per day to DOW.

Moloaʻa Irrigation Cooperative Water System

The Moloaʻa Irrigation Cooperative water system (PWS 437) was established in 2010 by a group of farmers to distribute water to over 60 farmers in Moloaʻa. The water system receives its water from the Moloaʻa water system (PWS 436) and serves over 600 acres of farms in an area called the Moloaʻa Hui Lands for both irrigation and domestic uses. Water from the Moloaʻa water system is measured at a master water meter and then piped to a 0.5 MG water tank before distribution. The State Legislature has allocated funds in 2015 to help replace the existing non-potable well (Moloaʻa Well No. 1) with a new potable well, upgrade the existing 0.5 MG tank and distribution system, and install a photovoltaic system. Construction is anticipated to be complete by the end of 2024. In addition, the water system's agricultural water meters were recently replaced with "smart" meters as a way to remotely monitor water use and identify undetected leaks. The agricultural water meter replacement was partially funded by the State.

20104-3.7.5 Per Capita Use

The per capita existing water use consumption based on domestic DOW metered water use and private-public water system use is presented in **Table 20104-8**. The per capita use in the Anahola ASYA is approximately 38.1% lower than the overall County of Kauaʻi per capita use.

Table 20104-8: Per Capita Use – Anahola ASYA

	DOW Metered Water Use – Domestic (mgd)	Private-Public Water System (mgd)	90% of 2015 Population	Per Capita Use (gpd)
Anahola ASYA	1.709	0.036	14,540	120
County of Kauaʻi	**9.360**	**2.951**	**63,462**	**194**

20104-3.8 Existing Water Use by Resource

20104-3.8.1 Ground Water

Table 20104-9 summarizes the current production, sustainable yield (SY), and percentage of SY for the current production. Current production is represented by the 2014 average yield calculated from the actual pumping data.

Table 20104-9: Pumpage – Anahola ASYA

Pumpage (mgd)	SY (mgd)	Pumpage Portion of SY
2.34	21	11.1%

Based on available information from the CWRM database, the current ground water use is 11.1 percent of the sustainable yield.

20104-3.8.2 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP. However, it is noted that the agricultural lands from Hanamāʻulu to Anahola are only lightly used.

20104-3.8.3 Water Conservation

Water conservation, including water loss management, may reduce water use. See **Section 20104-2.3** for existing conservation efforts.

20104-3.8.4 Rainwater Catchment

Developed parcels that are not supplied by ground water or surface water are assumed to be supplied by rainwater catchment.

20104-3.8.5 Recycled Water

There is no recycled water use in the Anahola ASYA.

20104-4 FUTURE WATER USE

20104-4.1 Full Build-Out Water Demand Projections

The full build-out water demand projections based on the General Plan and County Zoning for the Anahola ASYA is listed in **Table 20104-10** and **Table 20104-11**, respectively. Each land use class is associated with the most appropriate CWRM water use category.

Table 20104-10: General Plan Full Build-Out Water Demand Projection – Anahola ASYA

General Plan Category	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	1.17
Open	Domestic	0.11
Military	Military	0.00
Park	Irrigation	0.14
Residential	Domestic/Municipal	3.45
Resort	Domestic/Irrigation/Municipal	2.08
Transportation	Municipal	0.00
Urban Center	Domestic/Industrial/Municipal	1.87
DHHL	Domestic	1.47
	TOTAL	**10.29**

Table 20104-11: Zoning Full Build-Out Water Demand Projection – Anahola ASYA

Zoning Class	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	1.17
Commercial	Municipal	0.25
Industrial	Industrial/Municipal	0.10
Open	Domestic	0.11
Residential	Domestic/Municipal	2.55
Resort	Domestic/Irrigation/Municipal	1.58
Special Planning Area		0.08
DHHL	Domestic	1.47
	TOTAL	**7.31**

20104-4.1.1 Refined Land Use Based Water Projection

State Water Projects Plan

Table 20104-12 lists future State water projects reported in the 2021 SWPP update. The total projected demand to the year 2034 for these 16 State projects within the Anahola ASYA is 9.6173 mgd, 1.532 mgd using potable and 8.086 mgd using non-potable sources.

Table 20104-12: Future State Water Projects – Anahola ASYA

Project Name	State of Hawaiʻi Department	Primary Use	Water Development Strategy	2034 Demand (mgd)
Kapaʻa Elementary School New Administration	DOE	Potable	REMAIN	0.0003
Kapaʻa Elementary School New Library	DOE	Potable	REMAIN	0.0005
Kapaʻa High School New Administration	DOE	Potable	REMAIN	0.0005
Kapaʻa II Elementary School	DOE	Potable	REMAIN	0.0600
Anahola 1	DHHL	Potable	COUNTY-CREDIT	0.0932
Anahola 2	DHHL	Potable	EXSWS	0.0585
Anahola 3	DHHL	Potable	REMAIN	1.1518
Anahola (Non-Potable 1)	DHHL	Non-potable	NONE-AMBIENT RAINFALL	2.5959
Anahola (Non-Potable 2)	DHHL	Non-potable	NEWSWS	1.2799
Anahola (Non-Potable 3)	DHHL	Non-potable	NEWSWS	1.2799
Kapaʻa	DHHL	Potable	REMAIN	0.0674
Moloaʻa	DHHL	Potable	OTHER-CATCHMENT	0.0235
Moloaʻa (Non-Potable 1)	DHHL	Non-potable	OTHER-STREAM DIVERSION	2.2500
Moloaʻa (Non-Potable 2)	DHHL	Non-potable	NONE-AMBIENT RAINFALL	0.6800
Piʻilani Mai Ke Kai – Phase 2	DHHL	Potable	COUNTY-CREDIT	0.0235
Piʻilani Mai Ke Kai – Phase 3	DHHL	Potable	COUNTY-CREDIT	0.0505
TOTAL REMAIN				1.2805
TOTAL ANAHOLA ASYA SWPP 2034 DEMAND				9.6173

As mentioned in **Section 2.2.2.5.1**, State water projects with the water development strategy of REMAIN are located within the service areas of County water systems which need to be coordinated with the respective County water departments. Six of the 16 State projects within the Anahola ASYA were assigned the REMAIN water development strategy and results in a total 2034 demand of 1.2805 mgd. This accounts for 6.10 percent of the 21 mgd sustainable yield for the Anahola ASYA. See the following paragraph for more information on the DHHL projects within the Anahola ASYA.

State Department of Hawaiian Home Lands

Three DHHL tracts are located within the Anahola ASYA: the Anahola Tract, Moloaʻa Tract, and Kapaʻa Tract. The State Water Projects Plan – DHHL Update (SWPP), dated May 2017, provides information related to projected DHHL water demands and the related water development strategies being proposed to meet these water demands. The DHHL demands have also been incorporated into the SWPP Update, dated May 2021. See **Table 20104-12** for a breakdown of the demands. The projected potable water demands for the Anahola, Moloaʻa, and Kapaʻa tracts is 1.38 mgd, 0.02 mgd, and 0.07 mgd, respectively.

As provided in the 2017 SWPP, the projected Anahola Tract water demand can be met using the DOW Anahola Water System utilizing the existing water credit agreement between DHHL and the DOW. The projected Moloaʻa Tract water demand can be met by installing and utilizing a rainwater catchment system - the annual ambient rainfall should be sufficient to supply the projected water demand. The Kapaʻa Tract water demand can be supplied by the existing DOW Anahola Water System.

The 2017 SWPP also included a discussion related to meeting non-potable water demands. This discussion projected that non-potable demands for the Anahola and Moloaʻa tracts will be 5.16 and 2.93 mgd, respectively. As indicated in the 2017 SWPP, the projected non-potable water demand for the Anahola Tract can be met by utilizing ambient rainfall and water from the Anahola Irrigation System (once it is reinstated). Similarly, the projected non-potable water demands for the Moloaʻa Tract can be met by utilizing ambient rainfall and waters from the Moloaʻa Stream.

Agricultural Water Use and Development Plan

The AWUDP dated 2003 (revised 2004) was limited in scope. More recent, comprehensive information on agricultural lands is available in the County of Kauaʻi Important Agricultural Lands (IAL) Study.

In 2019, a public review draft of the AWUDP was released and it is anticipated that the next phase of the AWUDP will provide agricultural water demand projections in greater detail and will supersede information in the KWUDP when it becomes available.

County of Kauaʻi Important Agricultural Lands Study

4,567 acres of agricultural lands within the Anahola ASYA received a score of 28 or better in the County of Kauaʻi Important Agricultural Lands (IAL) Study. Lands that receive a score of 28 or better were determined to have met all eight IAL criteria to some degree. Only a subset of lands with a score of 28 or better is expected to be designated as IALs. **Table 20104-13** compares these lands that received a score of 28 or better to the declared surface water use from diversions and to the diversified water use rate of 3,400 gallons per acre per day (gpad) estimated in the 2004 AWUDP.

Table 20104-13: Irrigation of Agricultural Lands

(1) Declared Surface Water Use from Diversions (mgd)	2.96
(2) Agricultural Lands with a Score ≥ 28 (acres)	4,567
- How many acres can be sustained by **(1)** at a water rate of 3,400 gpad? (Acres)	871
- What percent of **(2)** can be sustained with a water rate of 3,400 gpad?	19%
- If all of **(2)** were to be irrigated, what is the water unit rate? (gpad)	648

20104-4.1.2 Water Use Unit Rates

Water use unit rates are based on the *Water System Standards* (WSS), as discussed in Chapter 2.

The General Plan provides only broad density guidelines for residential and resort designations. For these designations, under the assumption that most residents would like their communities, including the development density, to remain similar in the future, the average number of dwelling units as allowed by zoning was used as the density (i.e., 4.83 dwelling units per acre for residential designation and 20.00 dwelling units per acre for resort designation).

20104-4.2 Water Demand Projections to the Year 2035

The following section presents water demand projections to the year 2035 for the Anahola ASYA. The projected low, medium, and high growth rates are listed in **Table 20104-14** and are graphed in **Figure 20104-8**. Potable (domestic, industrial, municipal, and military water uses) and non-potable (irrigation) water demands are also differentiated.

Table 20104-14: Water Demand Projection – Anahola ASYA

Water Use Category	Water Demand by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
GROWTH RATE C (HIGH)									
TOTAL	**2.20**	**2.21**	**2.23**	**2.25**	**2.26**	**2.28**	**2.37**	**2.47**	**2.58**
Potable	2.20	2.21	2.23	2.25	2.26	2.28	2.37	2.47	2.58
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GROWTH RATE B (MEDIUM)									
TOTAL	**2.20**	**2.21**	**2.23**	**2.24**	**2.26**	**2.28**	**2.36**	**2.45**	**2.55**
Potable	2.20	2.21	2.23	2.24	2.26	2.28	2.36	2.45	2.55
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GROWTH RATE A (LOW)									
TOTAL	**2.20**	**2.21**	**2.22**	**2.22**	**2.23**	**2.24**	**2.29**	**2.34**	**2.40**
Potable	2.20	2.21	2.22	2.22	2.23	2.24	2.29	2.34	2.40
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figure 20104-8: Water Demand Projection Summary – Anahola ASYA

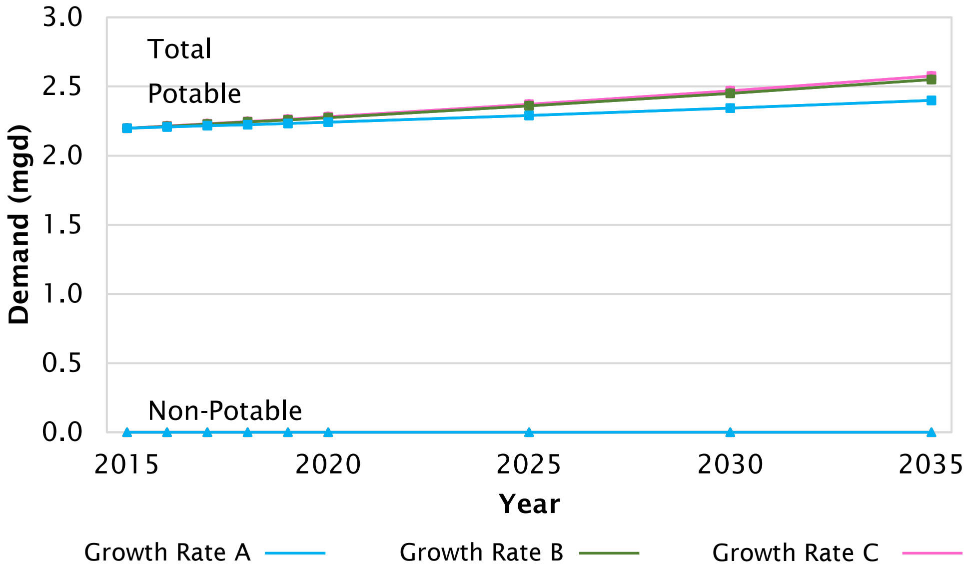


Figure 20104-9 shows the breakdown of water demand projections for a medium growth rate by CWRM categories through the year 2035. **Table 20104-15** summarizes this figure.

Figure 20104-9: Medium Growth Rate B Water Demand Projection by Category – Anahola ASYA

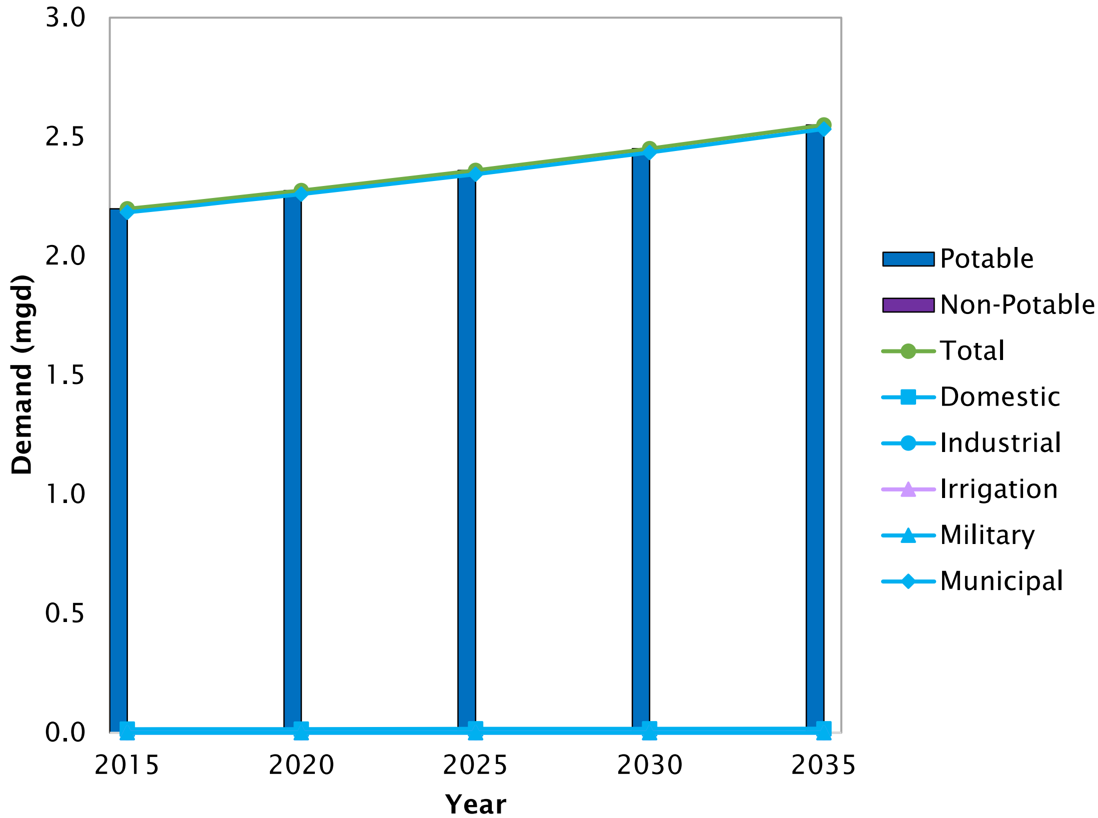


Table 20104-15: Medium Growth Rate B Water Demand Projection by Category – Anahola ASYA

Water Use Category	Water Use by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
Total	**2.20**	**2.21**	**2.23**	**2.24**	**2.26**	**2.28**	**2.36**	**2.45**	**2.55**
Potable	2.20	2.21	2.23	2.24	2.26	2.28	2.36	2.45	2.55
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Domestic	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Irrigation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Military	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Municipal	2.19	2.20	2.21	2.23	2.24	2.26	2.34	2.43	2.53
DOW	2.15	2.16	2.18	2.19	2.21	2.22	2.31	2.39	2.49

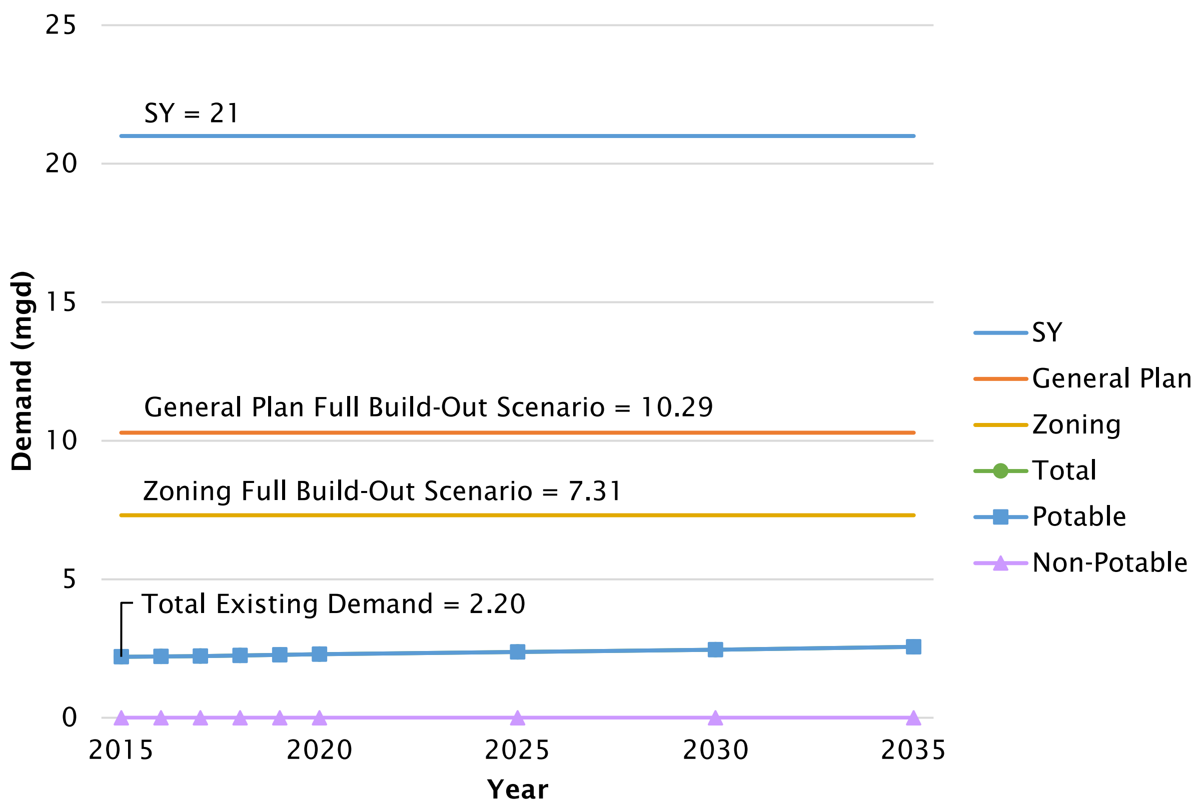
20104-4.3 Summary

Figure 20104-10 illustrates the magnitude of the sustainable yield, both General Plan and Zoning full build-out water use projections, and water use projection through the year 2035 focusing on Medium Growth Rate B. **Table 20104-16** summarizes the General Plan, Zoning, and 20-year water demand projection scenarios for the Anahola ASYA. The sustainable yield is presented to draw comparisons. All demands are in mgd.

Table 20104-16: Summary of Demand Projections

SY (mgd)	FBO (mgd)		Medium Growth Rate Demand by Year (mgd)								
	GP	Zoning	2015	2016	2017	2018	2019	2020	2025	2030	2035
21	10.29	7.31	2.20	2.21	2.23	2.24	2.26	2.28	2.36	2.45	2.55

Figure 20104-10: Medium Growth Rate B Water Demand Projections and Full Build-Out – Anahola ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use. For future agricultural water use analysis, please see Section 20104-4.1.1 County of Kaua'i Important Agricultural Lands Study.

20104-5 RESOURCE AND FACILITY RECOMMENDATION

20104-5.1 Water Source Adequacy

20104-5.1.1 Full Build-Out

Development to the highest extent allowed by the General Plan and County Zoning within the Anahola ASYA is sustainable, with General Plan and County Zoning full build-out water demands requiring 49 and 35 percent of the 21 mgd sustainable yield (SY), respectively.

20104-5.1.2 Twenty-Year Projection

The 2035 water demand projection for the Anahola ASYA is sustainable, requiring only 12 percent of the 21 mgd sustainable yield.

20104-5.2 Source Development Requirements

20104-5.2.1 Supply-Side Management

Supply-side management, including conventional water resource measures, water conservation, and alternative water resource measures, were evaluated to meet projected water demands.

Conventional Water Resource Measures

Ground Water

The Anahola ASYA contains basal, perched, and high level ground water. Most reported pumpage is from the high level, followed by basal and then perched.

The 2035 water demand projection for the Anahola ASYA is only 12 percent of the 21 mgd sustainable yield. This indicates that theoretically, more water could be pumped from the aquifer without impairing the utility or quality of the water resource if wells are optimally placed and the proper due diligence with regard to traditional and customary rights and impacts has been completed. However, it is noted that sustainable yield does not consider the feasibility of developing the ground water resources, and that the safe yield of an individual production well may be limited by localized ground water behavior near the well as a result of pumpage. Water supply reliability and quality, feasibility, environmental and cultural impacts, and water rights shall be considered as projects and programs develop. More detailed and site-specific evaluation of these impacts shall be required and accomplished through the environmental review process (HRS Chapter 343) for source development projects and programs utilizing public funding, and CWRM could consider requiring compliance with the environmental review process for private source development projects and programs also. **Section 1.5.3.1** provides additional information regarding the protection of traditional and customary rights.

There are several public water systems that pump ground water from the Anahola ASYA. Development of additional wells to meet future demands may be considered for the DOW's Wailua-Kapa'a subsystem and DOW's Anahola water system. In addition, the State Legislature allocated funds in 2015 to replace the existing Moloaʻa Well No. 1, which serves the Moloaʻa Water System and Moloaʻa Irrigation Cooperative Water System. The funding was to provide a new potable well and to upgrade the existing storage and distribution system. Construction is anticipated to be completed by the end of 2024.

The DOW's Water Plan 2020 identified water projects to meet the growing demand of its service areas. For DOW's Wailua-Kapaʻa subsystem, Kapaʻa Homesteads Well 4 is currently under construction. For DOW's Anahola water system, an additional 300-gpm well in north Anahola is proposed.

The DOW's Water Plan 2020 also identified potential storage and distribution system upgrades. Several storage deficiencies in the Wailua-Kapaʻa subsystem were identified under maximum day demand conditions. A few new tanks have been constructed and more new tanks are planned to address these deficiencies. Many water main projects have been completed in the Wailua-Kapaʻa subsystem. Several more water main projects have been proposed in both the Wailua-Kapaʻa subsystem and the Anahola system, including replacing mains in Kapaʻa town and replacing a main along Anahola Road.

Surface Water

The Anahola ASYA has 34 declared diversions. Until permanent instream flow standards are established, interim instream flow standards have been adopted. According to Section 13-169-46, Hawaiʻi Administrative Rules, "Interim Instream Flow Standard for all streams on Hawaiʻi, as adopted by the commission on water resource management on June 15, 1988, shall be that amount of water flowing in each stream on the effective date of this standard, and as that flow may naturally vary throughout the year and from year to year without further amounts of water being diverted off-stream through new or expanded diversions, and under the stream conditions existing on the effective date of the standard, except as may be modified [by the commission]." Therefore, for the purposes of assessing surface water availability, it is assumed that no additional diversions will be allowed without amendment of the interim IFS.

The existing declared diversions have the potential to meet additional demands. However, a challenge with developing surface water is transmission of these resources from source to location of need. Farmers generally grow what is feasible for the area; therefore, it is anticipated that agricultural water use will follow the availability of irrigation water. Increase in the availability of surface water would likely promote additional usage and could thereby minimize ground water being used for irrigation.

There are a couple of existing irrigation systems in the Anahola ASYA, including the East Kauaʻi Irrigation System (EKIS) and the Anahola Ditch. Due to the cessation of sugarcane cultivation, many of these irrigation systems may not be functioning as efficiently as they once were. It is noted that maintaining these valuable existing irrigation systems requires significant effort and funding, and agreements regarding how this is to occur will need to be developed. The Agricultural Water Use and Development Plan (AWUDP) should include an inventory of large irrigation systems and provide information on their rehabilitation and maintenance needs. The AWUDP should also include a more detailed assessment of agricultural water demand projections that will supersede information in the KWUDP when it becomes available. The 2017 SWPP identifies EKIS as the source of non-potable water for DHHL's Wailua tract and recommends reinstating the Anahola Irrigation System to meet the non-potable demands of DHHL's Anahola tract.

Water Transfer

Some existing irrigation systems have the capability to transfer surface water to adjacent ASYAs. The AWUDP shall study irrigation system services areas and provide information on irrigation systems' water transfer.

Water can also be transferred between ASYAs through public water systems. The Wailua-Kapaʻa subsystem consists of eight pressure zones. The 538' zone, located in the Wailua ASYA, can provide water to the 530' zone during an emergency when a source in the 530' zone is out of service. Also, DOW's Wailua-Kapaʻa subsystem is interconnected with the Līhuʻe-Hanamāʻulu subsystem. Currently, there is some water transfer from the Līhuʻe-Hanamāʻulu subsystem to the Wailua-Kapaʻa subsystem. Flow between these subsystems is regulated by a valve. In the past, water from the Wailua-Kapaʻa subsystem was boosted into the Līhuʻe-Hanamāʻulu system by the Hanamāʻulu Booster Station. To meet future demands, DOW could utilize the interconnection between these two subsystems to transfer any surplus supply from one system to the other.

Water Conservation

The per capita use in the Anahola ASYA is approximately 38.1% lower than the overall County of Kauaʻi per capita use. There are no ASYA-specific conservation measures in place at this time; however, there are general water conservation programs that are described in **Section 1.5.7**. Water conservation, including water loss management, can increase the amount of water available and help to ensure the long-term viability of water resources.

The DOW's Water Plan 2020 proposed instituting water conservation measures in the Anahola water system service area as a strategy to avoid a projected storage deficit in the system.

Alternative Water Resource Measures

Rainwater Catchment

Rainwater can be utilized as a water resource in several ways.

Rainwater can be harvested in rainwater catchment systems which can be utilized to supply domestic potable water needs. These systems are viable in areas that receive abundant rainfall and are a suitable source of potable water for individual domestic users in areas outside the limits of municipal water systems. Generally, these are remote areas and are not expected to expand significantly because most development is anticipated to be concentrated within existing urban areas. The 2017 SWPP proposes rainwater catchment as the strategy to meet the projected potable water demand for DHHL's Moloaʻa tract.

Rainwater can also be used to supplement or satisfy agricultural non-potable water needs through ambient rainfall.

See the Storm Water Reuse section below to see how rainwater as storm water runoff can be reclaimed and reused.

Storm Water Reuse

Rainfall can turn into storm water runoff. Storm water runoff from impervious surfaces in urban areas can be significant. This water could be captured, treated, and used as a source of non-potable water (e.g., irrigation), integrated with recycled water, or even as potable and/or non-potable ground water recharge. However, due to the lack of storm water reuse standards, the high initial infrastructure costs, and the treatment requirements, storm water reclamation and reuse on a small or large scale may not be feasible and requires further assessment as noted in the Water Resource Protection Plan. The U.S. Department of the Interior, Bureau of Reclamation published An Appraisal of Stormwater Reclamation and Reuse Opportunities in Hawai'i (Storm Water Report) in 2008 but did not identify any storm water reclamation and reuse opportunities in the Anahola ASYA.

Recycled Water

Recycled water is a valuable resource; an increase in its use may lower the dependence on potable sources. However, there are no wastewater reclamation facilities (WWRFs) in the Anahola ASYA.

Desalination

Desalination of brackish ground water is a potential alternative; however due to its high capital and operational costs, it likely would not be considered when other potable water sources are readily available.

20104-5.2.2 Demand-Side Management

Development Density Control

The full build-out demand for the Anahola ASYA based on County Zoning is 7.31 mgd, which is 35 percent of the sustainable yield. This indicates that there are adequate water resources to sustain the level of development that is allowed by law. In the Anahola ASYA, the average number of dwelling units allowed by County Zoning is 4.83 dwelling units per acre in residential districts and 20.00 dwelling units per acre in resort districts.

The full build-out demand for the Anahola ASYA based on the General Plan is 10.29 mgd which is 49 percent of sustainable yield. Although it is unlikely that full build-out will occur within the time frame of the General Plan, the full build-out demand is sustainable; there are adequate water resources to sustain the long-range land use vision for this area. Therefore, development density control may not be necessary. However, the County Planning Department could consider development density control for areas where there is the flexibility to do so, such as areas that are not yet zoned as residential or resort, and promote sustainable development. Further, it is noted that the full build-out scenario is unlikely to occur since it assumes all land is developed to the maximum extent.

20104-5.3 Recommended Alternatives

To optimize appropriate use of water resources, the quality of the water source should be matched to the quality of water required. The highest quality of water shall be reserved for the most valuable end use. Potable water is considered the highest quality water, and the sustenance of life is the most valuable end use. Recycled water, brackish water, untreated surface water, and other lower quality water sources should be used for landscaping and agriculture when available, thereby reserving potable water for human consumption. If there is a practical alternative water source available, that alternative source should be used in lieu of ground water or surface water. With this in mind, the following recommendations are made for the Anahola ASYA:

Alternative Water Resources

Use of alternative water sources can reduce demands on both ground and surface water resources and conserve water resources as a whole. However, aside from rainwater, there are no available alternative water sources in the area. Alternative water sources are unlikely to be developed when other water resources are readily available.

Conservation

Water resources are a finite resource that should be managed and used wisely. It should be conserved and not wasted. Implementation of conservation measures should continue to be encouraged.

Ground Water

Meeting future demands at a reasonable cost is a planning objective, and conventional sources, such as ground water, are typically the most cost-effective means for meeting projected water demands. Projected potable water needs are within the sustainable yield for this area. Therefore, ground water resources could continue to be used and developed to meet potable water needs now and into the future. However, as noted above, development of conventional water resource measures can have challenges, and water supply reliability and quality, feasibility, environmental and cultural impacts, and water rights shall be considered as projects and programs develop.

Development of ground water resources is the primary strategy to serve future potable demands in the Anahola ASYA.

Surface Water

Surface water, where available, should be used to meet non-potable demands if alternative water resources are not available. To achieve this, it will be critical to maintain and improve existing irrigation systems. Making surface waters more readily available to meet non-potable water demands has the potential to minimize future dependence on the use of ground water. It is therefore recommended that the AWUDP provide information on the rehabilitation and maintenance needs of large irrigation systems.

Demand-Side Management

Full build-out demand based on the General Plan is 49 percent of sustainable yield. At this projection, implementation of development density control by the County Planning Department is not needed. Although the projection is sustainable, the County Planning Department will need to consider potential impacts on available water resources when considering any future zoning modifications. Modifications that may result in increased development density within the area will increase demands on water resources.

Chapter 20105

Kīlauea Aquifer System Area

CHAPTER 20105 - TABLE OF CONTENTS

FIGURES

TABLES

20105 KĪLAUEA AQUIFER SYSTEM AREA

20105-1 SYSTEM AREA PROFILE

20105-1.1 General

The Kīlauea [20105] Aquifer System Area (ASYA) is roughly bound by the Pacific Ocean along the north, the ridge above the Moloaʻa and Puʻu Ka Ele Streams along the south and up to the peak of Mount Namahana, and along the ridge above Pōhakuhonu, Kahiliholo, and Kīlauea Streams on the west. The ASYA includes most of Kīlauea town.

Average annual rainfall ranges from 50 inches per year along the coast to 130 inches in the mountains. The sustainable yield for the Kīlauea ASYA is 10 mgd.

20105-1.2 Economy and Population

20105-1.2.1 Economy

The Kīlauea ASYA is primarily a rural residential community and is surrounded by agriculturally zoned lands. Land use within the Kīlauea ASYA is largely designated as Agriculture. Agricultural activities include orchards and farms specializing in the production of organic produce. Local retail and/or commercial areas are mainly centered in the area located near the intersection of Kūhiō Highway and Kīlauea Road.

20105-1.2.2 Population

The population within the Kīlauea ASYA is concentrated in closer proximity to the shoreline area below (north) of Kūhiō Highway. Historical population data for the Kīlauea AYSA is summarized in **Table 20105-1**. Population projections through the year 2035 are summarized in **Table 20105-2a**. As shown in **Table 20105-2b**, it is estimated that the area will continue to experience growth rates between 1 and 7 percent per decade.

Table 20105-1: Historical Population – Kīlauea ASYA

	Year		
	1990	2000	2010
Population	1,953	2,183	2,642
Percent Change		11.8	21.0

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report. Data redistributed and evaluated for Kīlauea ASYA.

Table 20105-2a: Population Projection by Year – Kīlauea ASYA

Growth Rate	Population by Year								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
A – Low	2,664	2,667	2,670	2,674	2,677	2,681	2,702	2,727	2,757
B – Med.	2,682	2,693	2,703	2,714	2,725	2,737	2,799	2,870	2,952
C – High	2,685	2,697	2,709	2,721	2,733	2,746	2,816	2,894	2,986

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report. Data redistributed and evaluated for Kīlauea ASYA.

Table 20105-2b: Population Projection – Percent Change – Kīlauea ASYA

Growth Rate	2015-2025 % Change	2025-2035 % Change
A – Low	1.4	2.8
B – Medium	4.4	7.9
C – High	4.9	6.0

20105-1.3 Land Use

20105-1.3.1 2000 Kaua'i General Plan

The 2000 Kaua'i County General Plan Land Use Designation Map for the Kīlauea ASYA is shown on **Figure 20105-1**. The estimated land use allocation acreage for each land use designation within the system area is listed in **Table 20105-3**.

Table 20105-3: General Plan Estimated Land Use Allocation Acreage – Kīlauea ASYA

General Plan Land Use Designation	Acreage	Percent of Total
Agricultural	6,476	52.5
Military	0	0.0
Open	5,717	46.3
Park	0	0.0
Residential Community	148	1.2
Resort	0	0.0
Transportation	0	0.0
Urban Center	0	0.0
DHHL	0	0.0
TOTAL	**12,341**	**100.0**

20105-1.3.2 Kaua'i Zoning

Kaua'i County Zoning Map for the Kīlauea ASYA is shown on **Figure 20105-2**. The estimated land use allocation acreage for each zoning district within the system area is listed in **Table 20105-4**.

Table 20105-4: County Zoning Estimated District Allocation Acreage – Kīlauea ASYA

Zoning District	Acreage	Percent of Total
Agriculture	5,066	40.4
Commercial – General	0	0.0
Commercial - Neighborhood	3	0.0
Conservation	4,147	33.1
Industrial – General	0	0.0
Industrial - Limited	0	0.0
Open	3,164	25.3
Residential	115	0.9
Resort	0	0.0
Project Development	0	0.0
Special Planning Area	0	0.0
Special Treatment	0	0.0
No Zoning	32	0.3
DHHL	0	0.0
TOTAL	**12,527**	**100.0**

The number of dwelling units allowed in residential and resort districts varies by the type of residential or resort district. The average number of dwelling units allowed in residential districts in the Kīlauea ASYA is 5.42 dwelling units per acre.

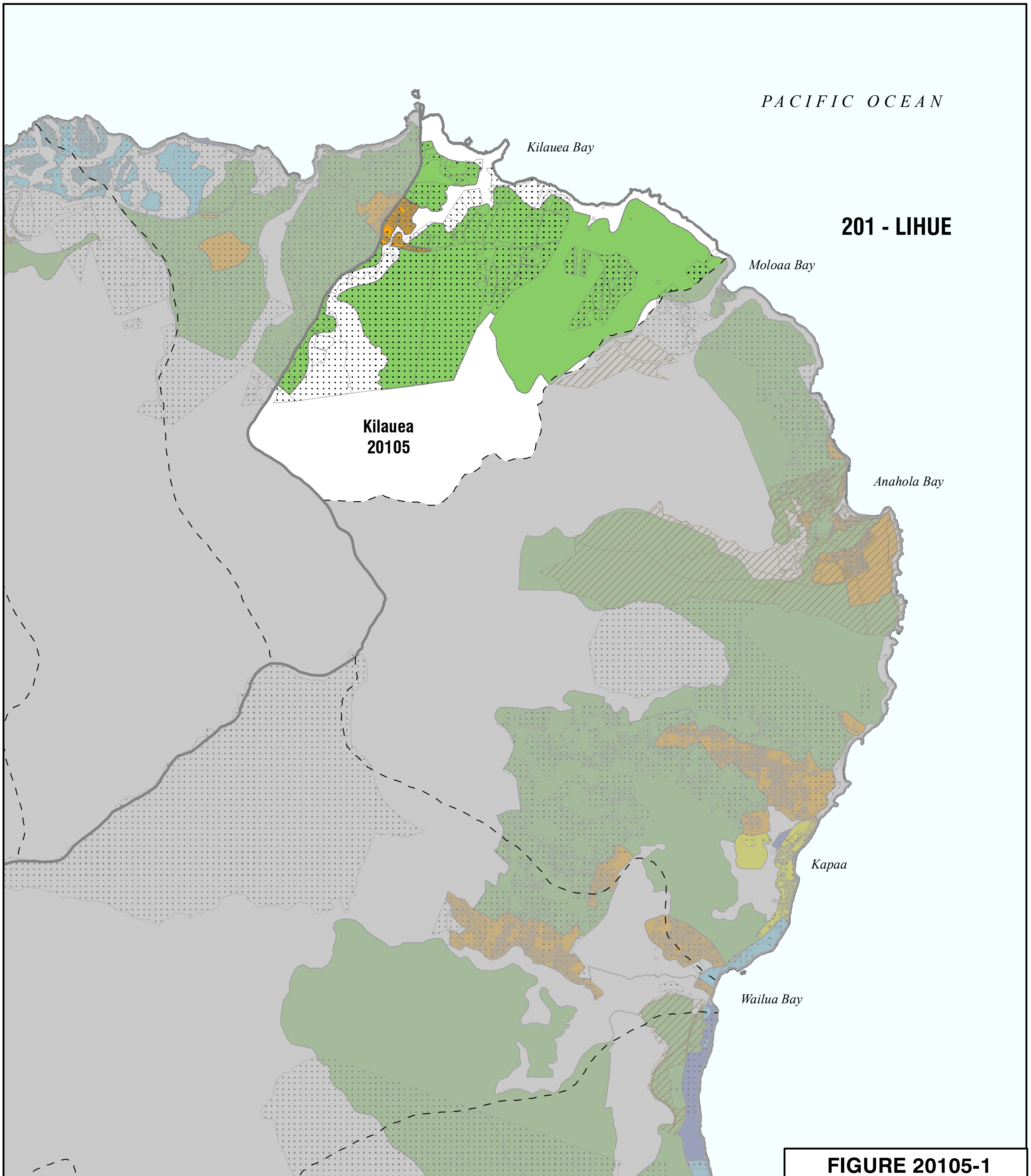
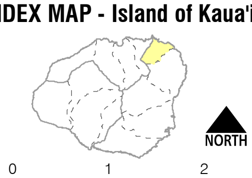


FIGURE 20105-1

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- Hawaiian Home Lands
- Developed Properties

Land Use Allocation Guide

- Agricultural
- Open
- Park
- Military
- Residential Community
- Resort
- Transportation
- Urban Center

GENERAL PLAN
LAND USE MAP
Aquifer Sector: LIHUE - 201
Aquifer System:
KILAUEA - 20105

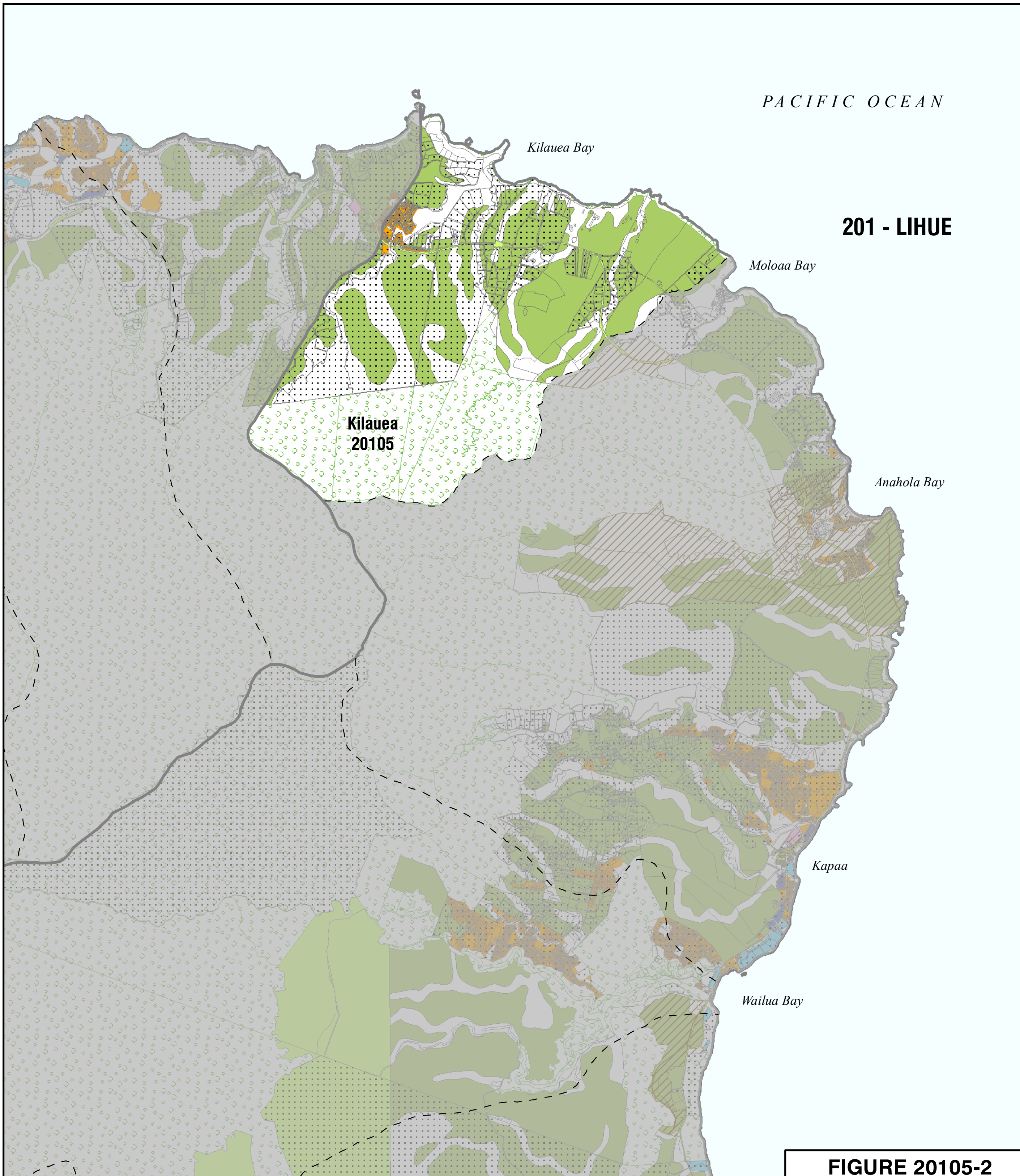
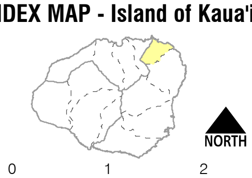


FIGURE 20105-2

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- Hawaiian Home Lands
- Developed Properties

Zoning Designations:

- Agriculture
- Commercial - General
- Commercial - Neighborhood
- Conservation
- Industrial - General
- Industrial - Limited
- No Zoning
- Open
- Residential
- Resort
- Special District

COUNTY ZONING

Aquifer Sector: LIHUE - 201
Aquifer System:
KILAUEA - 20105

20105-2 EXISTING WATER RESOURCES

20105-2.1 Ground Water

The Kīlauea ASYA has a sustainable yield of 10 mgd. According to the 2014 CWRM database, there are 43 production wells in the system, 10 agriculture, 2 municipal, 28 domestic, and 3 irrigation wells. There are also 12 wells drilled and categorized as "unused". Refer to **Appendix A** for this database. **Figure 20105-3** shows the well locations.

20105-2.2 Surface Water

There are 6 streams classified as perennial in the Kīlauea ASYA, of which 3 are considered continuous and 3 are considered intermittent. Kīlauea Stream, Kulihaili Stream, and Pīlaʻa Stream are classified as continuous streams. E. Waiakalua Stream, W. Waipakē Stream, and E. Waipakē Stream are classified as intermittent streams. The USGS has 1 active surface water gage in the system area. The gage is located on Hālaulani Stream, which was previously listed in **Table 1-19**.

In accordance with the Code, the CWRM must establish and administer instream flow standards (IFS) on a stream-by-stream basis as necessary to protect public interests. IFS is defined as "a quantity or flow of water or depth of water which is required to be present at a specific location in a stream system at certain specified times of the year to protect fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses." Considerably more research and study need to be completed to accumulate the data and perspective necessary to conduct a thorough and meaningful assessment of IFS. Until permanent IFS are established, interim IFS have been adopted. The interim IFS are defined as the amount of water flowing in each stream at the time the administrative rules governing them were adopted in 1988 and 1989. In order to assess surface water sustainability, this KWUDP assumes that no additional diversions will be allowed from any stream without amendment of the interim IFS.

There are 17 declared stream diversions in the CWRM database shown on **Figure 20105-4**, which accounts for 6 percent of the 292 declared stream diversions on the island. The declared stream diversions are listed in **Appendix B**. The total declared flow for the Kīlauea ASYA is 0.32 mgd.

Ka Loko and Puʻu Ka Ele Ditches, Stone Dam, and Kalihiwai Irrigation Subsystems were formerly owned by Kīlauea Sugar Company and used to irrigate sugarcane fields. The irrigation systems no longer function as a network and are now considered standalone subsystems.

- The Ka Loko Irrigation Ditch Subsystem is owned by the Mary N. Lucas Trust, Pflueger Partners, and Circensa. The subsystem is active but may need rehabilitation. It diverts water from the Puʻu Ka Ele Stream and Kaluaʻa Stream.

- The Puʻu Ka Ele Irrigation Ditch Subsystem is owned by Jurassic Kāhili Ranch and is inactive. The 2019 draft AWUDP update recommends that this subsystem not be rehabilitated since it is not in use and some portions are demolished.

- The Stone Dam Irrigation Subsystem is managed by Bridgewater Irrigation. The subsystem is currently active and diverts water from the Pōhakuhono and Hālaulani Streams. This subsystem also provides backup water to the Kalihiwai Irrigation subsystem.

- The Kalihiwai Irrigation subsystem is managed by Porter Irrigation System. The subsystem is currently active, in relatively good condition, and diverts water from the Pōhakuhono Stream. This subsystem is primarily located in and serving the Kalihiwai ASYA.

20105-2.3 Water Conservation

Water conservation increases the amount of water available and helps to ensure the long-term viability of water resources. Water conservation measures for this ASYA are as described in **Section 1.5.7** of this report. There are no ASYA specific special conservation measures in place at this time.

20105-2.4 Rainwater Catchment

Rainwater catchment is a viable resource for areas that are not served by ground water or surface water. **Figure 20105-5** shows the possible catchment areas, or parcels with a building value greater than $20,000 and assumed to be developed but without a ground water or surface water source.

20105-2.5 Recycled Water

There are no wastewater reclamation facilities in the Kīlauea ASYA.

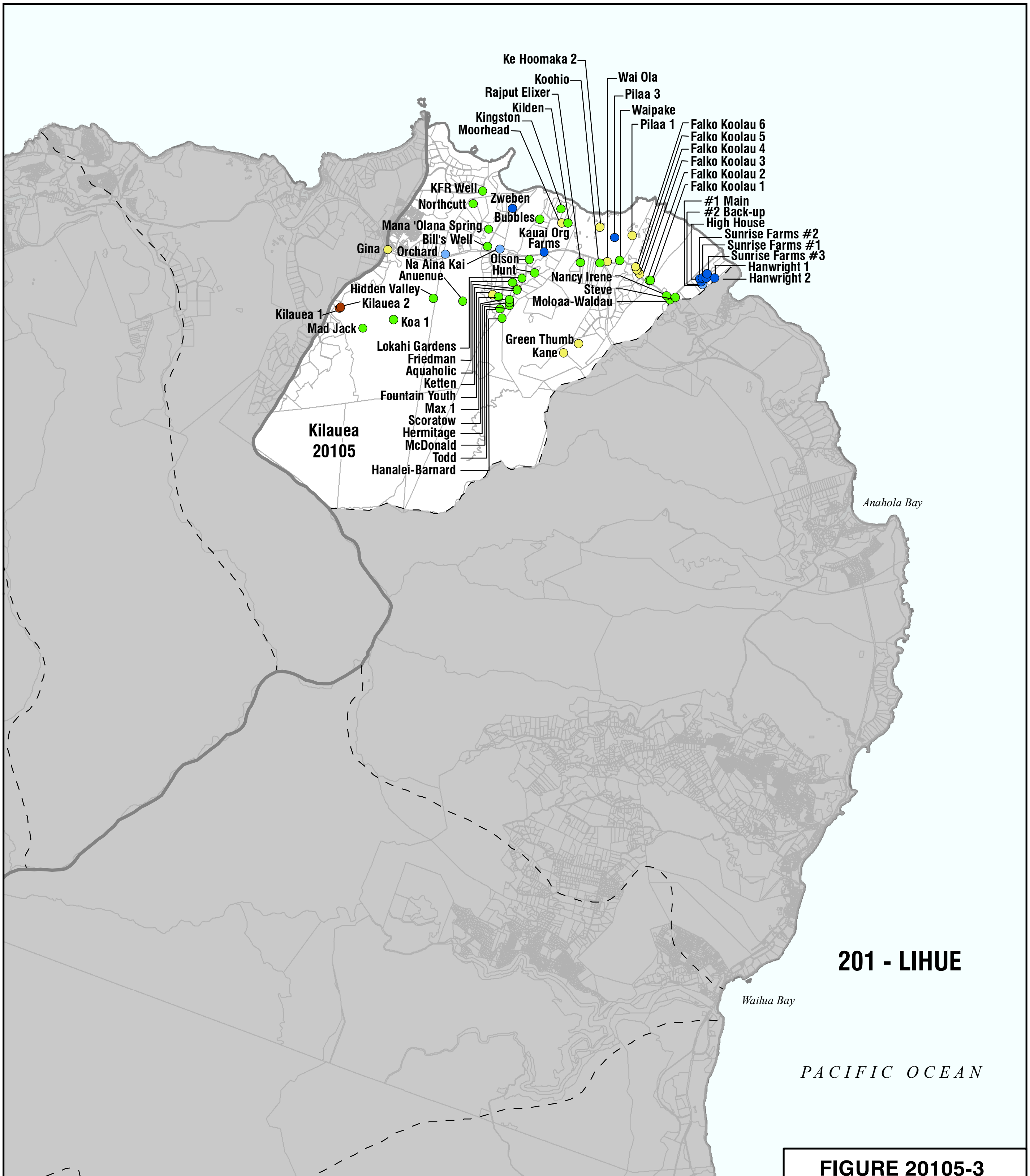
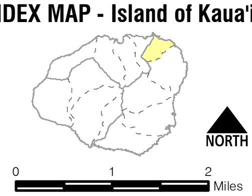


FIGURE 20105-3

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- TMK

Well Use Types

- Abandoned
- Agriculture
- Domestic
- Industrial
- Irrigation
- Military
- Municipal
- Observation
- Other
- Unused

WELL LOCATION

Aquifer Sector: LIHUE - 201
Aquifer System:
KILAUEA - 20105

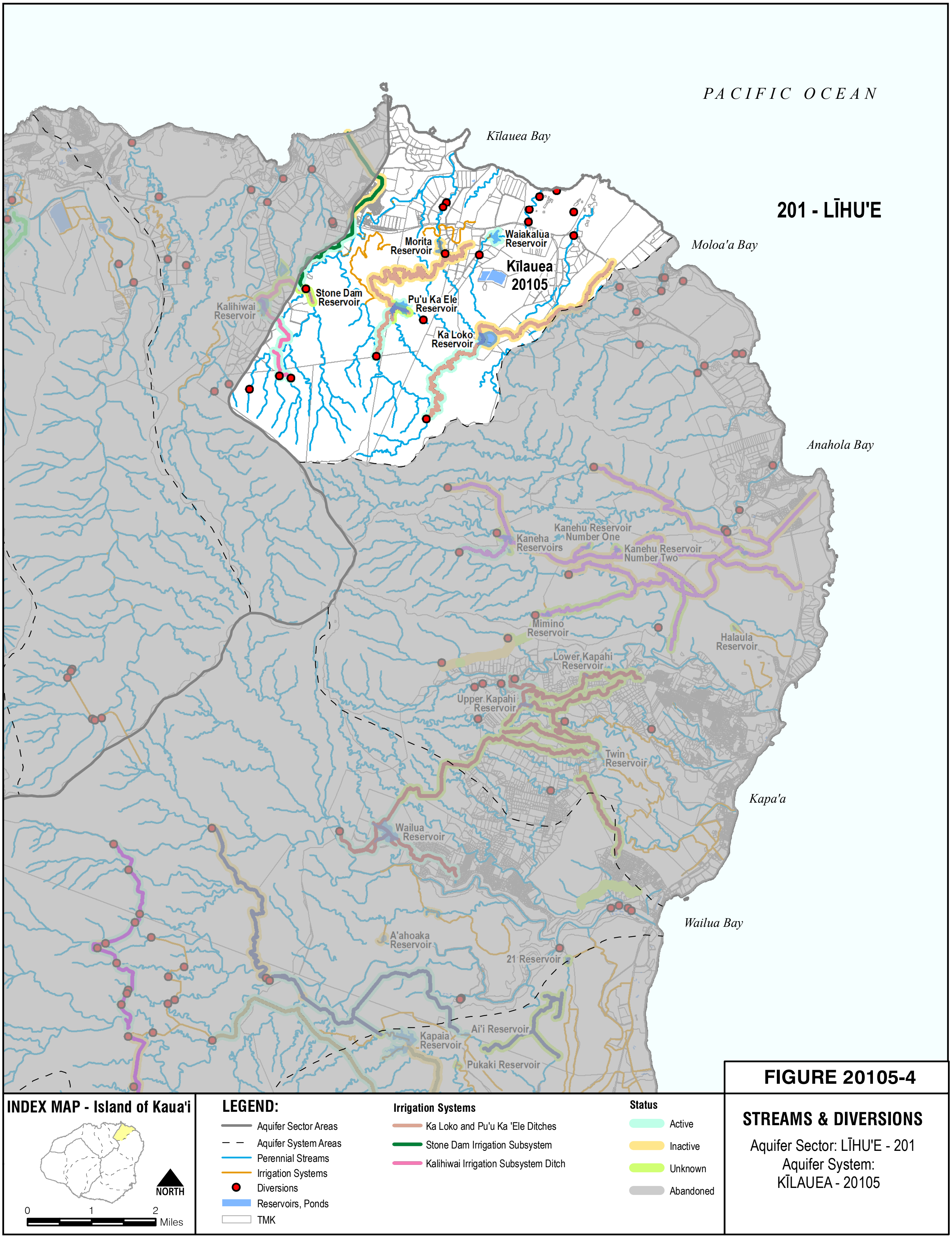


FIGURE 20105-4

STREAMS & DIVERSIONS

Aquifer Sector: LĪHU'E - 201
Aquifer System:
KĪLAUEA - 20105

Fukunaga & Associates, Inc.
Consulting Engineers

Kaua'i County - Department of Water

KAUA'I WATER USE AND DEVELOPMENT PLAN UPDATE

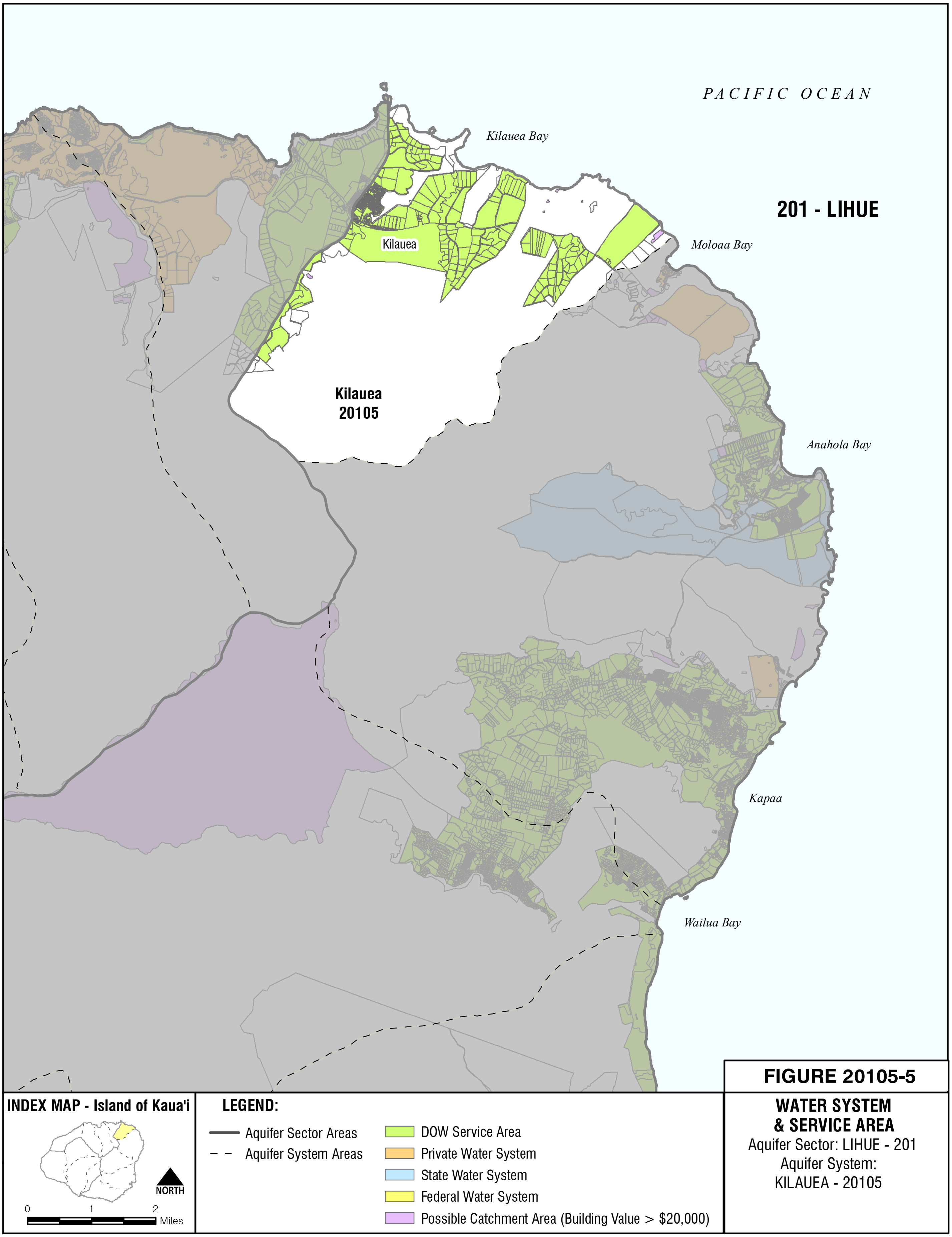


FIGURE 20105-5

WATER SYSTEM & SERVICE AREA

Aquifer Sector: LIHUE - 201
Aquifer System: KILAUEA - 20105

Fukunaga & Associates, Inc.
Consulting Engineers

Kaua'i County - Department of Water

KAUA'I WATER USE AND DEVELOPMENT PLAN UPDATE

20105-3 EXISTING WATER USE

20105-3.1 General

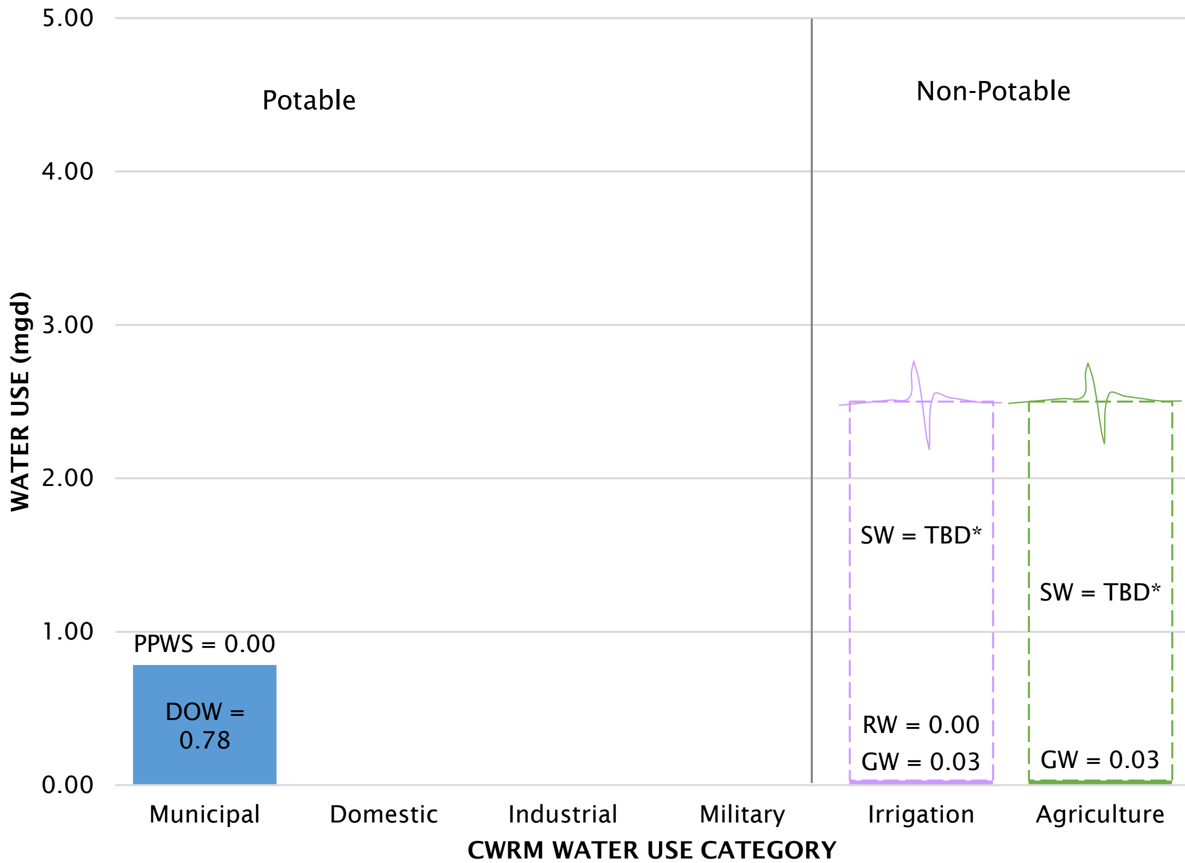
The following section presents the total estimated average water use within the Kīlauea ASYA. The total estimated average water use was based on data from CWRM (well pumpage) and DOH (Sanitary Surveys for Public Water Systems and estimated recycled water usage) for the year of 2014. Well classification changes since 2014 are noted in the sub-sections below. **Table 20105-5** and **Figure 20105-6** summarize the water use in accordance with CWRM categories.

Table 20105-5: Existing Water Use by Category – Kīlauea ASYA

CWRM Category	Ground Water (mgd)	Other Sources (mgd)	Total (mgd)	Percent of Total
Domestic	0.00		0.00	0.0
Industrial			0.00	0.0
Irrigation	0.03		0.03	3.6
Agriculture	0.03	TBD[1]	0.03	3.6
Military			0.00	0.0
Municipal				
DOW System	0.78		0.78	92.8
Private-Public WS			0.00	0.0
TOTAL	**0.84**		**0.84**	**100.0**

[1] Surface Water – TBD from AWUDP

Figure 20105-6: Existing Water Use by Category – Kīlauea ASYA



*Values to be determined by other components of the Hawai'i Water Plan

20105-3.2 Domestic Use

There are 28 wells classified as "Domestic" in the 2014 CWRM database; however, none have reported pumpage.

Three additional "Domestic" wells were added to the 2017 CWRM database and two "domestic" wells were re-classified to "Agriculture," increasing the "domestic" well total to 29 wells. One well was previously classified as "unused" in the 2014 CWRM database.

20105-3.3 Industrial Use

There is no industrial water use in the Kīlauea ASYA.

20105-3.4 Irrigation Use

Irrigation use has been divided into ground water, recycled water, and surface water.

20105-3.4.1 Ground Water

There are three wells classified as "Irrigation" in the CWRM database with total reported pumpage of 0.03 mgd. One is further classified as IRRLA – landscape irrigation, and one is further classified as IRROTH – other irrigation. The IRRLA and IRROTH wells are owned by Na Aina Kai Botanical Gardens and Mauna Ota LLC, respectively.

One additional IRRLA well was added to the CWRM database as of 2017.

20105-3.4.2 Recycled Water

There is no recycled water use in the Kīlauea ASYA.

20105-3.4.3 Surface Water

Information on surface water use for irrigation is to be determined by the AWUDP. However, typically, due to the location of parks and other landscaped areas within communities, it is assumed that it is unlikely for landscaping to be irrigated with surface water.

20105-3.5 Agricultural Use

Agricultural use has been divided into ground water, recycled water, and surface water.

20105-3.5.1 Ground Water

There are ten wells classified as "Agriculture" in the CWRM database, with nine wells further classified as AGRCP - crops and processing and the other well further classified as AGRON – ornamental and nursery plants. Sunrise Organic Farms owns five of the AGRCP wells to irrigate their organic noni crop and has reported pumpage of 0.02 mgd. Kaua'i Organic Farms owns one AGRCP well to irrigate their turmeric, ginger, and galangal crops and has reported pumpage of 0.01 mgd. Three of the AGRCP wells are owned by private landowners with no reported pumpage. The AGRON well is owned by Na 'Aina Kai Botanical Gardens with no reported pumpage.

Three additional wells were added to the 2017 CWRM database. As previously mentioned, two wells that were previously categorized as "domestic" were re-classified as "agriculture." These two wells changed ownership from Falco Partners, LLC to Kahu'aina Holdings, LLC. The third well added to the database is owned by a private landowner.

20105-3.5.2 Recycled Water

There is no recycled water use in the Kīlauea ASYA.

20105-3.5.3 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP.

20105-3.6 Military Use

There is no military water use in the Kīlauea ASYA.

20105-3.7 Municipal Use

There are 2 wells in the CWRM database classified as "Municipal" (MUNCO – Municipal County). Municipal can be subcategorized into the other water use categories: Domestic, Industrial, Agricultural, Military, and Municipal.

20105-3.7.1 County Water Systems

Kīlauea Water System

The DOW has one major water system that serves the Kīlauea ASYA. The Kīlauea water system is DOH Public Water System (PWS) No. 407 and services areas in both the Kīlauea ASYA and Kalihiwai ASYA. The system spans from the Waipakē Subdivision in east Kīlauea to the Kalihiwai River. Besides the residential community of Kīlauea Town, the majority of the service area consists of agricultural subdivisions that consist of a mixture of agricultural and residential uses. Water for this system is supplied by 2 wells. **Table 20105-6** lists the water sources, well number, pumping capacity, pressure zone, and pumpage amount.

Table 20105-6: DOW Kīlauea Water System Water Sources

WELL NAME	WELL NUMBER	PUMPING CAPACITY (gpm)	PRESSURE ZONE (ft)	PUMPAGE (mgd)
Kīlauea Well No. 1	2-1125-001	700	466, 566, 637	0.22
Kīlauea Well No. 2	2-1125-002	700	466, 566, 637	0.56

There are 3 primary pressure zones (466, 566, and 637 feet) and 5 storage tanks in the Kīlauea Water System. The water sources are located at a lower elevation and are pumped to storage tanks at the higher pressure zones.

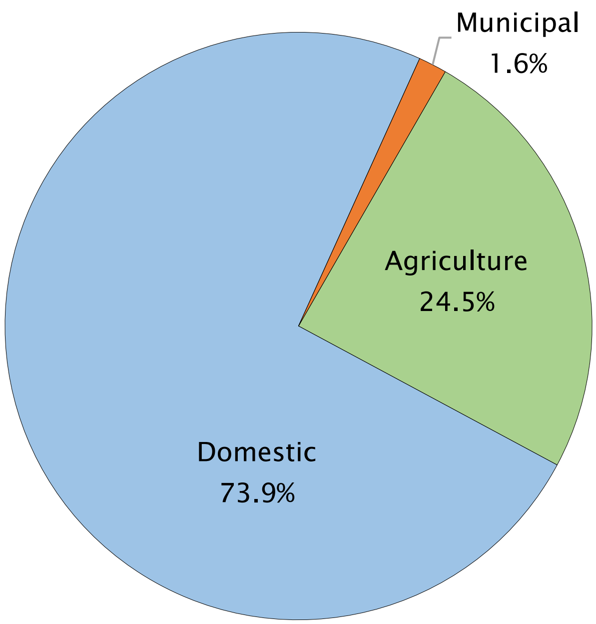
DOW Water Use by Category

DOW water use is subcategorized in **Table 20105-7** to the extent possible based on available meter data and is depicted in **Figure 20105-7**.

Table 20105-7: DOW Existing Water Use by Category – Kīlauea ASYA

CWRM Water Use Category	DOW Metered Water Use (mgd)	Percent of Total
Agricultural	0.090	24.5
Domestic	0.273	73.9
Industrial	0.000	0.0
Military	0.000	0.0
Municipal	0.006	1.6
Total	**0.369**	**100.0**

Figure 20105-7: DOW Existing Water Use by Category – Kīlauea ASYA



20105-3.7.2 State Water Systems

There are no State water systems in the Kīlauea ASYA regulated by the DOH.

20105-3.7.3 Federal Water Systems

There are no Federal water systems in the Kīlauea ASYA regulated by the DOH.

20105-3.7.4 Private-Public Water Systems

There are no private-public water systems in the Kīlauea ASYA regulated by the DOH.

20105-3.7.5 Per Capita Use

The per capita existing water use consumption based on domestic DOW metered water use and private-public water system use is presented in **Table 20105-8**. The per capita use in the Kīlauea ASYA is approximately 41.7% lower than the overall County of Kaua'i per capita use.

Table 20105-8: Per Capita Use – Kīlauea ASYA

	DOW Metered Water Use – Domestic (mgd)	Private-Public Water System (mgd)	90% of 2015 Population	Per Capita Use (gpd)
Kīlauea ASYA	0.273	0	2,414	113
County of Kaua'i	**9.360**	**2.951**	**63,462**	**194**

20105-3.8 Existing Water Use by Resource

20105-3.8.1 Ground Water

Table 20105-9 summarizes the current production, sustainable yield (SY), and percentage of SY for the current production. Current production is represented by the 2014 average yield calculated from the actual pumping data.

Table 20105-9: Pumpage – Kīlauea ASYA

Pumpage (mgd)	SY (mgd)	Pumpage Portion of SY
0.84	10	8.4%

Based on available information from the CWRM database, the current ground water use is 8.4 percent of the sustainable yield.

20105-3.8.2 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP.

20105-3.8.3 Water Conservation

Water conservation, including water loss management, may reduce water use. See **Section 20105-2.3** for existing conservation efforts.

20105-3.8.4 Rainwater Catchment

Developed parcels that are not supplied by ground water or surface water are assumed to be supplied by rainwater catchment.

20105-3.8.5 Recycled Water

There is no recycled water use in the Kīlauea ASYA.

20105-4 FUTURE WATER USE

20105-4.1 Full Build-Out Water Demand Projections

The full build-out water demand projections based on the General Plan and County Zoning for the Kīlauea ASYA is listed in **Table 20105-10** and **Table 20105-11**, respectively. Each land use class is associated with the most appropriate CWRM water use category.

Table 20105-10: General Plan Full Build-Out Water Demand Projection – Kīlauea ASYA

General Plan Category	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	0.81
Open	Domestic	0.02
Military	Military	0.00
Park	Irrigation	0.00
Residential	Domestic/Municipal	0.40
Resort	Domestic/Irrigation/Municipal	0.00
Transportation	Municipal	0.00
Urban Center	Domestic/Industrial/Municipal	0.00
DHHL	Domestic	0.00
	TOTAL	**1.23**

Table 20105-11: Zoning Full Build-Out Water Demand Projection – Kīlauea ASYA

Zoning Class	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	0.81
Commercial	Municipal	0.02
Industrial	Industrial/Municipal	0.00
Open	Domestic	0.02
Residential	Domestic/Municipal	0.31
Resort	Domestic/Irrigation/Municipal	0.00
DHHL	Domestic	0.00
	TOTAL	**1.16**

20105-4.1.1 Refined Land Use Based Water Projection

State Water Projects Plan

Table 20105-12 lists future State water projects reported in the 2021 SWPP update. The total projected demand to the year 2034 for these two State water projects within the Kīlauea ASYA is 0.001 mgd, both using potable sources.

Table 20105-12: Future State Water Projects – Kīlauea ASYA

Project Name	State of Hawai‘i Department	Primary Use	Water Development Strategy	2034 Demand (mgd)
Kīlauea Elementary School New Administration	DOE	Potable	REMAIN	0.0003
Kōloa II Elementary School	DOE	Potable	REMAIN	0.0005
			TOTAL REMAIN	0.0008
			TOTAL KĪLAUEA ASYA SWPP 2034 DEMAND	0.0008

As mentioned in **Section 2.2.2.5.1**, State water projects with the water development strategy of REMAIN are located within the service areas of County water systems which need to be coordinated with the respective County water departments. Both of the State projects within the Kīlauea ASYA were assigned the REMAIN water development strategy and results in a total 2034 demand of 0.0008 mgd. This accounts for 0.01 percent of the 10 mgd sustainable yield for the Kīlauea ASYA.

State Department of Hawaiian Home Lands

There are no DHHL tracts in the Kīlauea ASYA.

Agricultural Water Use and Development Plan

The AWUDP dated 2003 (revised 2004) was limited in scope. More recent, comprehensive information on agricultural lands is available in the County of Kaua‘i Important Agricultural Lands (IAL) Study.

In 2019, a public review draft of the AWUDP was released and it is anticipated that the next phase of the AWUDP will provide agricultural water demand projections in greater detail and will supersede information in the KWUDP when it becomes available.

County of Kaua‘i Important Agricultural Lands Study

1,737 acres of agricultural lands within the Kīlauea ASYA received a score of 28 or better in the County of Kaua‘i Important Agricultural Lands (IAL) Study. Lands that receive a score of 28 or better were determined to have met all eight IAL criteria to some degree. Only a subset of lands with a score of 28 or better is expected to be designated as IALs. **Table 20105-13** compares these lands that received a score of 28 or better to the declared surface water use from diversions and to the diversified water use rate of 3,400 gallons per acre per day (gpad) estimated in the 2004 AWUDP.

Table 20105-13: Irrigation of Agricultural Lands

(1) Declared Surface Water Use from Diversions (mgd)	0.32
(2) Agricultural Lands with a Score ≥ 28 (Acres)	1,737
- How many acres can be sustained by **(1)** at a water rate of 3,400 gpad? (Acres)	94
- What percent of **(2)** can be sustained with a water rate of 3,400 gpad?	5%
- If all of **(2)** were to be irrigated, what is the water unit rate? (gpad)	184

20105-4.1.2 Water Use Rates

Water use unit rates are based on the *Water System Standards* (WSS), as discussed in Chapter 2.

The General Plan provides only broad density guidelines for residential and resort designations. For these designations, under the assumption that most residents would like their communities, including the development density, to remain similar in the future, the average number of dwelling units as allowed by zoning was used as the density (i.e., 5.42 dwelling units per acre for residential designation).

20105-4.2 Water Demand Projections to the Year 2035

The following section presents water demand projections to the year 2035 for the Kīlauea ASYA. The projected low, medium, and high growth rates are listed in **Table 20105-14** and are graphed in **Figure 20105-8**. Potable (domestic, industrial, municipal, and military water uses) and non-potable (irrigation) water demands are also differentiated.

Table 20105-14: Water Demand Projection – Kīlauea ASYA

Water Use Category	Water Demand by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
GROWTH RATE C (HIGH)									
TOTAL	**0.81**	**0.82**	**0.82**	**0.82**	**0.83**	**0.83**	**0.85**	**0.88**	**0.90**
Potable	0.78	0.79	0.79	0.79	0.80	0.80	0.82	0.84	0.87
Non-Potable	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
GROWTH RATE B (MEDIUM)									
TOTAL	**0.81**	**0.82**	**0.82**	**0.82**	**0.83**	**0.83**	**0.85**	**0.87**	**0.89**
Potable	0.78	0.79	0.79	0.80	0.80	0.80	0.82	0.84	0.86
Non-Potable	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
GROWTH RATE A (LOW)									
TOTAL	**0.81**	**0.81**	**0.81**	**0.82**	**0.82**	**0.82**	**0.82**	**0.83**	**0.84**
Potable	0.78	0.78	0.78	0.79	0.79	0.79	0.79	0.80	0.81
Non-Potable	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03

Figure 20105-8: Water Demand Projection Summary – Kīlauea ASYA

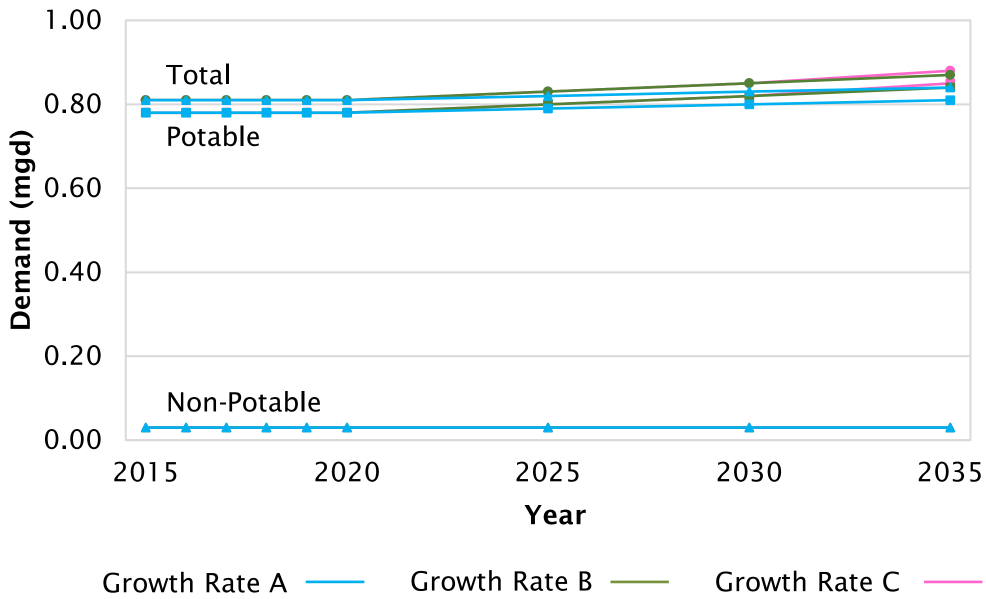


Figure 20105-9 shows the breakdown of water demand projections for a medium growth rate by CWRM categories through the year 2035. **Table 20105-15** summarizes this figure.

Figure 20105-9: Medium Growth Rate B Water Demand Projection by Category – Kīlauea ASYA

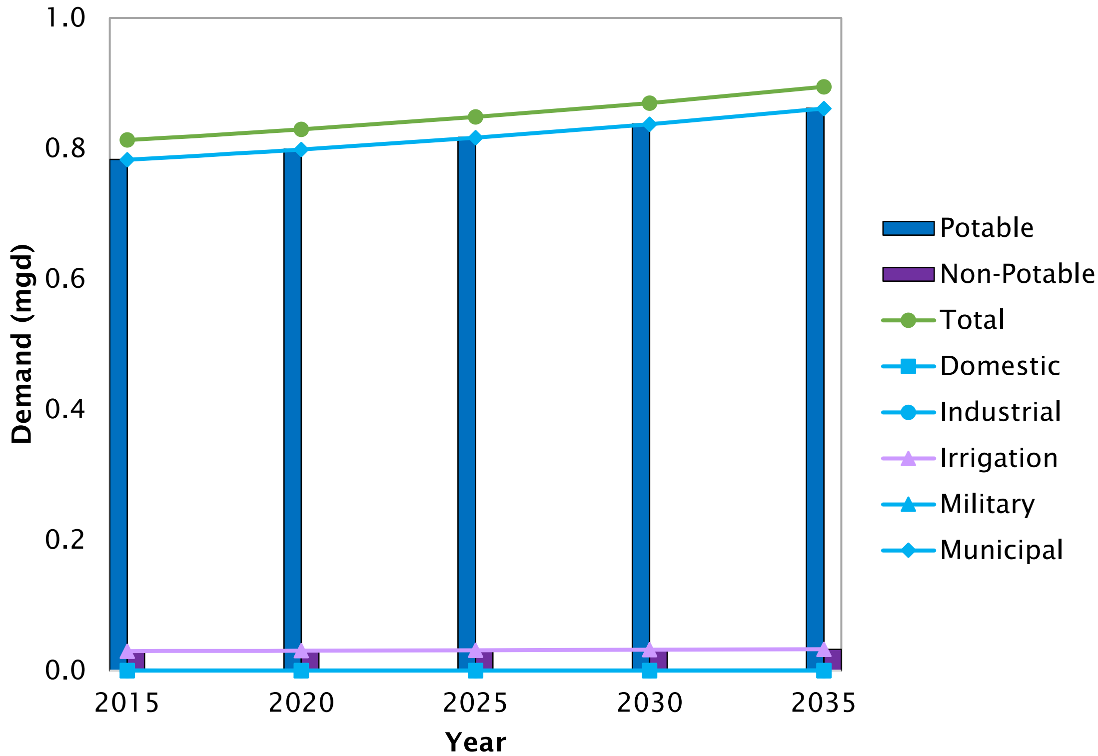


Table 20105-15: Medium Growth Rate B Water Demand Projection by Category – Kīlauea ASYA

Water Use Category	Water Use by Year (mgd)								
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2025**	**2030**	**2035**
Total	**0.81**	**0.82**	**0.82**	**0.82**	**0.83**	**0.83**	**0.85**	**0.87**	**0.89**
Potable	0.78	0.79	0.79	0.80	0.80	0.80	0.82	0.84	0.86
Non-Potable	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Domestic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Irrigation	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Military	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Municipal	0.78	0.79	0.79	0.80	0.80	0.80	0.82	0.84	0.86
DOW	0.78	0.79	0.79	0.80	0.80	0.80	0.82	0.84	0.86

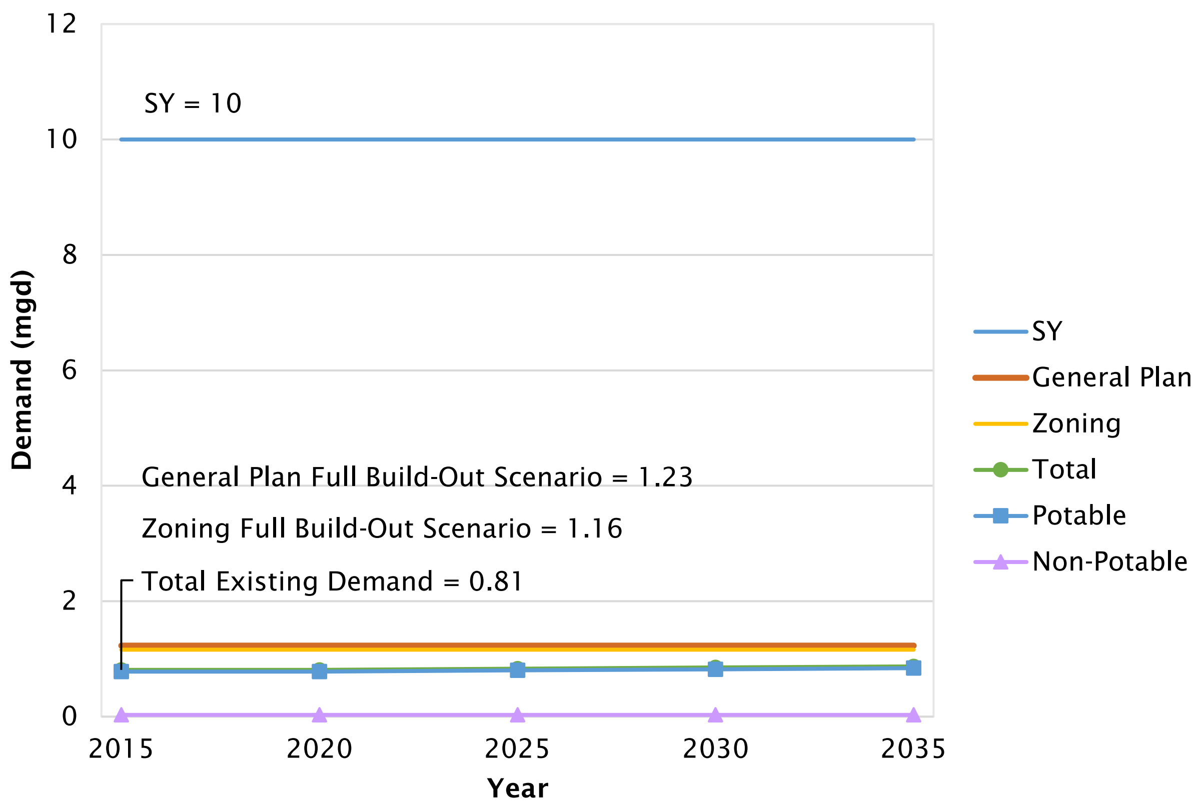
20105-4.3 Summary

Figure 20105-10 illustrates the magnitude of the sustainable yield, both General Plan and Zoning full build-out water use projections, and water use projection through the year 2035 focusing on Medium Growth Rate B. **Table 20105-16** summarizes the General Plan, Zoning, and 20-year water demand projection scenarios for the Kīlauea ASYA. The sustainable yield is presented to draw comparisons. All demands are in mgd.

Table 20105-16: Summary of Demand Projections

SY (mgd)	FBO (mgd)		Medium Growth Rate Demand by Year (mgd)								
	GP	Zoning	2015	2016	2017	2018	2019	2020	2025	2030	2035
10	1.23	1.16	0.81	0.82	0.82	0.82	0.83	0.83	0.85	0.87	0.89

Figure 20105-10: Medium Growth Rate B Water Demand Projections and Full Build-Out – Kīlauea ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use. For future agricultural water use analysis, please see Section 20105-4.1.1 County of Kaua'i Important Agricultural Lands Study.

20105-5 RESOURCE AND FACILITY RECOMMENDATIONS

20105-5.1 Water Source Adequacy

20105-5.1.1 Full Build-Out

Development to the highest extent allowed by the General Plan and County Zoning within the Kīlauea ASYA is sustainable, with General Plan and County Zoning full build-out water demands both requiring 12 percent of the 10 mgd sustainable yield.

20105-5.1.2 Twenty-Year Projection

The 2035 water demand projection for the Kīlauea ASYA is sustainable and is only 8 percent of the 10 mgd sustainable yield.

20105-5.2 Source Development Requirements

20105-5.2.1 Supply-Side Management

Supply-side management, including conventional water resource measures, water conservation, and alternative water resource measures, were evaluated to meet projected water demands.

Conventional Water Resource Measures

Ground Water

The Kīlauea ASYA contains basal, perched, and high level ground water. Most reported pumpage is from the basal, followed by perched zone and then high level.

The 2035 water demand projection for the Kīlauea ASYA is only 8 percent of the 10 mgd sustainable yield. This indicates that theoretically, more water could be pumped from the aquifer without impairing the utility or quality of the water resource if wells are optimally placed and the proper due diligence with regard to traditional and customary rights and impacts has been completed. However, it is noted that sustainable yield does not consider the feasibility of developing the ground water resources, and that the safe yield of an individual production well may be limited by localized ground water behavior near the well as a result of pumpage. Water supply reliability and quality, feasibility, environmental and cultural impacts, and water rights shall be considered as projects and programs develop. More detailed and site-specific evaluation of these impacts shall be required and accomplished through the environmental review process (HRS Chapter 343) for source development projects and programs utilizing public funding, and CWRM could consider requiring compliance with the environmental review process for private source development projects and programs also. **Section 1.5.3.1** provides additional information regarding the protection of traditional and customary rights.

The DOW's Kīlauea water system is the only public water system in the Kīlauea ASYA. The DOW's Water Plan 2020 identified projects to meet future demands of its service areas. For the Kīlauea water system, one new well (Kīlauea Well No. 4) is proposed.

The DOW's Water Plan 2020 also identified potential storage and distribution system upgrades. Proposed improvements include construction of a new tank in the 466' pressure zone and replacement of several water mains.

It is noted that most of the irrigation water for agriculture in the Kīlauea ASYA comes from ground water. There are approximately 100 agriculture water meters in Kīlauea water system, and they account for a significant portion of DOW's water sales in the area. There are also ten wells classified as agriculture and three wells classified as irrigation in the Kīlauea ASYA. Generally, the quality of the water source should be matched to the quality of the water needed, and it is typically recommended that ground water sources be primarily used as potable drinking water for human consumption. However, until other water sources become more available and economically feasible, ground water will likely remain the primary source for agriculture.

Surface Water

The Kīlauea ASYA has 17 declared diversions. Until permanent instream flow standards are established, interim instream flow standards have been adopted. According to Section 13-169-46, Hawai'i Administrative Rules, "Interim Instream Flow Standard for all streams on Hawai'i, as adopted by the commission on water resource management on June 15, 1988, shall be that amount of water flowing in each stream on the effective date of this standard, and as that flow may naturally vary throughout the year and from year to year without further amounts of water being diverted offstream through new or expanded diversions, and under the stream conditions existing on the effective date of the standard, except as may be modified [by the commission]." Therefore, for the purposes of assessing surface water availability, it is assumed that no additional diversions will be allowed without amendment of the interim IFS.

The existing declared diversions have the potential to meet additional demands. However, a challenge with developing surface water is transmission of these resources from source to location of need. Farmers generally grow what is feasible for the area; therefore, it is anticipated that agricultural water use will follow the availability of irrigation water. Increase in the availability of surface water would likely promote additional usage and could thereby minimize ground water being used for irrigation. As mentioned above, most of the irrigation water for agriculture in the Kīlauea ASYA currently comes from ground water.

There are a few existing irrigation systems in the Kīlauea ASYA, including the Ka Loko and Pu'u Ka Ele Ditches, and the Stone Dam and Kalihiwai irrigation subsystems. These irrigation systems may not be functioning as efficiently as they once were, and several reservoirs in the area have been decommissioned. The Agricultural Water Use and Development Plan (AWUDP) should include an inventory of large irrigation systems and provide information on their rehabilitation and maintenance needs. The AWUDP should also include a more detailed assessment of agricultural water demand projections that will supersede information in the KWUDP when it becomes available.

Water Transfer

Some existing irrigation systems have the capability to transfer surface water to adjacent ASYAs. The AWUDP shall study irrigation system services areas and provide information on irrigation systems' water transfer.

Water can also be transferred between ASYAs through public water systems. The Kīlauea water system services areas in the Kīlauea ASYA and Kalihiwai ASYA. The sources for the water system, including the proposed well, are in the Kīlauea ASYA, while its service area is in both the Kīlauea ASYA and Kalihiwai ASYA.

Water Conservation

The per capita use in the Kīlauea ASYA is approximately 41.7% lower than the overall County of Kauaʻi per capita use. There are no ASYA-specific conservation measures in place at this time; however, there are general water conservation programs that are described in **Section 1.5.7**. Water conservation, including water loss management, can increase the amount of water available and help to ensure the long-term viability of water resources.

Alternative Water Resource Measures

Rainwater Catchment

Rainwater can be utilized as a water resource in several ways.

Rainwater can be harvested in rainwater catchment systems which can be utilized to supply domestic potable water needs. These systems are viable in areas that receive abundant rainfall and are a suitable source of potable water for individual domestic users in areas outside the limits of municipal water systems. Generally, these are remote areas and are not expected to expand significantly because most development is anticipated to be concentrated within existing urban areas. Therefore, use of rainwater catchment systems is not anticipated to increase significantly.

Rainwater can also be used to supplement or satisfy agricultural non-potable water needs through ambient rainfall.

See the Storm Water Reuse section below to see how rainwater as storm water runoff can be reclaimed and reused.

Storm Water Reuse

Rainfall can turn into storm water runoff. Storm water runoff from impervious surfaces in urban areas can be significant. This water could be captured, treated, and used as a source of non-potable water (e.g., irrigation), integrated with recycled water, or even as potable and/or non-potable ground water recharge. However, due to the lack of storm water reuse standards, the high initial infrastructure costs, and the treatment requirements, storm water reclamation and reuse on a small or large scale may not be feasible and requires further assessment as noted in the Water Resource Protection Plan. The U.S. Department of the Interior, Bureau of Reclamation published An Appraisal of Stormwater Reclamation and Reuse Opportunities in Hawaiʻi (Storm Water Report) in 2008 but did not identify any storm water reclamation and reuse opportunities in the Kīlauea ASYA.

Recycled Water

Recycled water is a valuable resource; an increase in its use may lower the dependence on potable sources. However, there are no wastewater reclamation facilities (WWRFs) in the Kīlauea ASYA.

Desalination

Desalination of brackish ground water is a potential alternative; however, due to its high capital and operational costs, it likely would not be considered when other potable water sources are readily available.

20105-5.2.2 Demand-Side Management

Development Density Control

The full build-out demand for the Kīlauea ASYA based on County Zoning is 1.16 mgd which is 12 percent of the sustainable yield. This indicates that there are adequate water resources to sustain the level of development that is allowed by law. In the Kīlauea ASYA, the average number of dwelling units allowed by County Zoning is 5.42 dwelling units per acre in residential districts.

The full build-out demand for the Kīlauea ASYA based on the General Plan is 1.23 mgd which is 12 percent of sustainable yield. Although it is unlikely that full build-out will occur within the time frame of the General Plan, the full build-out demand is sustainable; there are adequate water resources to sustain the long-range land use vision for this area. Therefore, development density control may not be necessary. However, the County Planning Department could consider development density control for areas where there is the flexibility to do so, such as areas that are not yet zoned as residential or resort, and promote sustainable development. Further, it is noted that the full build-out scenario is unlikely to occur since it assumes all land is developed to the maximum extent.

20105-5.3 Recommended Alternatives

To optimize appropriate use of water resources, the quality of the water source should be matched to the quality of water required. The highest quality of water shall be reserved for the most valuable end use. Potable water is considered the highest quality water, and the sustenance of life is the most valuable end use. Recycled water, brackish water, untreated surface water, and other lower quality water sources should be used for landscaping and agriculture when available, thereby reserving potable water for human consumption. If there is a practical alternative water source available, that alternative source should be used in lieu of ground water or surface water. With this in mind, the following recommendations are made for the Kīlauea ASYA:

Alternative Water Resources

Use of alternative water sources can reduce demands on both ground and surface water resources and conserve water resources as a whole. However, aside from rainwater, there are no available alternative water sources in the area. Alternative water sources are unlikely to be developed when other water resources are readily available.

Conservation

Water resources are a finite resource that should be managed and used wisely. It should be conserved and not wasted. Implementation of conservation measures should continue to be encouraged.

Ground Water

Meeting future demands at a reasonable cost is a planning objective, and conventional sources, such as ground water, are typically the most cost-effective means for meeting projected water demands. Projected potable water needs are within the sustainable yield for this area. Therefore, ground water resources could continue to be used and developed to meet potable water needs now and into the future. However, as noted above, development of conventional water resource measures can have challenges, and water supply reliability and quality, feasibility, environmental and cultural impacts, and water rights shall be considered as projects and programs develop.

Development of ground water resources is the primary strategy to serve future potable demands in the Kīlauea ASYA.

It is noted that ground water is a significant source of water for non-potable agriculture needs in the Kīlauea ASYA. Existing use of ground water for agriculture is sustainable. Also, since the projections of potable water demand are low under full build-out conditions, increased used of ground water for agriculture can be accommodated within the sustainable yield. However, it is noted that the sustainable yield of the Kīlauea ASYA is only 10 mgd and is the lowest on Kaua'i. Because of this, caution should be exercised before committing to large quantities of ground water use for agriculture. Further, as discussed previously, it is typically recommended that ground water sources be primarily used as potable drinking water for human consumption, and therefore, it is encouraged that other sources of water be explored to meet future agricultural water needs.

Surface Water

Surface water, where available, should be used to meet non-potable demands if alternative water resources are not available. To achieve this, it will be critical to maintain and improve existing irrigation systems. Making surface waters more readily available to meet non-potable water demands has the potential to minimize future dependence on the use of ground water. As mentioned previously, agriculture in the area is currently dependent on the use of ground water. It is therefore recommended that the AWUDP provide information on the rehabilitation and maintenance needs of large irrigation systems.

Demand-Side Management

Full build-out demand based on the General Plan is 12 percent of sustainable yield. At this projection, implementation of development density control by the County Planning Department is not needed. Although the projection is sustainable, the County Planning Department will need to consider potential impacts on available water resources when considering any future zoning modifications. Modifications that may result in increased development density within the area will increase demands on water resources.

Chapter 20201

Kalihiwai Aquifer System Area

CHAPTER 20201 - TABLE OF CONTENTS

FIGURES

TABLES

20201 KALIHIWAI AQUIFER SYSTEM AREA

20201-1 SYSTEM AREA PROFILE

20201-1.1 General

The Kalihiwai [20201] Aquifer System Area (ASYA) is bound on the north by the Pacific Ocean from Princeville to roughly the western side of Kīlauea town, from about Kīlauea Point along the ridge above Kaumoku Stream along the east, to the peak of the Makaleha Mountains along the south, and back down to the ocean along the eastern ridge above the Hanalei River on the west. Urbanized areas within the Kalihiwai ASYA include Kalihiwai and portions of Princeville and Kīlauea town.

Average annual rainfall ranges from 65 inches per year along the coast to 140 inches in the mountains. The sustainable yield is 16 mgd.

20201-1.2 Economy and Population

20201-1.2.1 Economy

The largest industries within the Kalihiwai ASYA include real estate, rental and leasing, accommodation and food service and healthcare and social assistance. These activities are primarily concentrated in Princeville and Kīlauea.

20201-1.2.2 Population

The population contributing to the demand within the Kalihiwai ASYA is primarily located in Princeville and Kīlauea. A smaller portion of the population in Kalihiwai ASYA is located in the Kalihiwai area itself with residences primarily located in proximity to Kūhiō Highway. Historical population data for the Kalihiwai ASYA is summarized in **Table 20201-1**. Population projections through the year 2035 are summarized in **Table 20201-2a**. As shown in **Table 20201-2b**, it is estimated that the area will continue to experience growth rates between 1 and 6 percent per decade.

Table 20201-1: Historical Population – Kalihiwai ASYA

	Year		
	1990	2000	2010
Population	2,256	2,520	3,053
Percent Change		11.7	21.2

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report. Data redistributed and evaluated for Kalihiwai ASYA.

Table 20201-2a: Population Projection – Kalihiwai ASYA

Growth Rate	Population by Year								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
A – Low	3,078	3,081	3,085	3,089	3,093	3,097	3,120	3,149	3,183
B – Med.	3,099	3,111	3,123	3,135	3,148	3,161	3,233	3,314	3,408
C – High	3,103	3,116	3,129	3,143	3,157	3,172	3,252	3,342	3,447

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report. Data redistributed and evaluated for Kalihiwai ASYA.

Table 20201-2b: Population Projection – Percent Change – Kalihiwai ASYA

Growth Rate	2015-2025 % Change	2025-2035 % Change
A – Low	1.4	2.0
B – Medium	4.3	5.4
C – High	4.8	6.0

20201-1.3 Land Use

20201-1.3.1 2000 Kauaʻi General Plan

The 2000 Kauaʻi County General Plan Land Use Designation Map for the Kalihiwai ASYA is shown on **Figure 20201-1**. The estimated land use allocation acreage for each land use designation within the system area is listed in **Table 20201-3**.

Table 20201-3: General Plan Estimated Land Use Allocation Acreage – Kalihiwai ASYA

General Plan Land Use Designation	Acreage	Percent of Total
Agricultural	3,890	34.3
Military	0	0.0
Open	6,500	57.3
Park	13	0.1
Residential Community	311	2.7
Resort	636	5.6
Transportation	0	0.0
Urban Center	0	0.0
DHHL	0	0.0
TOTAL	**11,350**	**100.0**

20201-1.3.2 Kauaʻi Zoning

Kauaʻi County Zoning Map for the Kalihiwai ASYA is shown on **Figure 20201-2**. The estimated land use allocation acreage for each zoning district within the system area is listed in **Table 20201-4**.

The number of dwelling units allowed in residential and resort districts varies by the type of residential or resort district. The average number of dwelling units allowed in residential districts in the Kalihiwai ASYA is 6.84 dwelling units per acre. There are only a few parcels zoned as resort in the Kalihiwai ASYA, and the average number of dwelling units allowed on those resort-zoned parcels is 19.60 dwelling units per acre. However, it is noted that Princeville is generally considered a resort area and is designated as resort in the General Plan although most of the area is zoned as residential. Taking the residential-zoned areas into consideration, the average number of dwelling units allowed in resort areas in the Kalihiwai ASYA is 7.46 dwelling units per acre.

Table 20201-4: County Zoning Estimated District Allocation Acreage – Kalihiwai ASYA

Zoning District	Acreage	Percent of Total
Agriculture	3,380	30.1
Commercial – General	0	0.0
Commercial - Neighborhood	7	0.1
Conservation	5,253	46.7
Industrial – General	0	0.0
Industrial - Limited	15	0.1
Open	2,133	19.0
Residential	408	3.6
Resort	21	0.2
Project Development	0	0.0
Special Planning Area	0	0.0
Special Treatment	0	0.0
No Zoning	22	0.2
DHHL	0	0.0
TOTAL	**11,239**	**100.0**

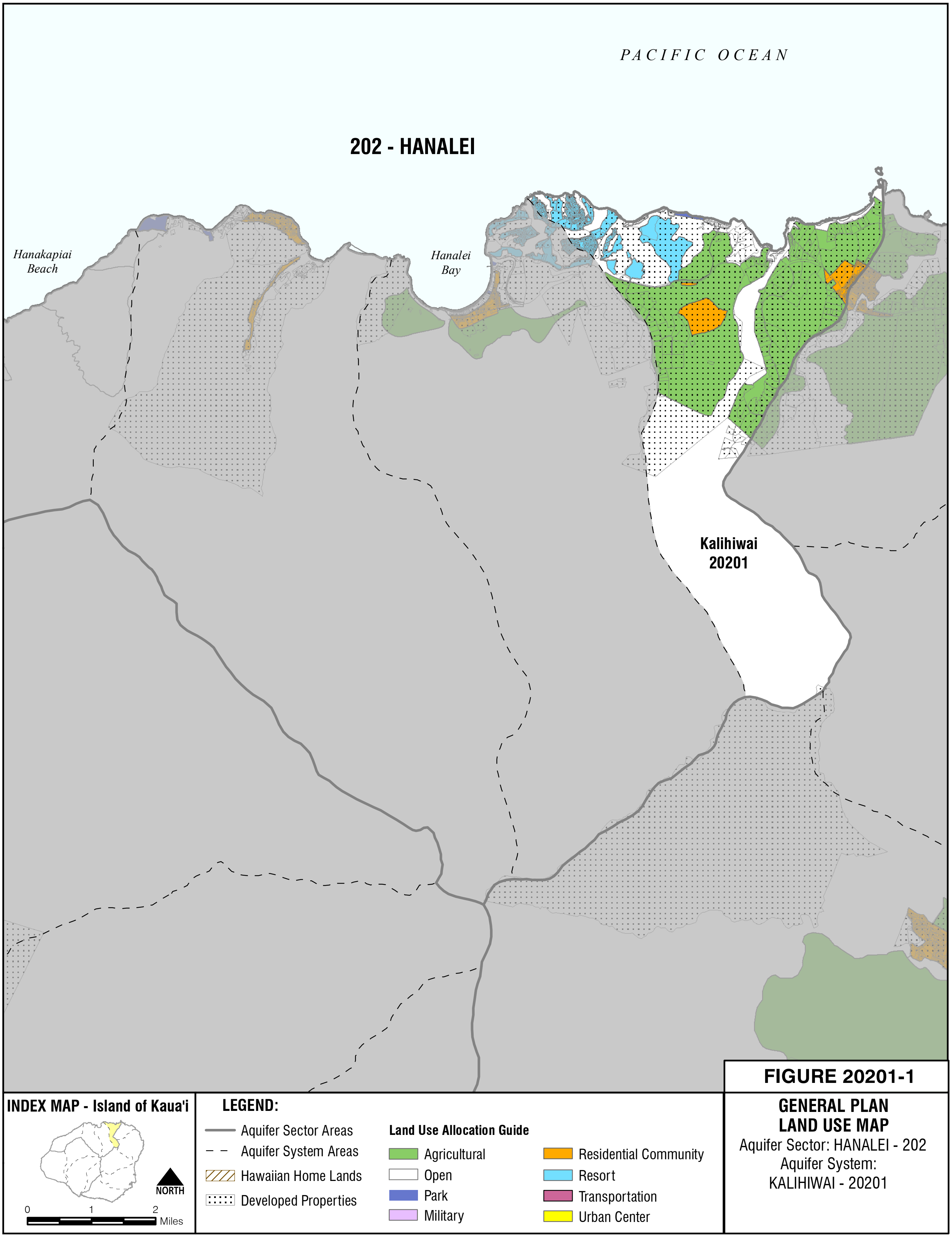


FIGURE 20201-1

GENERAL PLAN LAND USE MAP

Aquifer Sector: HANALEI - 202

Aquifer System: KALIHIWAI - 20201

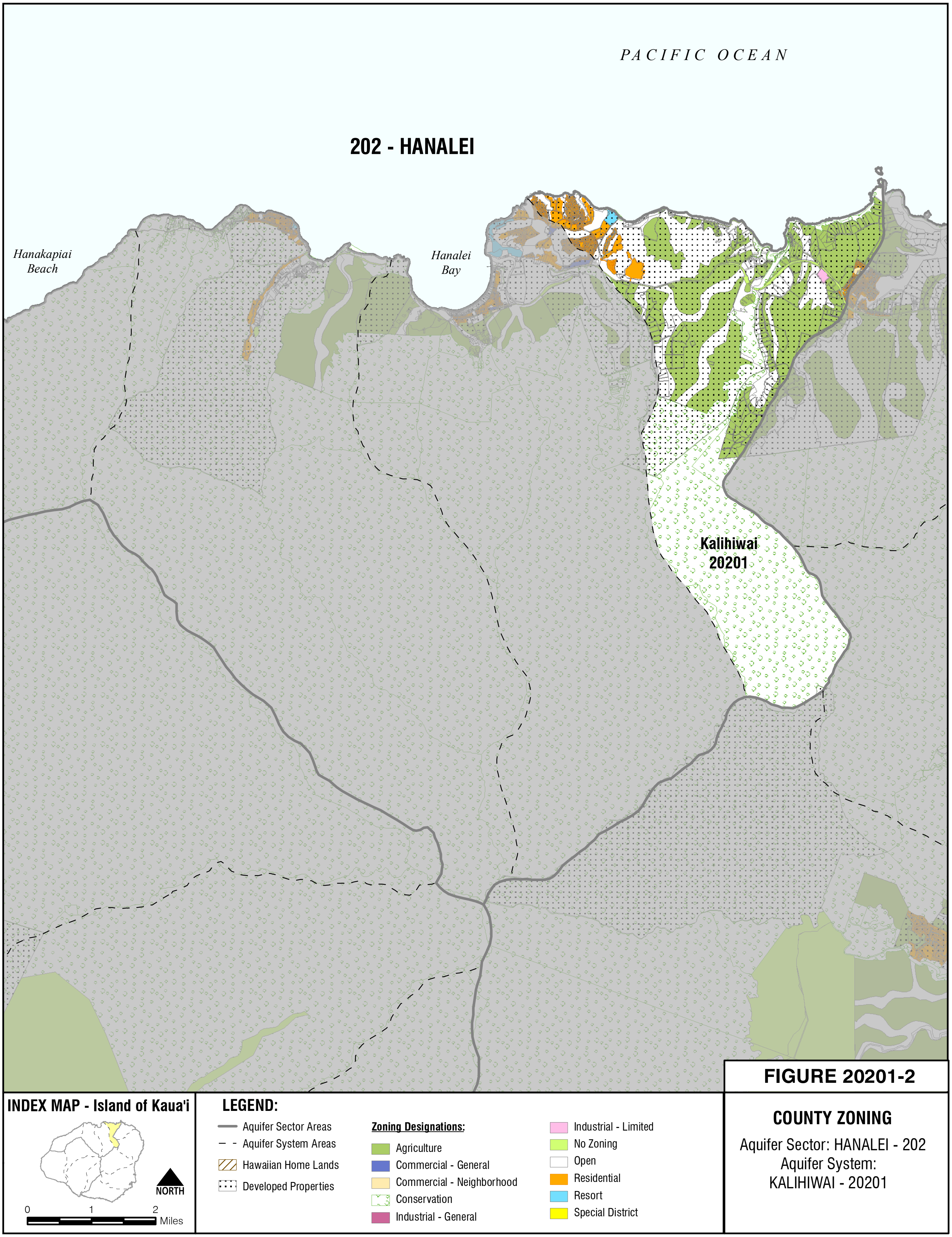


FIGURE 20201-2

COUNTY ZONING

Aquifer Sector: HANALEI - 202
Aquifer System: KALIHIWAI - 20201

20201-2 EXISTING WATER RESOURCES

20201-2.1 Ground Water

The Kalihiwai ASYA has a sustainable yield of 16 mgd. According to the 2014 CWRM database, there are 17 production wells in the system, 2 agriculture, 2 municipal (non-DOW), 12 domestic, and 1 irrigation well. There are also 8 wells drilled and categorized as "unused". Refer to **Appendix A** for this database. **Figure 20201-3** shows the well locations.

20201-2.2 Surface Water

There are 5 streams classified as perennial in the Kalihiwai ASYA, all of which are considered continuous. These streams are the Waileia Stream, ʻAnini Stream, Kalihiwai River, Puʻukumu Stream, and an unnamed stream. The USGS has 1 active surface water gage in the system area. The gage is located on Puʻukumu Stream near Kīlauea, which was previously listed in **Table 1-19**.

In accordance with the Code, the CWRM must establish and administer instream flow standards (IFS) on a stream-by-stream basis as necessary to protect public interests. IFS is defined as "a quantity or flow of water or depth of water which is required to be present at a specific location in a stream system at certain specified times of the year to protect fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses." Considerably more research and study need to be completed to accumulate the data and perspective necessary to conduct a thorough and meaningful assessment of IFS. Until permanent IFS are established, interim IFS have been adopted. The interim IFS are defined as the amount of water flowing in each stream at the time the administrative rules governing them were adopted in 1988 and 1989. In order to assess surface water sustainability, this KWUDP assumes that no additional diversions will be allowed from any stream without amendment of the interim IFS.

There are 13 declared stream diversions in the CWRM database shown on **Figure 20201-4**, which accounts for 4 percent of the 292 declared stream diversions on the island. The declared stream diversions are listed in **Appendix B**. The total declared flow for the Kalihiwai ASYA is 0.09 mgd.

The Kalihiwai Irrigation subsystem is managed by Porter Irrigation System. The subsystem is currently active, in relatively good condition, and diverts water from the Pōhakuhono Stream. This subsystem is primarily located in and serving the Kalihiwai ASYA.

20201-2.3 Water Conservation

Water conservation increases the amount of water available and helps to ensure the long-term viability of water resources. Water conservation, including water loss management, may reduce water use. See **Section 1.5.7** for discussion of existing conservation efforts.

20201-2.4 Rainwater Catchment

Rainwater catchment is a viable resource for areas that are not served by ground water or surface water. **Figure 20201-5** shows the possible catchment areas, or parcels with a building value greater than $20,000 and assumed to be developed but without a ground water or surface water source.

20201-2.5 Recycled Water

There are no wastewater reclamation facilities in the Kalihiwai ASYA.

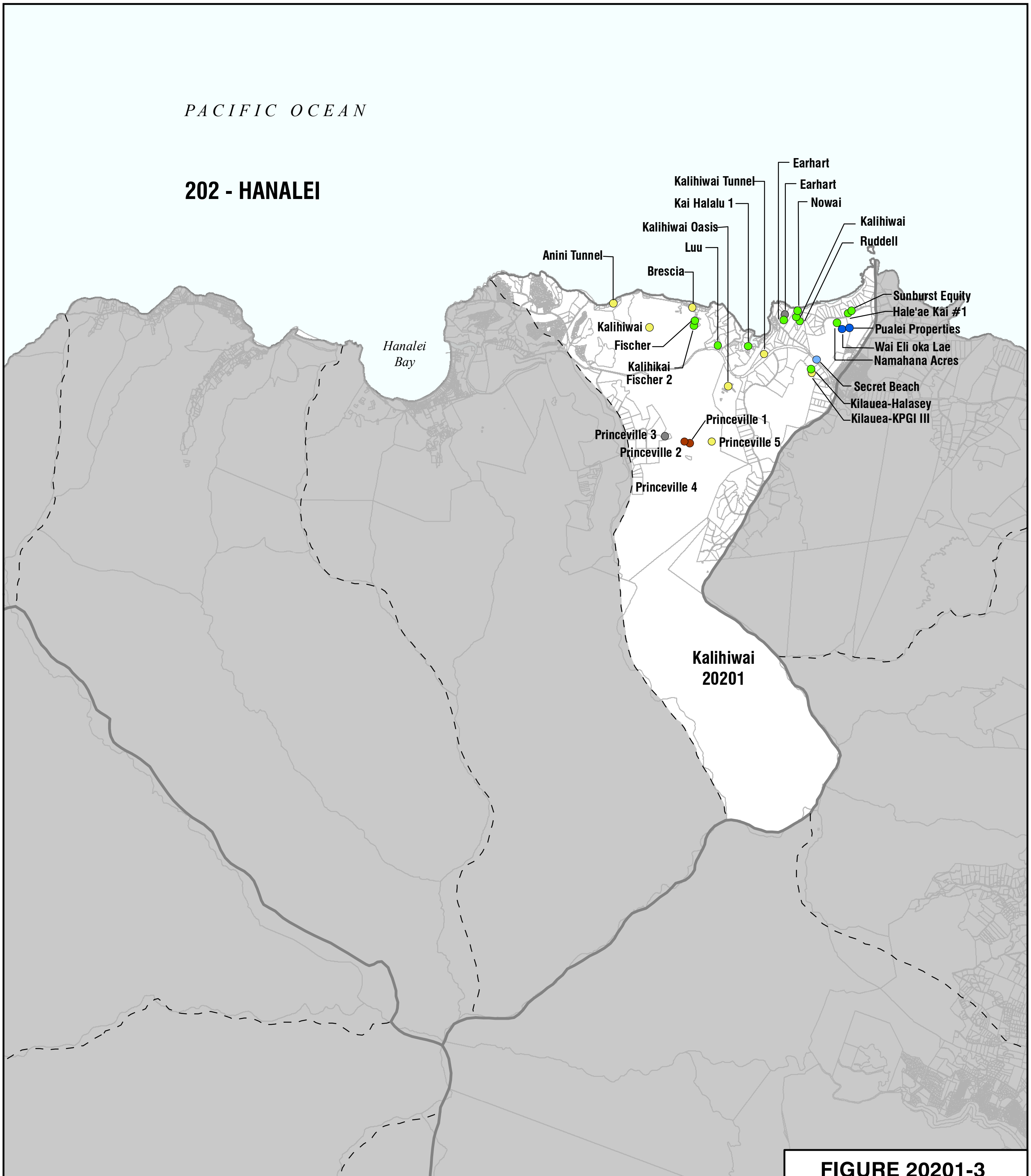


FIGURE 20201-3

INDEX MAP - Island of Kaua'i

NORTH

0 1 2

Miles

LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- TMK

Well Use Types

- Abandoned
- Agriculture
- Domestic
- Industrial
- Irrigation
- Military
- Municipal
- Observation
- Other
- Unused

WELL LOCATION

Aquifer Sector: HANALEI - 202
Aquifer System:
KALIHIWAI - 20201

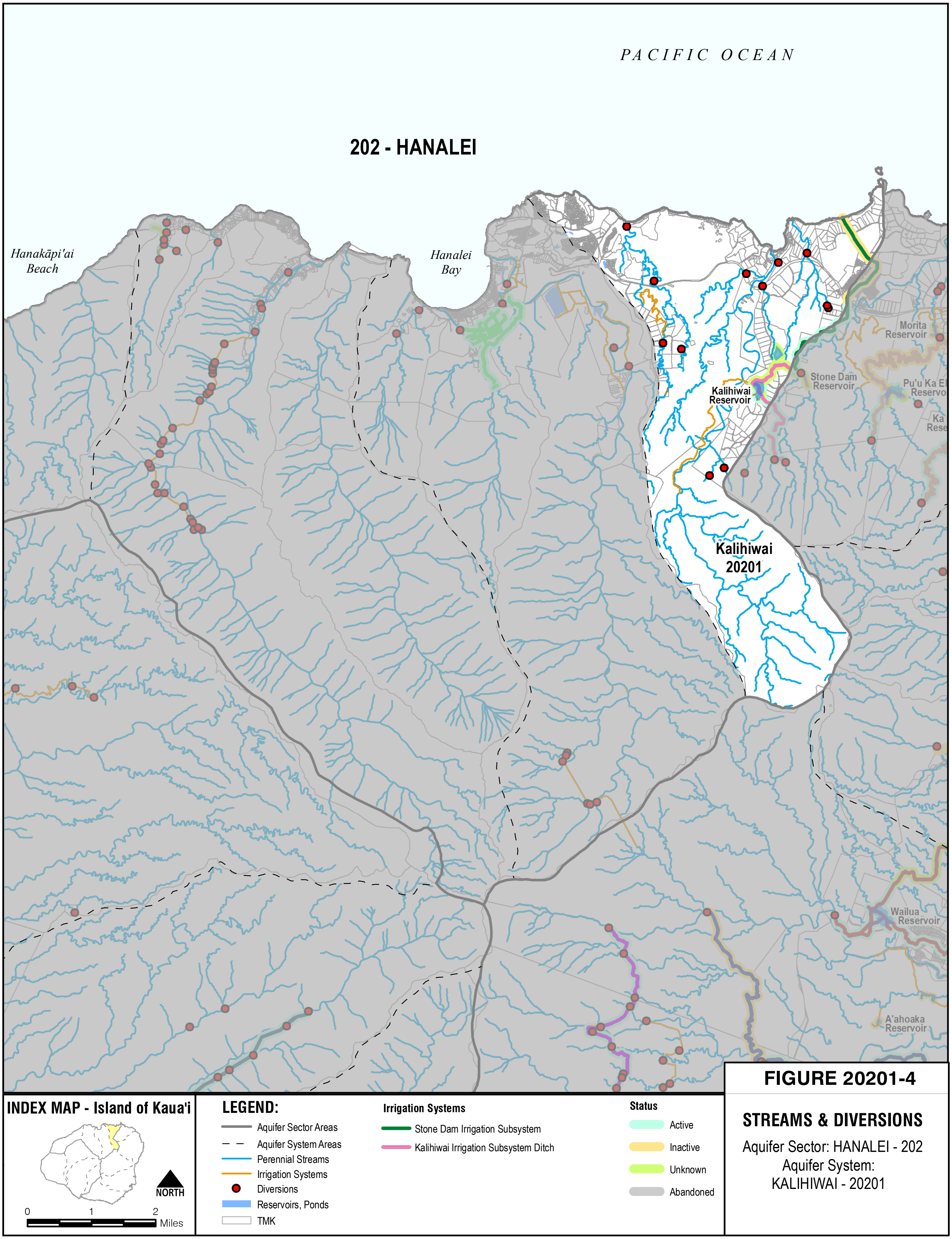
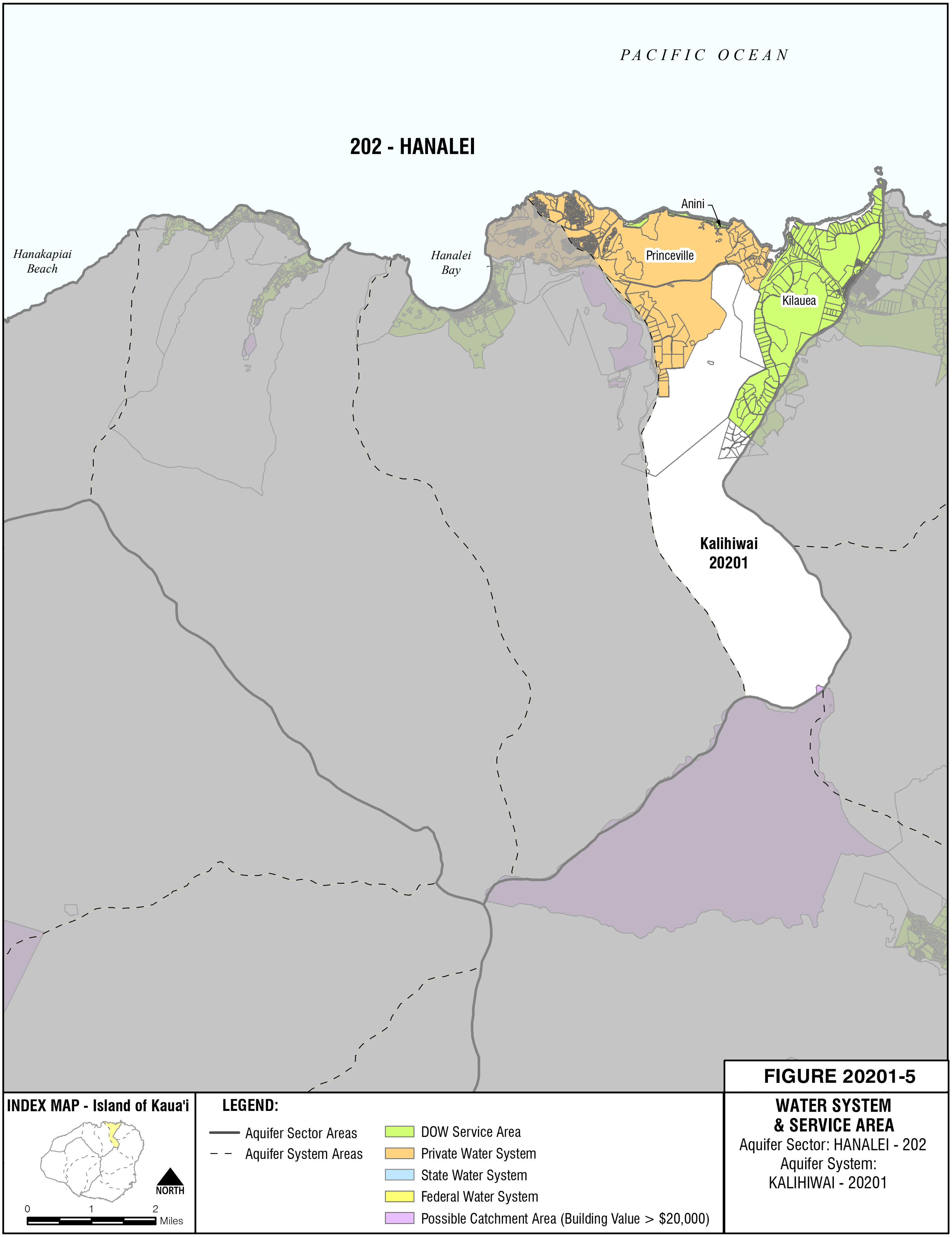


FIGURE 20201-4

STREAMS & DIVERSIONS

Aquifer Sector: HANALEI - 202
Aquifer System:
KALIHIWAI - 20201



Fukunaga & Associates, Inc.
Consulting Engineers

Kaua'i County - Department of Water
KAUA'I WATER USE AND DEVELOPMENT PLAN UPDATE

20201-3 EXISTING WATER USE

20201-3.1 General

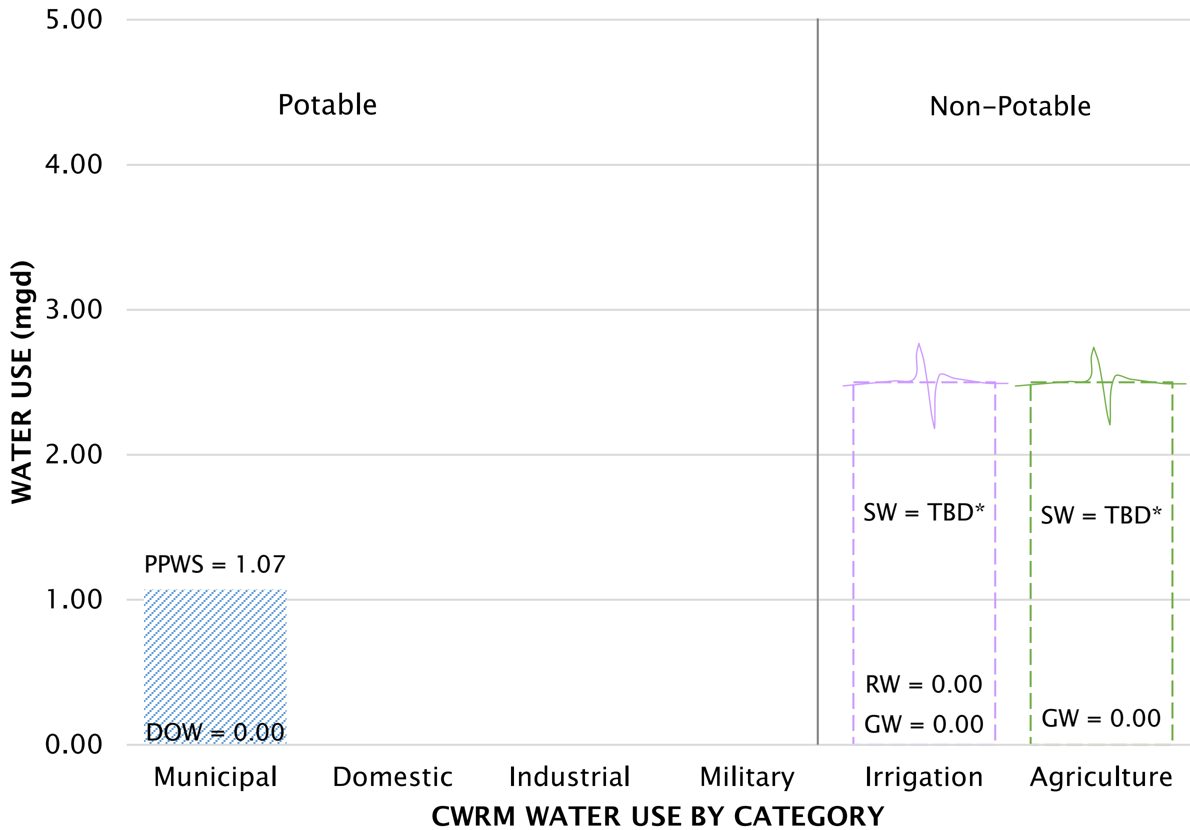
The following section presents the total estimated average water use within the Kalihiwai ASYA. The total estimated average water use was based on data from CWRM (well pumpage) and DOH (Sanitary Surveys for Public Water Systems and estimated recycled water usage) for the year of 2014. Well classification changes since 2014 are noted in the sub-sections below. **Table 20201-5** and **Figure 20201-6** summarize the water use in accordance with CWRM categories.

Table 20201-5: Existing Water Use by Category – Kalihiwai ASYA

CWRM Category	Ground Water (mgd)	Other Sources (mgd)	Total (mgd)	Percent of Total
Domestic	0.00		0.00	0.0
Industrial			0.00	0.0
Irrigation	0.00		0.00	0.0
Agriculture	0.00	TBD[1]	0.00	0.0
Military			0.00	0.0
Municipal				
DOW System			0.00	0.0
Private-Public WS	1.07		1.07	100.0
TOTAL	**1.07**		**1.07**	**100.0**

[1] Surface Water – TBD from AWUDP

Figure 20201-6: Existing Water Use by Category – Kalihiwai ASYA



*Values to be determined by other components of the Hawai‘i Water Plan

20201-3.2 Domestic Use

There are 12 wells classified as "Domestic" in the 2014 CWRM database; however, none have not reported pumpage.

Two additional DOMNOTH – Domestic, Other Non-Residential wells were added to the 2017 CWRM database, increasing the "domestic" well total to 14 wells.

20201-3.3 Industrial Use

There is no industrial water use in the Kalihiwai ASYA.

20201-3.4 Irrigation Use

Irrigation use has been divided into ground water, recycled water, and surface water.

20201-3.4.1 Ground Water

There is one well classified as "Irrigation" in the CWRM database owned by Secret Beach Plantation, LLC with no reported pumpage.

One additional well was added to the 2017 CWRM database, owned by Kauapea Papaya, LLC, which increases the "irrigation" well total to 2 wells.

20201-3.4.2 Recycled Water

The Princeville Makai Golf Course is irrigated with R-2 water from the Princeville WWRF in the Hanalei ASYA. The golf course is in the Kalihiwai and Hanalei ASYAs. The Princeville WWRF and Princeville Makai Golf Course are discussed further in **Section 20202**.

20201-3.4.3 Surface Water

Information on surface water use for irrigation is to be determined by the AWUDP. However, typically, due to the location of parks and other landscaped areas within communities, it is assumed that it is unlikely for landscaping to be irrigated with surface water.

20201-3.5 Agricultural Use

Agricultural use has been divided into ground water, recycled water, and surface water.

20201-3.5.1 Ground Water

There are 2 wells classified as "Agriculture" in the CWRM database, with 1 well further classified as AGRCP - crops and processing. The AGRCP well is owned by Pualei Properties, LLC with no reported pumpage. The other well is owned by a private landowner with no reported pumpage.

20201-3.5.2 Recycled Water

There are no agriculture demands served by recycled water in the Kalihiwai ASYA.

20201-3.5.3 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP.

20201-3.6 Military Use

There is no military water use in the Kalihiwai ASYA.

20201-3.7 Municipal Use

There are 2 wells in the CWRM database classified as "Municipal," none of which are MUNCO – Municipal County. These two wells are classified as MUNPR – Municipal Private. County Municipal can be subcategorized into the other water use categories: Domestic, Industrial, Agricultural, Military, and Municipal.

20201-3.7.1 County Water Systems

The DOW has two major water systems that serve the Kalihiwai ASYA; the ‘Anini Water System and the Kīlauea Water System.

‘Anini Water System

The ‘Anini water system is DOH Public Water System (PWS) No. 402 and serves 109 people through 61 service connections, per the 2009 DOH Sanitary Survey. This water system is considered a consecutive water system; water for this system is purchased from the Princeville (PWS 428 water system). The ‘Anini water system service area includes beach front residences along ‘Anini Beach Road, a public park, and a polo field. There are no DOW storage facilities or booster pump stations for this water system.

Kīlauea Water System

The Kīlauea water system is DOH PWS No. 407 and services areas in both the Kīlauea ASYA and Kalihiwai ASYA. This water system was discussed in **Section 20105** – Kīlauea ASYA.

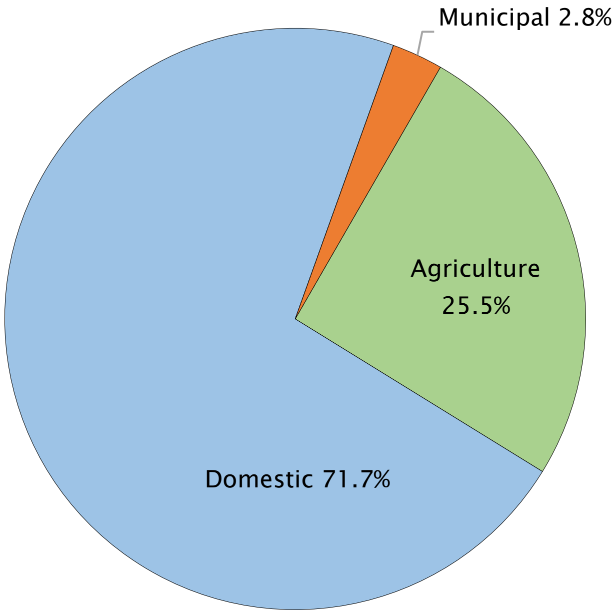
DOW Water Use by Category

DOW water use is subcategorized in **Table 20201-6** to the extent possible based on available meter data and is depicted in **Figure 20201-7**.

Table 20201-6: DOW Existing Water Use by Category – Kalihiwai ASYA

CWRM Water Use Category	DOW Metered Water Use (mgd)	Percent of Total
Agricultural	0.070	25.5
Domestic	0.196	71.7
Industrial	0.000	0.0
Military	0.000	0.0
Municipal	0.008	2.8
Total	**0.274**	**100.0**

Figure 20201-7: DOW Existing Water Use by Category – Kalihiwai ASYA



20201-3.7.2 State Water Systems

There are no State water systems in the Kalihiwai ASYA regulated by the DOH.

20201-3.7.3 Federal Water Systems

There are no Federal water systems in the Kalihiwai ASYA regulated by the DOH.

20201-3.7.4 Private-Public Water Systems

The Princeville Water System (PWS 428) is the only private-public water system in the Kalihiwai ASYA regulated by the DOH. The water system is owned and operated by Princeville Utilities Company, Inc and serves 1,698 people through 1,029 service connections. This water system serves residents in the Princeville, Kalihiwai, and ‘Anini Vista communities, including the Princeville Resort and golf clubhouses. Water for this system is supplied by 3 wells. Two wells are located in the Kalihiwai ASYA: Princeville 1 (2-1126-001), Princeville 2 (2-1126-002) with total reported pumpage of 1.07 mgd. The third well, Princeville 4 (2-1127-002), is located in the Hanalei ASYA with reported pumpage of 0.32 mgd. The water is stored in 3 tanks and flows to the distribution system by gravity.

20201-3.7.5 Per Capita Use

The per capita existing water use consumption based on domestic DOW metered water use and private-public water system use is presented in **Table 20201-7**. The per capita use in the Kalihiwai ASYA is approximately 134% higher than the overall County of Kaua‘i per capita use largely due to the high PPWS use in the Princeville resort area.

Table 20201-7: Per Capita Use – Kalihiwai ASYA

	DOW Metered Water Use – Domestic (mgd)	Private-Public Water System (mgd)	90% of 2015 Population	Per Capita Use (gpd)
Kalihiwai ASYA	0.196	1.07	2,789	454
County of Kaua'i	**9.360**	**2.951**	**63,462**	**194**

20201-3.8 Existing Water Use by Resource

20201-3.8.1 Ground Water

Table 20201-8 summarizes the current production, sustainable yield (SY), and percentage of SY for the current production. Current production is represented by the 2014 average yield calculated from the actual pumping data.

Table 20201-8: Pumpage – Kalihiwai ASYA

Pumpage (mgd)	SY (mgd)	Pumpage Portion of SY
1.07	16	6.7%

Based on available information from the CWRM database, the current ground water use is 6.7 percent of the sustainable yield.

20201-3.8.2 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP.

20201-3.8.3 Water Conservation

Water conservation, including water loss management, may reduce water use. See **Section 20201-2.3** for existing conservation efforts.

20201-3.8.4 Rainwater Catchment

Developed parcels that are not supplied by ground water or surface water are assumed to be supplied by rainwater catchment.

20201-3.8.5 Recycled Water

The Princeville Makai Golf Course is irrigated with recycled water from the Princeville WWRF, discussed further in **Section 20202**.

20201-4 FUTURE WATER USE

20201-4.1 Full Build-Out Water Demand Projections

The full build-out water demand projections based on the General Plan and County Zoning for the Kīlauea ASYA is listed in **Table 20201-9** and **20201-10**, respectively. Each land use class is associated with the most appropriate CWRM water use category.

Table 20201-9: General Plan Full Build-Out Water Demand Projection – Kalihiwai ASYA

General Plan Category	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	0.51
Open	Domestic	0.04
Military	Military	0.00
Park	Irrigation	0.05
Residential	Domestic/Municipal	1.06
Resort	Domestic/Irrigation/Municipal	3.32
Transportation	Municipal	0.00
Urban Center	Domestic/Industrial/Municipal	0.00
DHHL	Domestic	0.00
	TOTAL	**4.98**

Table 20201-10: Zoning Full Build-Out Water Demand Projection – Kalihiwai ASYA

Zoning Class	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	0.51
Commercial	Municipal	0.04
Industrial	Industrial/Municipal	0.06
Open	Domestic	0.04
Residential	Domestic/Municipal	1.30
Resort	Domestic/Irrigation/Municipal	0.28
DHHL	Domestic	0.00
	TOTAL	**2.23**

20201-4.1.1 Refined Land Use Based Water Projection

State Water Projects Plan

There are no future State water projects through the year 2034 within the Kalihiwai ASYA according to the 2021 SWPP Update.

State Department of Hawaiian Home Lands

There are no DHHL tracts in the Kīlauea ASYA.

Agricultural Water Use and Development Plan

The AWUDP dated 2003 (revised 2004) was limited in scope. More recent, comprehensive information on agricultural lands is available in the County of Kaua'i Important Agricultural Lands (IAL) Study.

In 2019, a public review draft of the AWUDP was released and it is anticipated that the next phase of the AWUDP will provide agricultural water demand projections in greater detail and will supersede information in the KWUDP when it becomes available.

County of Kaua'i Important Agricultural Lands Study

1,306 acres of agricultural lands within the Kalihiwai ASYA received a score of 28 or better in the County of Kaua'i Important Agricultural Lands (IAL) Study. Lands that receive a score of 28 or better were determined to have met all eight IAL criteria to some degree. Only a subset of lands with a score of 28 or better is expected to be designated as IALs. **Table 20201-11** compares these lands that received a score of 28 or better to the declared surface water use from diversions and to the diversified water use rate of 3,400 gallons per acre per day (gpad) estimated in the 2004 AWUDP.

Table 20201-11: Irrigation of Agricultural Lands

(1) Declared Surface Water Use from Diversions (mgd)	0.09
(2) Agricultural Lands with a Score ≥ 28 (Acres)	1,306
- How many acres can be sustained by **(1)** at a water rate of 3,400 gpad? (Acres)	26
- What percent of **(2)** can be sustained with a water rate of 3,400 gpad?	2%
- If all of **(2)** were to be irrigated, what is the water unit rate? (gpad)	69

20201-4.1.2 Water Use Unit Rates

Water use unit rates are based on the *Water System Standards* (WSS), as discussed in Chapter 2.

The General Plan provides only broad density guidelines for residential and resort designations. For these designations, under the assumption that most residents would like their communities, including the development density, to remain similar in the future, the average number of dwelling units as allowed by zoning was used as the density (i.e., 6.84 dwelling units per acre for residential designation and 7.46 dwelling units per acre for resort designation).

20201-4.2 Water Demand Projections to the Year 2035

The following section presents water demand projections to the year 2035 for the Kalihiwai ASYA. The projected low, medium, and high growth rates are listed in **Table 20201-12** and are graphed in **Figure 20201-8**. Potable (domestic, industrial, municipal, and military water uses) and non-potable (irrigation) water demands are also differentiated.

Table 20201-12: Water Demand Projection – Kalihiwai ASYA

Water Use Category	Water Demand by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
GROWTH RATE C (HIGH)									
TOTAL	**1.07**	**1.07**	**1.08**	**1.08**	**1.09**	**1.09**	**1.12**	**1.15**	**1.19**
Potable	1.07	1.07	1.08	1.08	1.09	1.09	1.12	1.15	1.19
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GROWTH RATE B (MEDIUM)									
TOTAL	**1.07**	**1.07**	**1.08**	**1.08**	**1.09**	**1.09**	**1.12**	**1.14**	**1.18**
Potable	1.07	1.07	1.08	1.08	1.09	1.09	1.12	1.14	1.18
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GROWTH RATE A (LOW)									
TOTAL	**1.07**	**1.07**	**1.07**	**1.07**	**1.08**	**1.08**	**1.08**	**1.09**	**1.11**
Potable	1.07	1.07	1.07	1.07	1.08	1.08	1.08	1.09	1.11
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figure 20201-8: Water Demand Projection Summary – Kalihiwai ASYA

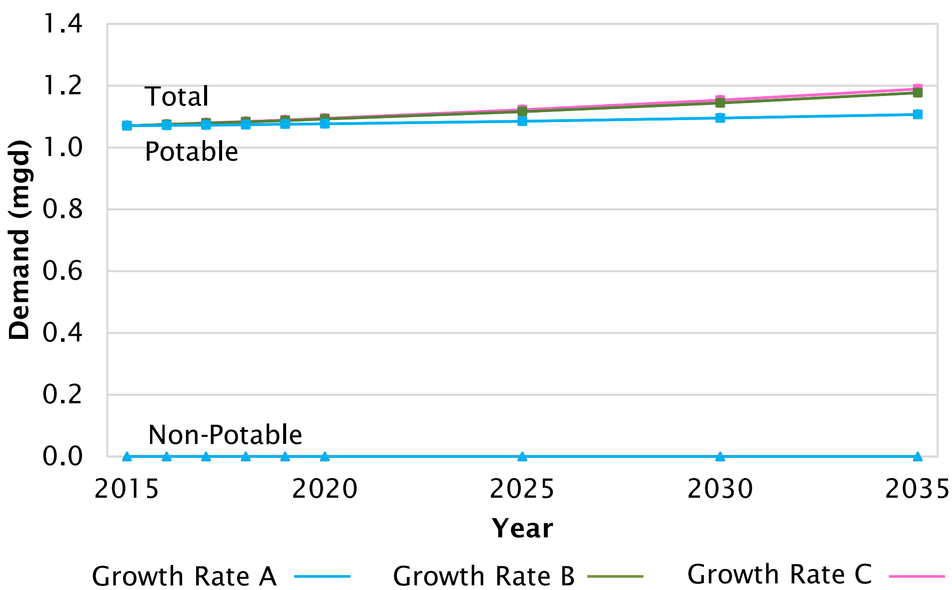


Figure 20201-9 shows the breakdown of water demand projections for a medium growth rate by CWRM categories through the year 2035. **Table 20201-13** summarizes this figure.

Figure 20201-9: Medium Growth Rate B Water Demand Projection by Category – Kalihiwai ASYA

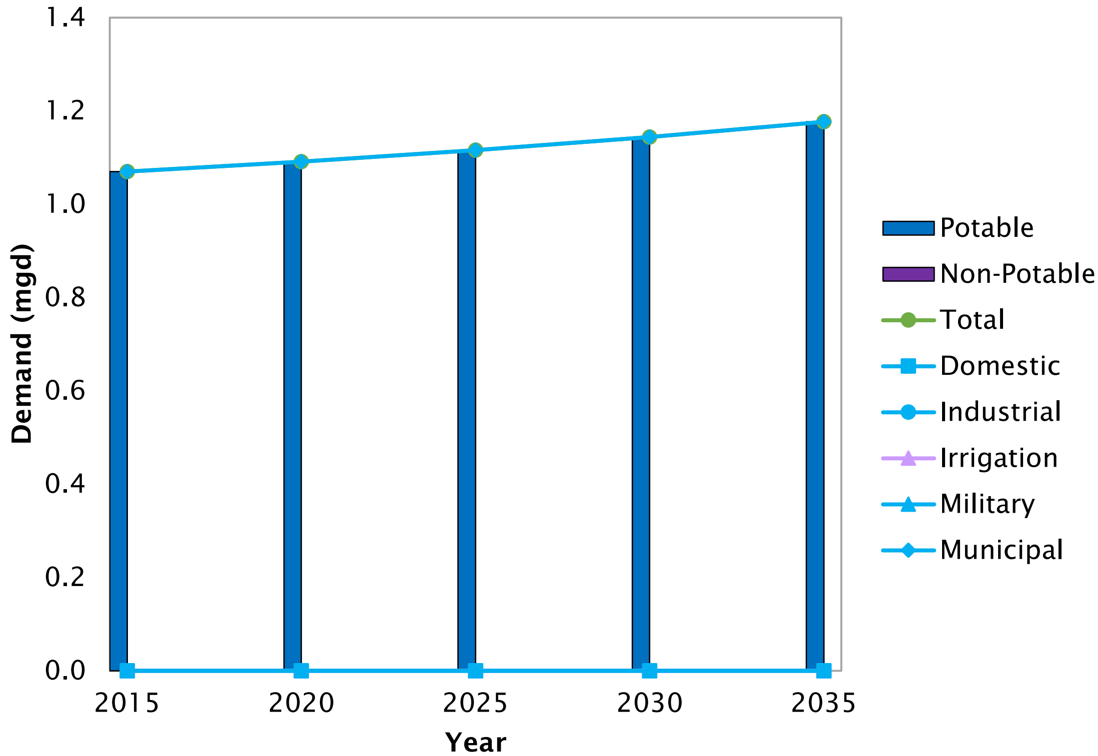


Table 20201-13: Medium Growth Rate B Water Demand Projection by Category – Kalihiwai ASYA

Water Use Category	Water Use by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
Total	**1.07**	**1.07**	**1.08**	**1.08**	**1.09**	**1.09**	**1.12**	**1.14**	**1.18**
Potable	1.07	1.07	1.08	1.08	1.09	1.09	1.12	1.14	1.18
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Domestic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Irrigation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Military	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Municipal	1.07	1.07	1.08	1.08	1.09	1.09	1.12	1.14	1.18
DOW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

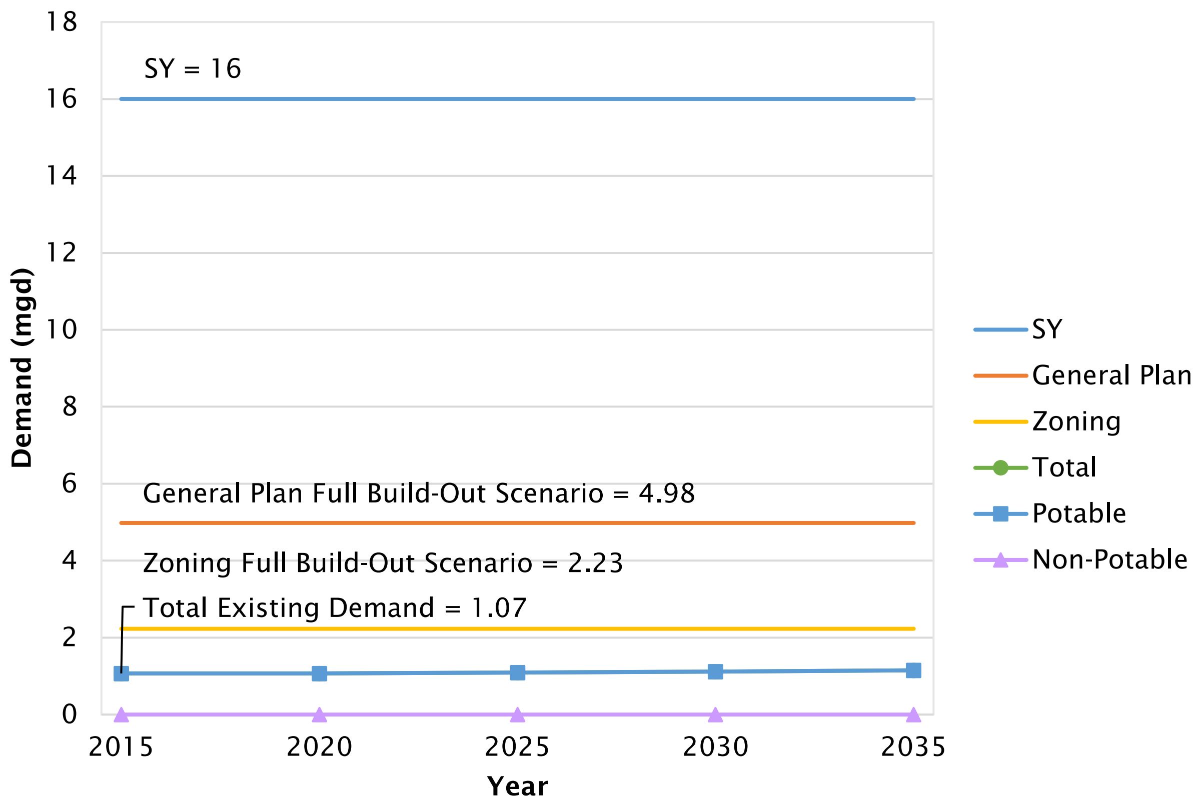
20201-4.3 Summary

Figure 20201-10 illustrates the magnitude of the sustainable yield, both General Plan and Zoning full build-out water use projections, and water use projection through the year 2035 focusing on Medium Growth Rate B. **Table 20201-14** summarizes the General Plan, Zoning, and 20-year water demand projection scenarios for the Kalihiwai ASYA. The sustainable yield is presented to draw comparisons. All demands are in mgd.

Table 20201-14: Summary of Demand Projections

SY (mgd)	FBO (mgd)		Medium Growth Rate Demand by Year (mgd)								
	GP	Zoning	2015	2016	2017	2018	2019	2020	2025	2030	2035
16	4.98	2.23	1.07	1.07	1.08	1.08	1.09	1.09	1.12	1.14	1.18

Figure 20201-10: Medium Growth Rate B Water Demand Projections and Full Build-Out – Kalihiwai ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use. For future agricultural water use analysis, please see Section 20201-4.1.1 County of Kaua'i Important Agricultural Lands Study.

20201-5 RESOURCE AND FACILITY RECOMMENDATIONS

20201-5.1 Water Source Adequacy

20201-5.1.1 Full Build-Out

Development to the highest extent allowed by the General Plan and County Zoning within the Kalihiwai ASYA is sustainable, with General Plan and County Zoning full build-out water demands requiring 31 and 14 percent of the 16 mgd sustainable yield, respectively.

20201-5.1.2 Twenty-Year Projection

The 2035 water demand projection for the Kīlauea ASYA is sustainable and is only 7 percent of the 16 mgd sustainable yield.

20201-5.2 Source Development Requirements

20201-5.2.1 Supply-Side Management

Supply-side management, including conventional water resource measures, water conservation, and alternative water resource measures, were evaluated to meet projected water demands.

Conventional Water Resource Measures

Ground Water

The Kalihiwai ASYA contains basal and perched ground water. All reported pumpage is from the basal zone.

The 2035 water demand projection for the Kalihwai ASYA is only 7 percent of the 16 mgd sustainable yield. This indicates that theoretically, more water could be pumped from the aquifer without impairing the utility or quality of the water resource if wells are optimally placed and the proper due diligence with regard to traditional and customary rights and impacts has been completed. However, it is noted that sustainable yield does not consider the feasibility of developing the ground water resources, and that the safe yield of an individual production well may be limited by localized ground water behavior near the well as a result of pumpage. Water supply reliability and quality, feasibility, environmental and cultural impacts, and water rights shall be considered as projects and programs develop. More detailed and site-specific evaluation of these impacts shall be required and accomplished through the environmental review process (HRS Chapter 343) for source development projects and programs utilizing public funding, and CWRM could consider requiring compliance with the environmental review process for private source development projects and programs also. **Section 1.5.3.1** provides additional information regarding the protection of traditional and customary rights.

The Princeville Water System serves the Princeville, Kalihiwai, and ʻAnini Vista communities and is owned and operated by the Princeville Utilities Company, Inc. This water system also provides water to DOW's 'Anini Water System. Development of ground water to meet projected demands is feasible since projected potable water needs are within the sustainable yield of this area.

Surface Water

The Kalihiwai ASYA has 13 declared diversions. Until permanent instream flow standards are established, interim instream flow standards have been adopted. According to Section 13-169-46, Hawai'i Administrative Rules, "Interim Instream Flow Standard for all streams on Hawai'i, as adopted by the commission on water resource management on June 15, 1988, shall be that amount of water flowing in each stream on the effective date of this standard, and as that flow may naturally vary throughout the year and from year to year without further amounts of water being diverted offstream through new or expanded diversions, and under the stream conditions existing on the effective date of the standard, except as may be modified [by the commission]." Therefore, for the purposes of assessing surface water availability, it is assumed that no additional diversions will be allowed without amendment of the interim IFS.

The existing declared diversions have the potential to meet additional demands. However, a challenge with developing surface water is transmission of these resources from source to location of need. Farmers generally grow what is feasible for the area; therefore, it is anticipated that agricultural water use will follow the availability of irrigation water. Increase in the availability of surface water would likely promote additional usage and could thereby minimize ground water being used for irrigation.

There are a couple of small existing irrigation lines in the Kalihiwai ASYA, as shown on **Figure 20201-4**, but there are no major irrigation systems.

Water Transfer

Some existing irrigation systems have the capability to transfer surface water to adjacent ASYAs. Water can also be transferred between ASYAs through public water systems. The DOW's Kīlauea water system services areas in the Kīlauea ASYA and Kalihiwai ASYA. The sources for the water system, including a proposed well, are in the Kīlauea ASYA, while its service area is in both the Kīlauea ASYA and Kalihiwai ASYA. The Princeville water system services areas in the Kalihiwai ASYA and Hanalei ASYA. Two of its wells are in the Kalihiwai ASYA, and one well is located in the Hanalei ASYA.

Water Conservation

The per capita use in the Kalihiwai ASYA is approximately 134% higher than the overall County of Kaua'i per capita use largely due to the high PPWS use in the Princeville resort area. There are no ASYA-specific conservation measures in place at this time; however, there are general water conservation programs that are described in **Section 1.5.7**. Water conservation, including water loss management, can increase the amount of water available and help to ensure the long-term viability of water resources.

Alternative Water Resource Measures

Rainwater Catchment

Rainwater can be utilized as a water resource in several ways.

Rainwater can be harvested in rainwater catchment systems which can be utilized to supply domestic potable water needs. These systems are viable in areas that receive abundant rainfall and are a suitable source of potable water for individual domestic users in areas outside the limits of municipal water systems. Generally, these are remote areas and are not expected to expand significantly because most development is anticipated to be concentrated within existing urban areas. Therefore, use of rainwater catchment systems is not anticipated to increase significantly.

Rainwater can also be used to supplement or satisfy agricultural non-potable water needs through ambient rainfall.

See the Storm Water Reuse section below to see how rainwater as storm water runoff can be reclaimed and reused.

Storm Water Reuse

Rainfall can turn into storm water runoff. Storm water runoff from impervious surfaces in urban areas can be significant. This water could be captured, treated, and used as a source of non-potable water (e.g., irrigation), integrated with recycled water, or even as potable and/or non-potable ground water recharge. However, due to the lack of storm water reuse standards, the high initial infrastructure costs, and the treatment requirements, storm water reclamation and reuse on a small or large scale may not be feasible and requires further assessment as noted in the Water Resource Protection Plan. The U.S. Department of the Interior, Bureau of Reclamation published An Appraisal of Stormwater Reclamation and Reuse Opportunities in Hawai‘i (Storm Water Report) in 2008 but did not identify any storm water reclamation and reuse opportunities in the Kalihiwai ASYA.

Recycled Water

Recycled water is a valuable resource; an increase in its use may lower the dependence on potable sources. However, there are no wastewater reclamation facilities (WWRFs) in the Kalihiwai ASYA.

Desalination

Desalination of brackish ground water is a potential alternative; however, due to its high capital and operational costs, it likely would not be considered when other potable water sources are readily available.

20201-5.2.2 Demand-Side Management

Development Density Control

The full build-out demand for the Kalihiwai ASYA based on County Zoning is 2.23 mgd which is 14 percent of the sustainable yield. This indicates that there are adequate water resources to sustain the level of development that is allowed by law. In the Kalihiwai ASYA, the average number of dwelling units allowed by County Zoning is 6.84 dwelling units per acre in residential districts and 19.60 dwelling units per acre in resort districts.

The full build-out demand for the Kalihiwai ASYA based on the General Plan is 4.98 mgd which is 31 percent of sustainable yield. This full build-out demand is sustainable, but it is noted that it is based on 7.46 dwelling units per acre on lands designated as resort in the General Plan. As discussed in **Section 20201-1.3.2**, Princeville is designated as resort in the General Plan but is mostly zoned as residential, and the average number of dwelling units allowed in Princeville is 7.46 dwelling units per acre. If Princeville were to be rezoned as resort and the allowed number of dwelling units increased, this would increase water demand. For example, if the average number of dwelling units per acre increased from 7.46 to 15, the water demand for the area could potentially double. It is assumed that most residents would like their communities, including the development density, to remain similar in the future, and therefore, it is assumed that the development density will remain at about 8 dwelling units per acre. If an increase in development density is considered in the future by the Planning Department, it is recommended that the effect on water demand be assessed.

20201-5.3 Recommended Alternatives

To optimize appropriate use of water resources, the quality of the water source should be matched to the quality of water required. The highest quality of water shall be reserved for the most valuable end use. Potable water is considered the highest quality water, and the sustenance of life is the most valuable end use. Recycled water, brackish water, untreated surface water, and other lower quality water sources should be used for landscaping and agriculture when available, thereby reserving potable water for human consumption. If there is a practical alternative water source available, that alternative source should be used in lieu of ground water or surface water. With this in mind, the following recommendations are made for the Kalihiwai ASYA:

Alternative Water Resources

Use of alternative water sources can reduce demands on both ground and surface water resources and conserve water resources as a whole. However, aside from rainwater, there are no available alternative water sources in the area. Alternative water sources are unlikely to be developed when other water resources are readily available.

Conservation

Water resources are a finite resource that should be managed and used wisely. It should be conserved and not wasted. Implementation of conservation measures should continue to be encouraged.

Ground Water

Meeting future demands at a reasonable cost is a planning objective, and conventional sources, such as ground water, are typically the most cost-effective means for meeting projected water demands. Projected potable water needs are within the sustainable yield for this area. Therefore, ground water resources could continue to be used and developed to meet potable water needs now and into the future. However, as noted above, development of conventional water resource measures can have challenges, and water supply reliability and quality, feasibility, environmental and cultural impacts, and water rights shall be considered as projects and programs develop.

Development of ground water resources is the primary strategy to serve future potable demands in the Kalihiwai ASYA.

<u>Surface Water</u>

Surface water, where available, should be used to meet non-potable demands if alternative water resources are not available. To achieve this, it will be critical to maintain and improve existing irrigation systems. Making surface waters more readily available to meet non-potable water demands has the potential to minimize future dependence on the use of ground water. It is therefore recommended that the AWUDP provide information on the rehabilitation and maintenance needs of large irrigation systems.

<u>Demand-Side Management</u>

Full build-out demand based on the General Plan is 31 percent of sustainable yield. At this projection, implementation of development density control by the County Planning Department is not needed. However, as discussed previously, this full build-out demand is based on development density of approximately 8 units per acre, and an increase in the average development density will increase demand. Therefore, if an increase in development density is considered, the effect on water demand should be assessed.

Chapter 20202

Hanalei Aquifer System Area

CHAPTER 20202 - TABLE OF CONTENTS

FIGURES

TABLES

20202 HANALEI AQUIFER SYSTEM AREA

20202-1 SYSTEM AREA PROFILE

20202-1.1 General

The Hanalei [20202] Aquifer System Area (ASYA) is roughly bound on the north by Hanalei Bay, along the east ridge of the Hanalei River to the peak of Keāhua, from Keāhua to the peak of Wai‘ale‘ale along the southeast, and from the peak of Wai‘ale‘ale back to Hanalei Bay along the east ridge above the Lumaha‘i River. The Hanalei ASYA includes Hanalei town and a portion of Princeville.

Average annual rainfall ranges from about 80 inches per year along the coast to 340 inches in the mountains. The sustainable yield is 35 mgd.

20202-1.2 Economy and Population

20202-1.2.1 Economy

The Hanalei ASYA is generally residential but also includes commercial and resort areas in areas typically located along the north side of Kūhiō Highway. The Hanalei ASYA also includes the island’s largest agricultural areas for the raising of taro crops.

The largest industries in Hanalei are accommodation and food service, retail trade, and educational services. The largest industries in Princeville are accommodation and food service; art, entertainment, recreation; and real estate, rental and leasing.

20202-1.2.2 Population

Most of the population within the Hanalei ASYA is concentrated along the areas close to the shoreline, north of Kūhiō Highway, in Hanalei Town and in Princeville. Historical population data for this ASYA is summarized in **Table 20202-1**. Population projections through the year 2035 are summarized in **Table 20202-2a**. As shown in **Table 20202-2b**, it is estimated that the area will continue to experience growth rates between 1 and 6 percent per decade.

Table 20202-1: Historical Population – Hanalei ASYA

	Year		
	1990	**2000**	**2010**
Population	978	1,092	1,323
Percent Change		11.7	21.2

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report.
Data redistributed and evaluated for Hanalei ASYA.

Table 20202-2a: Population Projection – Hanalei ASYA

Growth Rate	Population by Year								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
A – Low	1,334	1,335	1,337	1,338	1,340	1,342	1,352	1,365	1,379
B – Med.	1,343	1,348	1,353	1,359	1,364	1,370	1,401	1,436	1,477
C – High	1,344	1,350	1,356	1,362	1,368	1,375	1,409	1,448	1,494

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report. Data redistributed and evaluated for Hanalei ASYA.

Table 20202-2b: Population Projection – Percent Change – Hanalei ASYA

Growth Rate	2015-2025 % Change	2025-2035 % Change
A – Low	1.3	2.0
B – Medium	4.3	5.4
C – High	4.8	6.0

20202-1.3 Land Use

20202-1.3.1 2000 Kauaʻi General Plan

The 2000 Kauaʻi County General Plan Land Use Designation Map for the Hanalei ASYA is shown on **Figure 20202-1**. The estimated land use allocation acreage for each land use designation within the system area is listed in **Table 20202-3**.

Table 20202-3: General Plan Estimated Land Use Allocation Acreage – Hanalei ASYA

General Plan Land Use Designation	Acreage	Percent of Total
Agricultural	723	3.5
Military	0	0.0
Open	19,427	94.5
Park	4	0.0
Residential Community	131	0.6
Resort	276	1.4
Transportation	0	0.0
Urban Center	0	0.0
DHHL	0	0.0
TOTAL	**20,561**	**100.0**

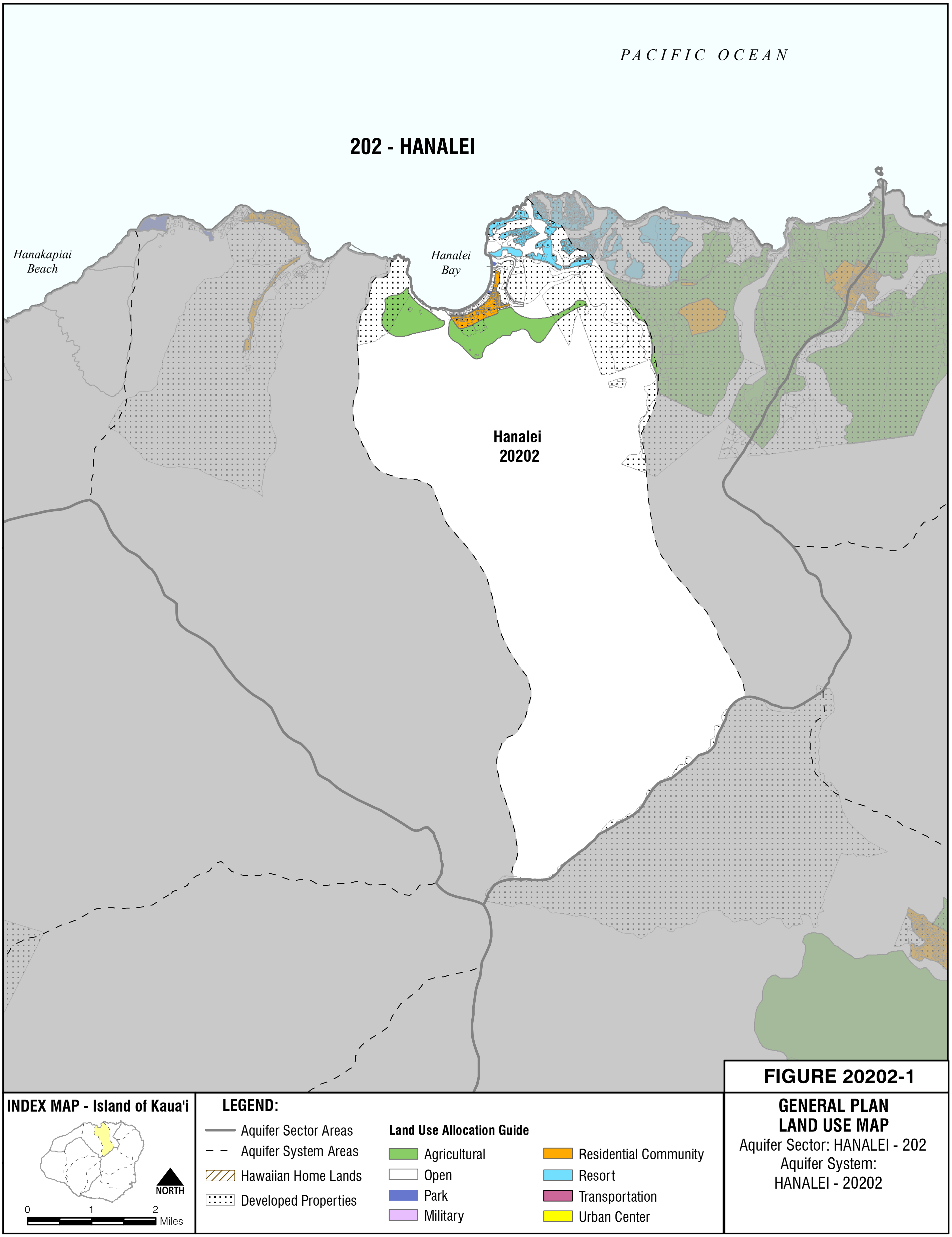
20202-1.3.2 Kauaʻi Zoning

Kauaʻi County Zoning Map for the Hanalei ASYA is shown on **Figure 20202-2**. The estimated land use allocation acreage for each zoning district within the system area is listed in **Table 20202-4**.

Table 20202-4: County Zoning Estimated District Allocation Acreage – Hanalei ASYA

Zoning District	Acreage	Percent of Total
Agriculture	1,143	5.4
Commercial – General	26	0.1
Commercial - Neighborhood	9	0.0
Conservation	18,439	87.0
Industrial – General	0	0.0
Industrial - Limited	0	0.0
Open	1,283	6.0
Residential	237	1.1
Resort	68	0.3
Project Development	0	0.0
Special Planning Area	0	0.0
Special Treatment	0	0.0
No Zoning	22	0.1
DHHL	0	0.0
TOTAL	**21,227**	**100.0**

The number of dwelling units allowed in residential and resort districts varies by the type of residential or resort district. The average number of dwelling units allowed in residential districts in the Hanalei ASYA is 5.92 dwelling units per acre. The average number of dwelling units allowed in resort districts in the Hanalei ASYA is 12.37 dwelling units per acre.



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Kaua'i County - Department of Water
KAUA'I WATER USE AND DEVELOPMENT PLAN UPDATE

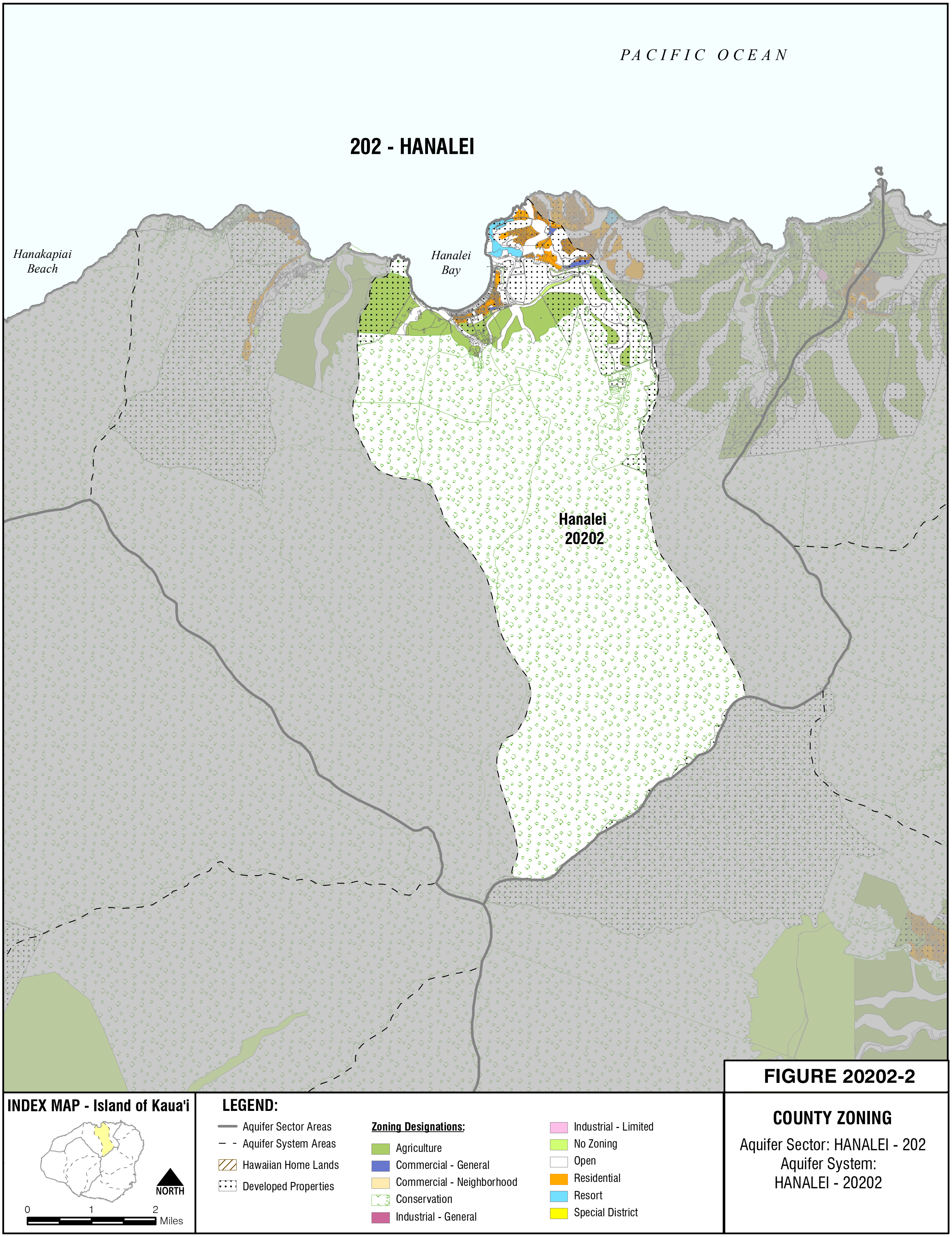


FIGURE 20202-2

COUNTY ZONING

Aquifer Sector: HANALEI - 202
Aquifer System:
HANALEI - 20202

20202-2 EXISTING WATER RESOURCES

20202-2.1 Ground Water

The Hanalei ASYA has a sustainable yield of 35 mgd. According to the 2014 CWRM database, there are 5 production wells in the system, 2 municipal (1 DOW, 1 non-DOW) and 3 domestic. There are also 2 wells drilled and categorized as "unused". Refer to **Appendix A** for this database. **Figure 20202-3** shows the well locations.

20202-2.2 Surface Water

There are 4 streams classified as perennial in the Hanalei ASYA, all of which 4 are considered continuous. The continuous streams are Waikoko Stream, Waipā Stream, Waiʻoli Stream, and Hanalei River. The USGS has 2 active surface water gages in the system area. Both gages are located on Hanalei River, which was previously listed in **Table 1-19**.

In accordance with the Code, the CWRM must establish and administer instream flow standards (IFS) on a stream-by-stream basis as necessary to protect public interests. IFS is defined as "a quantity or flow of water or depth of water which is required to be present at a specific location in a stream system at certain specified times of the year to protect fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses." Considerably more research and study need to be completed to accumulate the data and perspective necessary to conduct a thorough and meaningful assessment of IFS. Until permanent IFS are established, interim IFS have been adopted. The interim IFS are defined as the amount of water flowing in each stream at the time the administrative rules governing them were adopted in 1988 and 1989. In order to assess surface water sustainability, this KWUDP assumes that no additional diversions will be allowed from any stream without amendment of the interim IFS.

There are 13 declared stream diversions in the CWRM database shown on **Figure 20202-4**, which accounts for 4 percent of the 292 declared stream diversions on the island. The declared stream diversions are listed in **Appendix B**. The total declared flow for the Hanalei ASYA is 0.57 mgd. 0.03 mgd is declared surface water use from 1989 and the IIFS for Lumahaʻi River was amended in 2016 to include the remaining 0.54 mgd.

20202-2.3 Water Conservation

Water conservation increases the amount of water available and helps to ensure the long-term viability of water resources. Water conservation measures for this ASYA are as described in **Section 1.5.7** of this report. There are no ASYA specific special conservation measures in place at this time.

20202-2.4 Rainwater Catchment

Rainwater catchment is a viable resource for areas that are not served by ground water or surface water. **Figure 20202-5** shows the possible catchment areas, or parcels with a building value greater than $20,000 and assumed to be developed but without a ground water or surface water source.

20202-2.5 Recycled Water

There is 1 wastewater reclamation facility in the Hanalei ASYA. **Table 20202-5** lists the wastewater facility, reclaimed water classification, facility treatment capacity, current reuse amount, facility type, and current application. **Figure 20202-6** shows the facility location.

Table 20202-5: Wastewater Reclamation Facilities – Hanalei ASYA

WWRF/ WWTP	Recycled Water Classification	Design Capacity (mgd)	Quantity Produced (mgd)	Current Reuse Amount (mgd)	Owner	Irrigation Application
Princeville WWRF	R-2	1.5	0.6	0.53	Private	Princeville Makai Golf Course

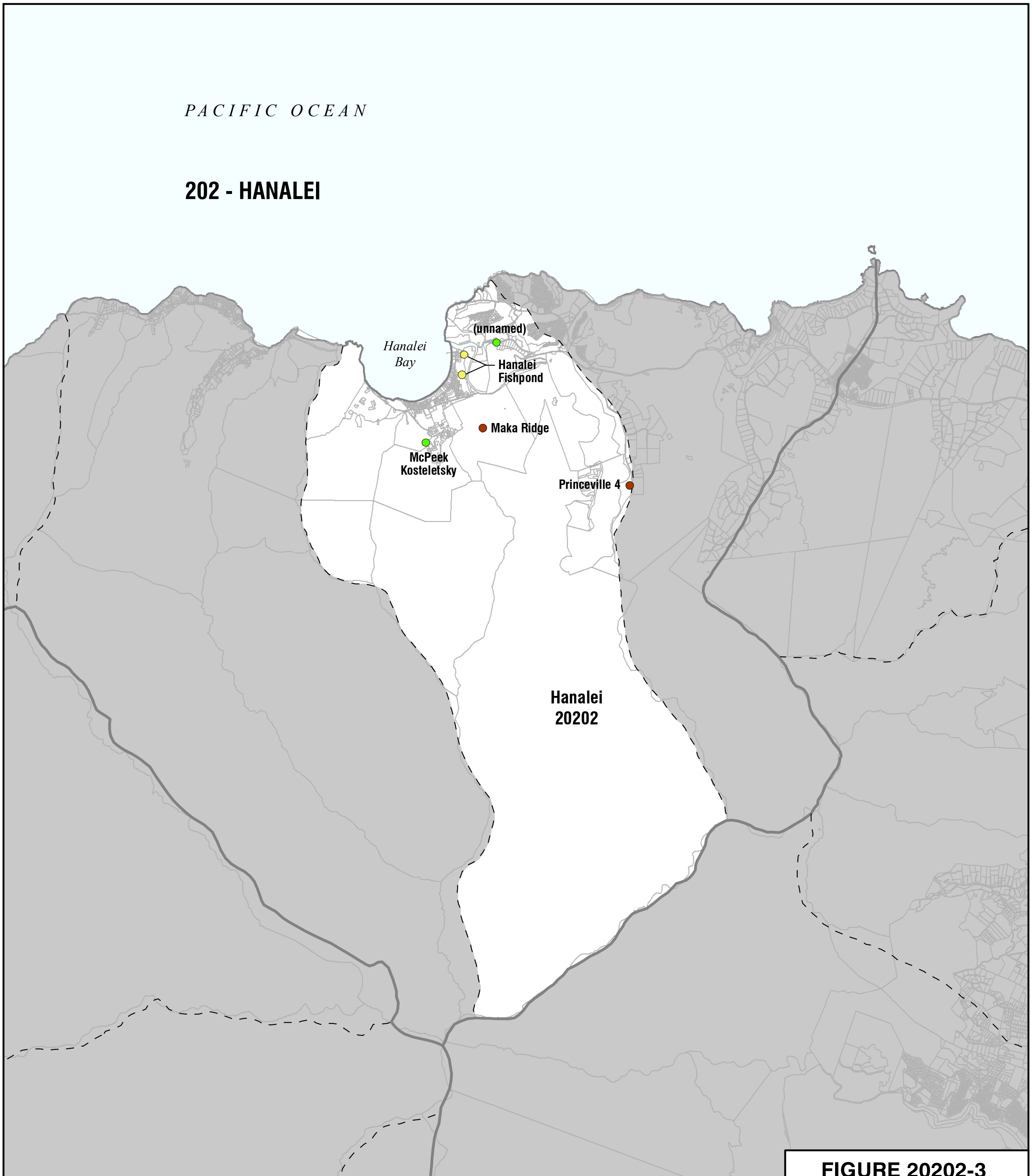
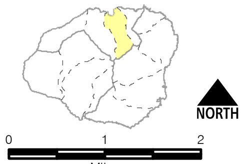


FIGURE 20202-3

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- TMK

Well Use Types

- Abandoned
- Agriculture
- Domestic
- Industrial
- Irrigation
- Military
- Municipal
- Observation
- Other
- Unused

WELL LOCATION

Aquifer Sector: HANALEI - 202
Aquifer System:
HANALEI - 20202

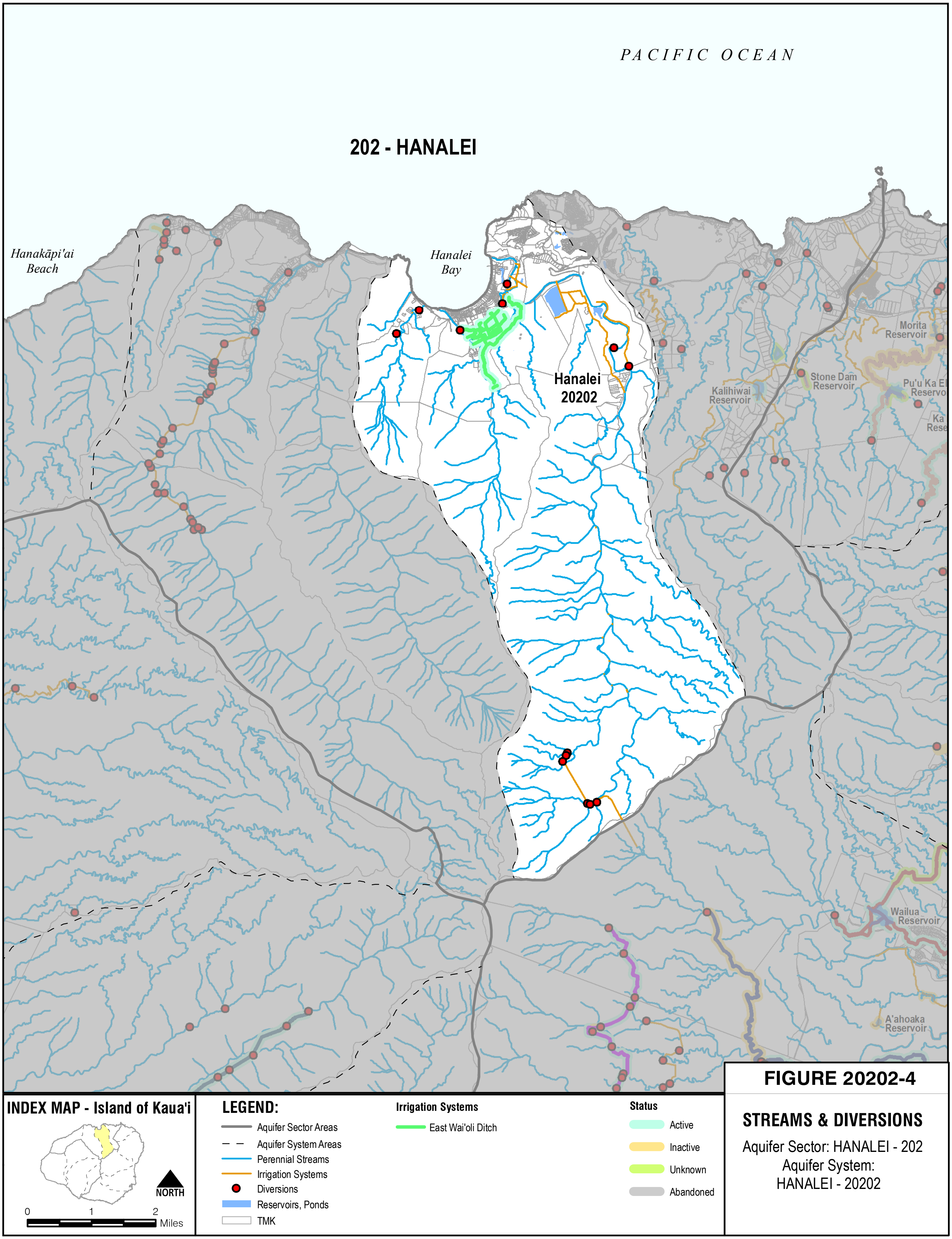


FIGURE 20202-4

STREAMS & DIVERSIONS

Aquifer Sector: HANALEI - 202
Aquifer System:
HANALEI - 20202

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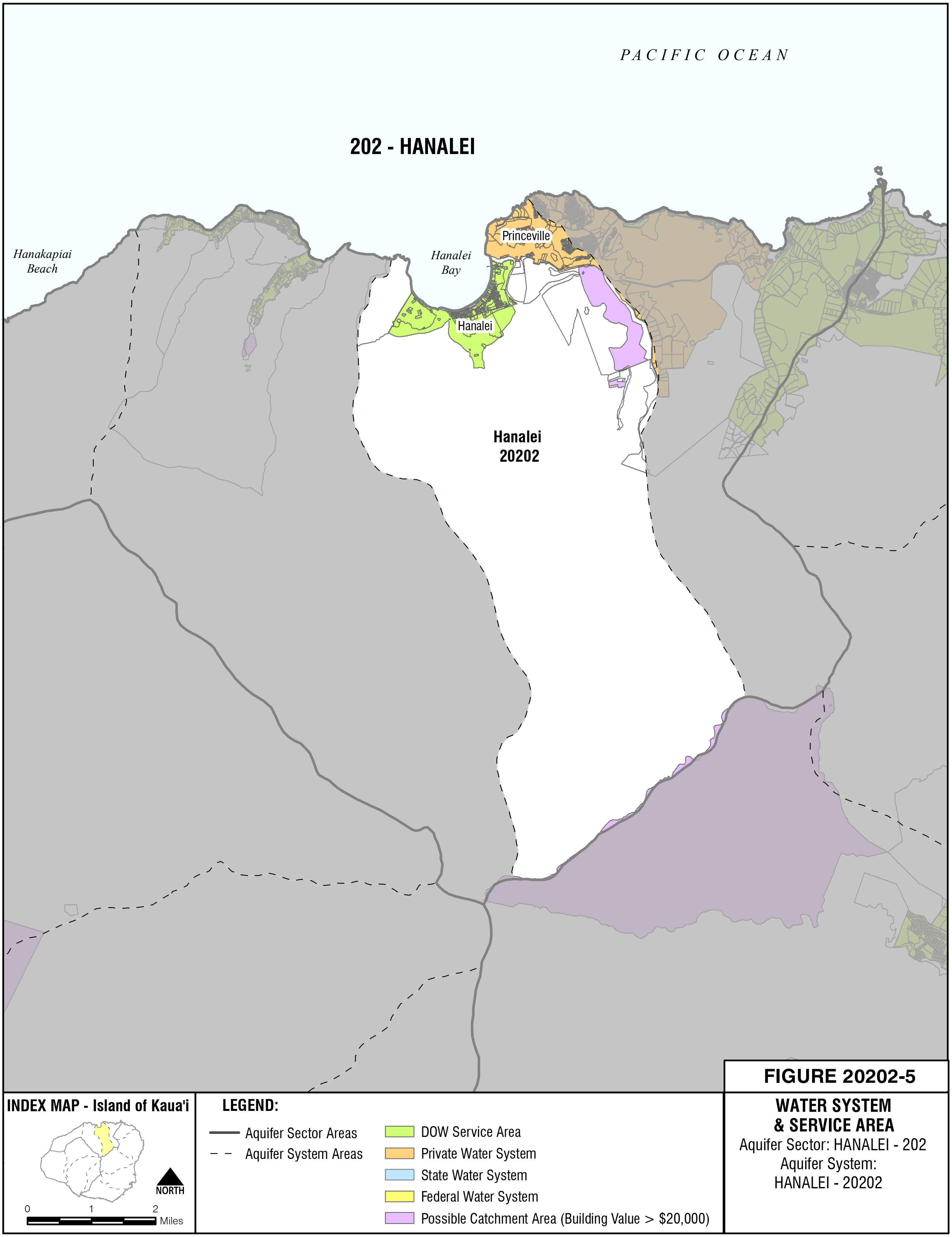


FIGURE 20202-5

WATER SYSTEM & SERVICE AREA

Aquifer Sector: HANALEI - 202

Aquifer System: HANALEI - 20202

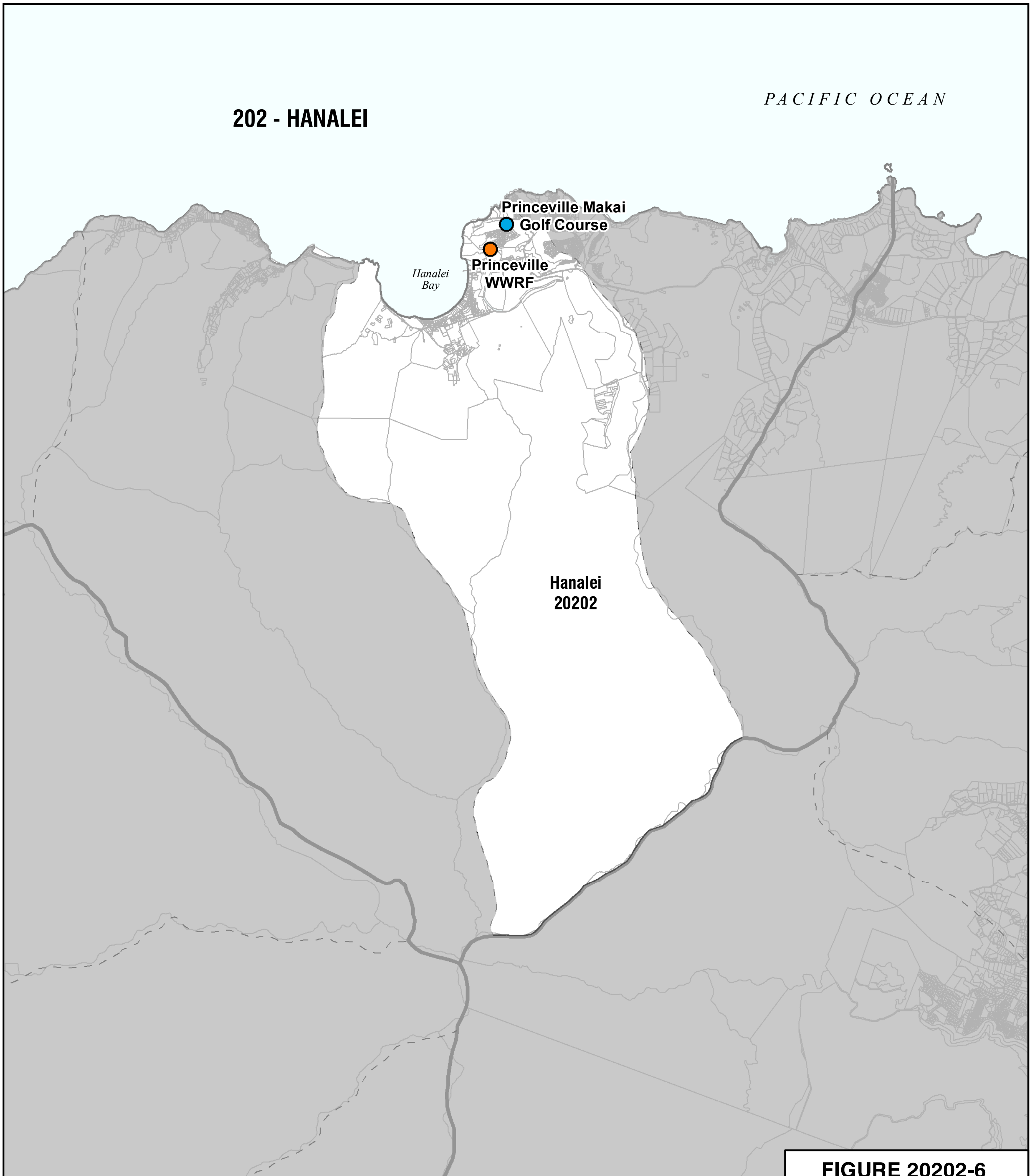
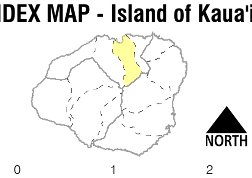


FIGURE 20202-6

WASTEWATER RECLAMATION FACILITIES

Aquifer Sector: HANALEI - 202
Aquifer System:
HANALEI - 20202

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- TMK
- Wastewater Facilities
- Area irrigating with recycled water

20202-3 EXISTING WATER USE

20202-3.1 General

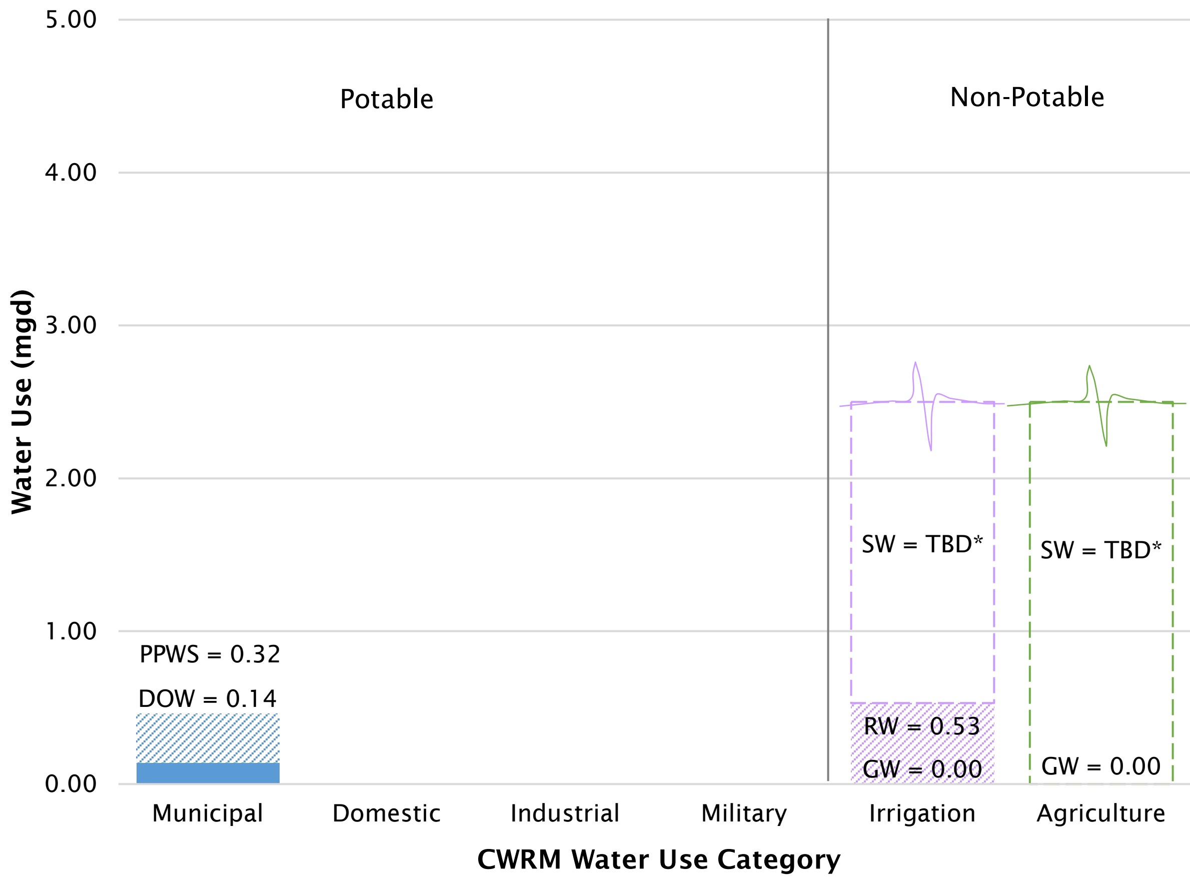
The following section presents the total estimated average water use within the Hanalei ASYA. The total estimated average water use was based on data from CWRM (well pumpage) and DOH (Sanitary Surveys for Private-Public Water Systems and estimated reclaimed water usage) for the year of 2014. **Table 20202-6** and **Figure 20202-7** summarize the water use in accordance with CWRM categories.

Table 20202-6: Existing Water Use by Category – Hanalei ASYA

CWRM Category	Ground Water (mgd)	Other Sources (mgd)	Total (mgd)	Percent of Total
Domestic	0.00		0.00	0.0
Industrial			0.00	0.0
Irrigation		0.53[1]	0.53	53.6
Agriculture		TBD[2]	0.00	0.0
Military			0.00	0.0
Municipal				
DOW System	0.14		0.14	14.1
Private-Public WS	0.32		0.32	32.3
TOTAL	**0.46**	**0.53**	**0.99**	**100.0**

[1] Recycled Water
[2] Surface Water – TBD from AWUDP

Figure 20202-7: Existing Water Use by Category – Hanalei ASYA



*Values to be determined by other components of the Hawai‘i Water Plan

20202-3.2 Domestic Use

There are 3 wells classified as “Domestic” in the 2014 CWRM database, all owned by private landowners. None of the three wells have reported pumpage.

20202-3.3 Industrial Use

There is no industrial water use in the Hanalei ASYA.

20202-3.4 Irrigation Use

Irrigation use has been divided into ground water, recycled water, and surface water.

20202-3.4.1 Ground Water

There are no wells classified as “Irrigation” in the Hanalei ASYA.

20202-3.4.2 Recycled Water

The Princeville Makai Golf Course, located in the Kalihiwai ASYA and Hanalei ASYA, receives R-2 water from the Princeville WWRF. A blend of the R-2 water and captured rainwater has been used to irrigate the golf course since 1971.

20202-3.4.3 Surface Water

Information on surface water use for irrigation is to be determined by the AWUDP. However, typically, due to the location of parks and other landscaped areas within communities, it is assumed that it is unlikely for landscaping to be irrigated with surface water.

20202-3.5 Agricultural Use

Agricultural use has been divided into ground water, recycled water, and surface water.

20202-3.5.1 Ground Water

There are no wells classified as "Agriculture" in the Hanalei ASYA.

20202-3.5.2 Recycled Water

There are no agriculture demands served by recycled water in the Hanalei ASYA.

20202-3.5.3 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP.

There are approximately 366 acres of loʻi in Hanalei utilizing surface water.

There are 190 acres of IAL in the Hanalei ASYA owned by Kamehameha Schools for taro cultivation, diversified agriculture, and pasture[1]. The IAL is divided into two areas by a mountain ridge. The Lumahaʻi area is to the west of the mountain ridge and the Waipā area is to the east of the mountain range. The areas consist of approximately 66 and 124 acres, respectively. Approximately 0.54 mgd is diverted from the Lumahaʻi River to serve the Lumahaʻi area[2]. The Waipā area is served from the Waipā Stream, Kiwaʻa Spring, and the DOW Hanalei water system; the capacity and estimated use from each source has not been quantified.

20202-3.6 Military Use

There is no military use in the Hanalei ASYA.

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[1] DR13-50 Trustees of the Estate of Bernice Pauahi Bishop dba Kamehameha Schools, Findings of Fact, Conclusions of Law, and Decision and Order, dated January 2014

[2] Stream Diversion Works Permit (SDWP.3936.2)

20202-3.7 Municipal Use

There is 1 well in the CWRM database classified as "Municipal" (MUNCO – Municipal County) and 1 well classified as MUNPR (Municipal-Private). County Municipal can be subcategorized into the other water use categories: Domestic, Industrial, Agricultural, Military, and Municipal.

20202-3.7.1 County Water Systems

Hanalei Water System

The DOW has one major water system that serves the Hanalei ASYA. The Hanalei water system is DOH Public Water System (PWS) No. 403 that serves 988 people through 349 service connections. The community water system serves residences and small-town businesses. Water for this system is supplied by 1 well. **Table 20202-7** lists the water source, well number, pumping capacity, pressure zone, and pumpage amount.

Table 20202-7: DOW Hanalei Water System Water Source

WELL NAME	WELL NUMBER	PUMPING CAPACITY (gpm)	PRESSURE ZONE (ft)	PUMPAGE (mgd)
Maka Ridge Well	2-1229-003	350	225	0.14

There is 1 primary pressure zone (225') and 1 storage tank in the Hanalei water system. Water can also be obtained from the Princeville (PWS 428) water system.

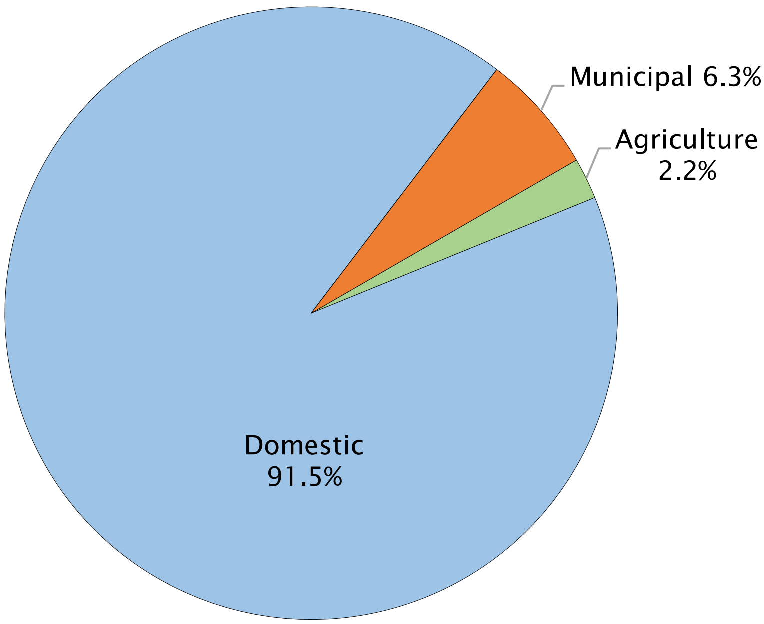
DOW Water Use by Category

DOW water use is subcategorized in **Table 20202-8** to the extent possible based on available meter data and is depicted in **Figure 20202-8**.

Table 20202-8: DOW Existing Water Use by Category – Hanalei ASYA

CWRM Water Use Category	DOW Metered Water Use (mgd)	Percent of Total
Agricultural	0.003	2.2
Domestic	0.143	91.5
Industrial	0.000	0.0
Military	0.000	0.0
Municipal	0.010	6.3
Total	**0.156**	**100.0**

Figure 20202-8: DOW Existing Water Use by Category – Hanalei ASYA



20202-3.7.2 State Water Systems

There are no State water systems in the Hanalei ASYA regulated by the DOH.

20202-3.7.3 Federal Water Systems

There are no Federal water systems in the Hanalei ASYA regulated by the DOH.

20202-3.7.4 Private-Public Water Systems

The Princeville (PWS 428) is the only private-public water system in the Hanalei ASYA regulated by the DOH. The majority of the service area for this water system lies within the Kalihiwai ASYA and therefore is discussed in **Section 20201**.

20202-3.7.5 Per Capita Use

The per capita existing water use consumption based on domestic DOW metered water use and private-public water system use is presented in **Table 20202-9**. The per capita use in the Hanalei ASYA is approximately 97.9% higher than the overall County of Kaua'i per capita use largely due to the high PPWS use in the Princeville resort area.

Table 20202-9: Per Capita Use – Hanalei ASYA

	DOW Metered Water Use – Domestic (mgd)	Private-Public Water System (mgd)	90% of 2015 Population	Per Capita Use (gpd)
Hanalei ASYA	0.143	0.321	1,209	384
County of Kauaʻi	**9.360**	**2.951**	**63,462**	**194**

20202-3.8 Existing Water Use by Resource

20202-3.8.1 Ground Water

Table 20202-10 summarizes the current production, sustainable yield (SY), and percentage of SY for the current production. Current production is represented by the 2014 average yield calculated from the actual pumping data.

Table 20202-10: Pumpage – Hanalei ASYA

Pumpage (mgd)	SY (mgd)	Pumpage Portion of SY
0.46	35	1.3%

Based on available information from the CWRM database, the current ground water use is 1.3 percent of the sustainable yield.

20202-3.8.2 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP. However, some limited information is available in the AWUDP dated 2003 (revised 2004) and in IAL designation documents.

As previously mentioned, there are loʻi in Hanalei that use surface water and 0.54 mgd of surface water is diverted from the Lumahaʻi River to serve approximately 66 acres of IAL. The remaining 124 acres of IAL owned by Kamehameha Schools is served from the Waipā Stream, Kiwaʻa Spring, and DOW Hanalei water system, and existing surface water use is unknown.

20202-3.8.3 Water Conservation

Water conservation, including water loss management, may reduce water use. See **Section 20202-2.3** for existing conservation efforts.

20202-3.8.4 Rainwater Catchment

Developed parcels that are not supplied by ground water or surface water are assumed to be supplied by rainwater catchment.

20202-3.8.5 Recycled Water

Recycled wastewater from the wastewater reclamation facility is used for golf course irrigation. Refer to **Table 20202-5** presented earlier.

20202-4 FUTURE WATER USE

20202-4.1 Full Build-Out Water Demand Projections

The full build-out water demand projections based on the General Plan and County Zoning for the Hanalei ASYA is listed in **Tables 20202-11** and **20202-12**, respectively. Each land use class is associated with the most appropriate CWRM water use category.

Table 20202-11: General Plan Full Build-Out Water Demand Projection – Hanalei ASYA

General Plan Category	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	0.17
Open	Domestic	0.07
Military	Military	0.00
Park	Irrigation	0.02
Residential	Domestic/Municipal	0.39
Resort	Domestic/Irrigation/Municipal	2.39
Transportation	Municipal	0.00
Urban Center	Domestic/Industrial/Municipal	0.00
DHHL	Domestic	0.00
	TOTAL	**3.04**

Table 20202-12: Zoning Full Build-Out Water Demand Projection – Hanalei ASYA

Zoning Class	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	0.17
Commercial	Municipal	0.17
Industrial	Industrial/Municipal	0.00
Open	Domestic	0.07
Residential	Domestic/Municipal	0.63
Resort	Domestic/Irrigation/Municipal	0.59
DHHL	Domestic	0.00
	TOTAL	**1.63**

20202-4.1.1 Refined Land Use Based Water Projection

State Water Projects Plan

There are no future State water projects through the year 2034 within the Hanalei ASYA according to the 2021 SWPP Update.

State Department of Hawaiian Home Lands

There are no DHHL tracts in the Hanalei ASYA.

Agricultural Water Use and Development Plan

The AWUDP dated 2003 (revised 2004) was limited in scope. More recent, comprehensive information on agricultural lands is available in the County of Kaua'i Important Agricultural Lands (IAL) Study.

In 2019, a public review draft of the AWUDP was released and it is anticipated that the next phase of the AWUDP will provide agricultural water demand projections in greater detail and will supersede information in the KWUDP when it becomes available.

County of Kaua'i Important Agricultural Lands Study

494 acres of agricultural lands within the Hanalei ASYA received a score of 28 or better in the County of Kaua'i Important Agricultural Lands (IAL) Study. Lands that receive a score of 28 or better were determined to have met all eight IAL criteria to some degree. Only a subset of lands with a score of 28 or better is expected to be designated as IALs. **Table 20202-13** compares these lands that received a score of 28 or better to the declared surface water use from diversions and to the diversified water use rate of 3,400 gallons per acre per day (gpad) estimated in the 2004 AWUDP.

Table 20202-13: Irrigation of Agricultural Lands

(1) Declared Surface Water Use from Diversions (mgd)	0.57
(2) Agricultural Lands with a Score ≥ 28 (Acres)	494
- How many acres can be sustained by **(1)** at a water rate of 3,400 gpad? (Acres)	167
- What percent of **(2)** can be sustained with a water rate of 3,400 gpad?	34%
- If all of **(2)** were to be irrigated, what is the water unit rate? (gpad)	1,153

A total of 190 acres of agricultural lands have been designated as IAL in the Hanalei ASYA thus far.

20202-4.1.2 Water Use Unit Rates

Water use unit rates are based on the *Water System Standards* (WSS), as discussed in Chapter 2.

The General Plan provides only broad density guidelines for residential and resort designations. For these designations, under the assumption that most residents would like their communities, including the development density, to remain similar in the future, the average number of dwelling units as allowed by zoning was used as the density (i.e., 5.92 dwelling units per acre for residential designation and 12.37 dwelling units per acre for resort designation).

20202-4.2 Water Demand Projections to the Year 2035

The following section presents water demand projections to the year 2035 for the Hanalei ASYA. The projected low, medium, and high growth rates are listed in **Table 20202-14** and are graphed in **Figure 20202-9**. Potable (domestic, industrial, municipal, and military water uses) and non-potable (irrigation) water demands are also differentiated.

Table 20202-14: Water Demand Projection – Hanalei ASYA

Water Use Category	Water Demand by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
GROWTH RATE C (HIGH)									
TOTAL	**0.99**	**1.00**	**1.00**	**1.01**	**1.01**	**1.01**	**1.04**	**1.07**	**1.10**
Potable	0.46	0.46	0.47	0.47	0.47	0.47	0.48	0.50	0.51
Non-Potable	0.53	0.53	0.53	0.54	0.54	0.54	0.56	0.57	0.59
GROWTH RATE B (MEDIUM)									
TOTAL	**0.99**	**1.00**	**1.00**	**1.00**	**1.01**	**1.01**	**1.03**	**1.06**	**1.09**
Potable	0.46	0.46	0.47	0.47	0.47	0.47	0.48	0.49	0.51
Non-Potable	0.53	0.53	0.53	0.54	0.54	0.54	0.55	0.57	0.58
GROWTH RATE A (LOW)									
TOTAL	**0.99**	**0.99**	**0.99**	**1.00**	**1.00**	**1.00**	**1.01**	**1.01**	**1.03**
Potable	0.46	0.46	0.46	0.46	0.46	0.46	0.47	0.47	0.48
Non-Potable	0.53	0.53	0.53	0.53	0.53	0.53	0.54	0.54	0.55

Figure 20202-9: Water Demand Projection Summary – Hanalei ASYA

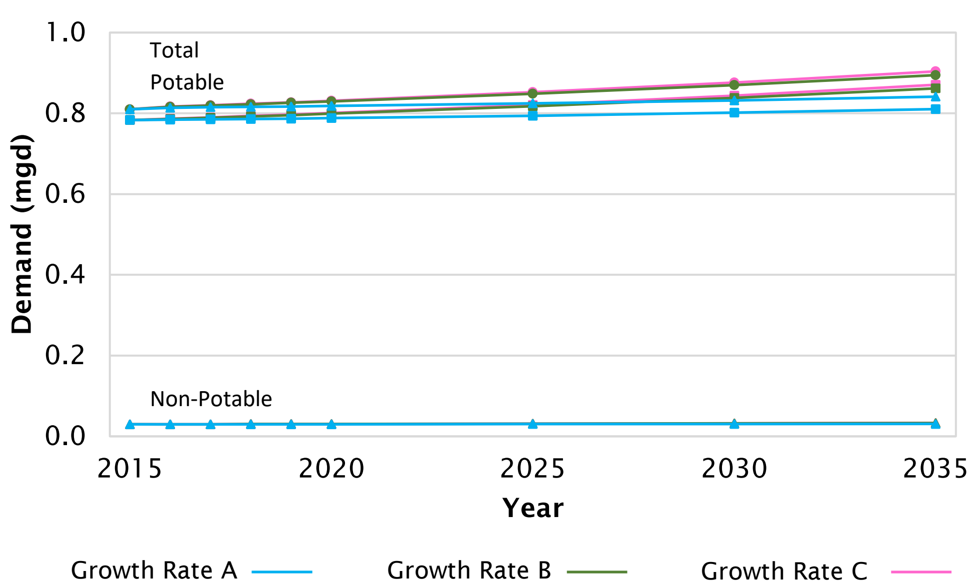


Figure 20202-10 shows the breakdown of water demand projections for a medium growth rate by CWRM categories through the year 2035. **Table 20202-15** summarizes this figure.

Figure 20202-10: Medium Growth Rate B Water Demand Projection by Category – Hanalei ASYA

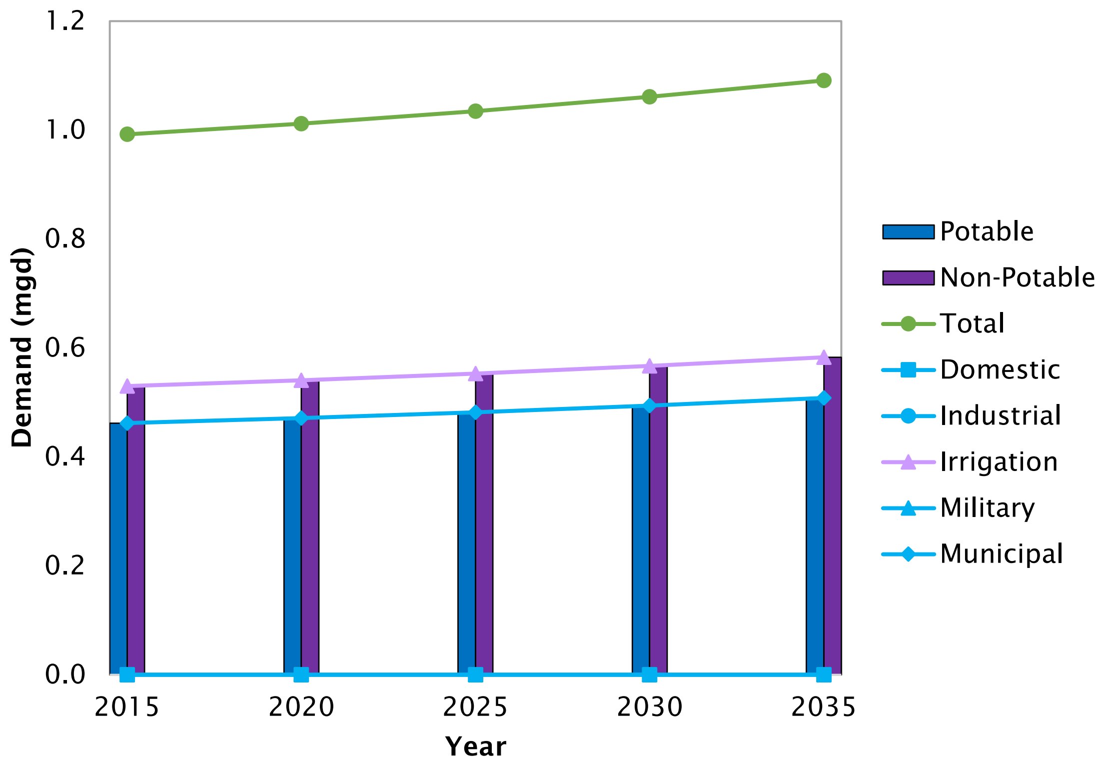


Table 20202-15: Medium Growth Rate B Water Demand Projection by Category – Hanalei ASYA

Water Use Category	Water Use by Year (mgd)								
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2025**	**2030**	**2035**
Total	**0.99**	**1.00**	**1.00**	**1.00**	**1.01**	**1.01**	**1.03**	**1.06**	**1.09**
Potable	0.46	0.46	0.47	0.47	0.47	0.47	0.48	0.49	0.51
Non-Potable	0.53	0.53	0.53	0.54	0.54	0.54	0.55	0.57	0.58
Domestic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Irrigation	0.53	0.53	0.53	0.54	0.54	0.54	0.55	0.57	0.58
Military	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Municipal	0.46	0.46	0.47	0.47	0.47	0.47	0.48	0.49	0.51
DOW	0.14	0.14	0.14	0.14	0.14	0.14	0.15	0.15	0.16

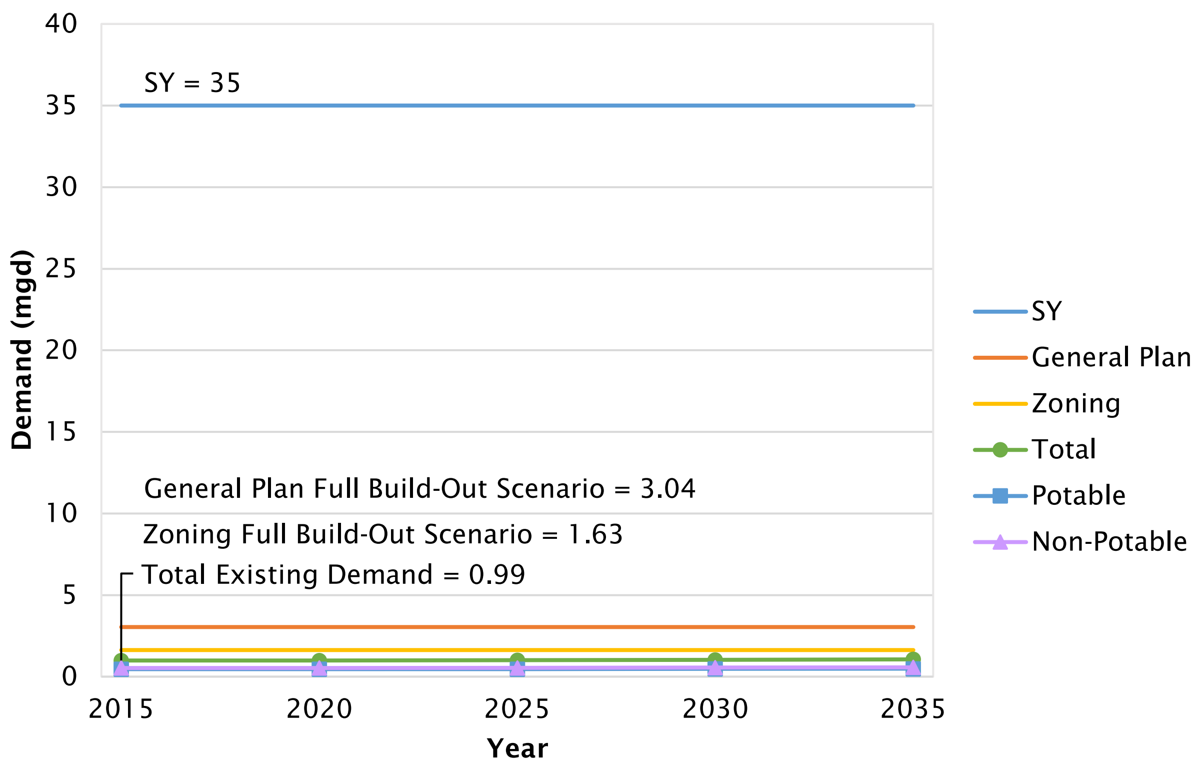
20202-4.3 Summary

Figure 20202-11 illustrates the magnitude of the sustainable yield, both General Plan and Zoning full build-out water use projections, and water use projection through the year 2035 focusing on Medium Growth Rate B. **Table 20202-16** summarizes the General Plan, Zoning, and 20-year water demand projection scenarios for the Hanalei ASYA. The sustainable yield is presented to draw comparisons. All demands are in mgd.

Table 20202-16: Summary of Demand Projections

SY (mgd)	FBO (mgd)		Medium Growth Rate Demand by Year (mgd)								
	GP	Zoning	2015	2016	2017	2018	2019	2020	2025	2030	2035
35	3.04	1.63	0.99	1.00	1.00	1.00	1.01	1.01	1.03	1.06	1.09

Figure 20202-11: Medium Growth Rate B Water Demand Projections and Full Build-Out – Hanalei ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use. For future agricultural water use analysis, please see Section 20202-4.1.1 County of Kaua'i Important Agricultural Lands Study.

20202-5 RESOURCE AND FACILITY RECOMMENDATIONS

20202-5.1 Water Source Adequacy

20202-5.1.1 Full Build-Out

Development to the highest extent allowed by the General Plan and County Zoning within the Hanalei ASYA is sustainable, with General Plan and County Zoning full build-out water demands requiring 9 and 5 percent of the 35 mgd sustainable yield, respectively.

20202-5.1.2 Twenty-Year Projection

The 2035 water demand projection for the Hanalei ASYA is sustainable and is only 3 percent of the 35 mgd sustainable yield.

20202-5.2 Source Development Requirements

20202-5.2.1 Supply-Side Management

Supply-side management, including conventional water resource measures, water conservation, and alternative water resource measures, were evaluated to meet projected water demands.

Conventional Water Resource Measures

Ground Water

The Hanalei ASYA contains basal, perched, and high level ground water. Most reported pumpage is from the basal zone, followed by from the perched zone. There are no wells located at the high level.

The 2035 water demand projection for the Hanalei ASYA is only 3 percent of the 35 mgd sustainable yield. This indicates that theoretically, more water could be pumped from the aquifer without impairing the utility or quality of the water resource if wells are optimally placed and the proper due diligence with regard to traditional and customary rights and impacts has been completed. However, it is noted that sustainable yield does not consider the feasibility of developing the ground water resources, and that the safe yield of an individual production well may be limited by localized ground water behavior near the well as a result of pumpage. Water supply reliability and quality, feasibility, environmental and cultural impacts, and water rights shall be considered as projects and programs develop. More detailed and site-specific evaluation of these impacts shall be required and accomplished through the environmental review process (HRS Chapter 343) for source development projects and programs utilizing public funding, and CWRM could consider requiring compliance with the environmental review process for private source development projects and programs also. **Section 1.5.3.1** provides additional information regarding the protection of traditional and customary rights.

There are two public water systems in the Hanalei ASYA: Princeville Water System and DOW's Hanalei ASYA.

The Princeville Water System serves the Princeville, Kalihiwai, and ʻAnini Vista communities and is owned and operated by the Princeville Utilities Company, Inc. Its service area and ground water sources are located in the Hanalei ASYA and Kalihiwai ASYA. Further development of ground water sources to meet projected demands should be viable.

DOW's Hanalei Water System serves the lowland bay area of Hanalei. The DOW's Water Plan 2020 identified projects to meet demands of its service areas. For the Hanalei Water System, one new well (Hanalei Well) is proposed.

The DOW's Water Plan 2020 also identified potential storage and distribution system upgrades. Proposed improvements include construction of a new tank and replacement of several water mains along Weke, Anae, and Malolo Roads.

Surface Water

The Hanalei ASYA has 13 declared diversions. Until permanent instream flow standards are established, interim instream flow standards have been adopted. According to Section 13-169-46, Hawaiʻi Administrative Rules, "Interim Instream Flow Standard for all streams on Hawaiʻi, as adopted by the commission on water resource management on June 15, 1988, shall be that amount of water flowing in each stream on the effective date of this standard, and as that flow may naturally vary throughout the year and from year to year without further amounts of water being diverted offstream through new or expanded diversions, and under the stream conditions existing on the effective date of the standard, except as may be modified [by the commission]." Therefore, for the purposes of assessing surface water availability, it is assumed that no additional diversions will be allowed without amendment of the interim IFS.

The existing declared diversions have the potential to meet additional demands. However, a challenge with developing surface water is transmission of these resources from source to location of need. Farmers generally grow what is feasible for the area; therefore, it is anticipated that agricultural water use will follow the availability of irrigation water. Increase in the availability of surface water would likely promote additional usage and could thereby minimize ground water being used for irrigation.

There are a couple of small existing irrigation lines in the Hanalei ASYA, as shown on **Figure 20202-4**; however, there are no major irrigation systems.

Water Transfer

It may be possible to transfer surface water between ASYAs by utilizing existing irrigation systems. Water can also be transferred between ASYAs through the existing Princeville water system which services areas in the Kalihiwai ASYA and Hanalei ASYA. Two of the Princeville water system wells are in the Kalihiwai ASYA, and one well is located in the Hanalei ASYA.

Water Conservation

The per capita use in the Hanalei ASYA is approximately 97.9% higher than the overall County of Kauaʻi per capita use largely due to the high PPWS use in the Princeville resort area. There are no ASYA-specific conservation measures in place at this time; however, there are general water conservation programs that are described in **Section 1.5.7**. Water conservation, including water loss management, can increase the amount of water available and help to ensure the long-term viability of water resources.

Alternative Water Resource Measures

Rainwater Catchment

Rainwater can be utilized as a water resource in several ways.

Rainwater can be harvested in rainwater catchment systems which can be utilized to supply domestic potable water needs. These systems are viable in areas that receive abundant rainfall and are a suitable source of potable water for individual domestic users in areas outside the limits of municipal water systems. Generally, these are remote areas and are not expected to expand significantly because most development is anticipated to be concentrated within existing urban areas. Therefore, use of rainwater catchment systems is not anticipated to increase significantly.

Rainwater can also be used to supplement or satisfy agricultural non-potable water needs through ambient rainfall.

See the Storm Water Reuse section below to see how rainwater as storm water runoff can be reclaimed and reused.

Storm Water Reuse

Rainfall can turn into storm water runoff. Storm water runoff from impervious surfaces in urban areas can be significant. This water could be captured, treated, and used as a source of non-potable water (e.g., irrigation), integrated with recycled water, or even as potable and/or non-potable ground water recharge. However, due to the lack of storm water reuse standards, the high initial infrastructure costs, and the treatment requirements, storm water reclamation and reuse on a small or large scale may not be feasible and requires further assessment as noted in the Water Resource Protection Plan. The U.S. Department of the Interior, Bureau of Reclamation published An Appraisal of Stormwater Reclamation and Reuse Opportunities in Hawai‘i (Storm Water Report) in 2008 but did not identify any storm water reclamation and reuse opportunities in the Hanalei ASYA.

Recycled Water

Recycled water is a valuable resource; an increase in its use may lower the dependence on potable sources. The Princeville Wastewater Reclamation Facility (WWRF) is the only WWRF in the Hanalei ASYA, and it produces R-2 water. Comparing the current reuse amount to the design capacity of the facility, it appears that there is recycled water available to meet additional demands, see **Table 20202-17** below. However, the actual additional recycled water use is dependent on several factors, including the quantity of wastewater generated (which may be significantly less than the design capacity), the demand for recycled water, and the number of viable users within close proximity to the facility.

Table 20202-17: Wastewater Reclamation Facilities Available Capacity – Hanalei ASYA

WWRF/ WWTP	Reclaimed Water Classification	Design Capacity (mgd)	Quantity Produced (mgd)	Current Reuse Amount (mgd)	Available Capacity (mgd)
Princeville WWRF	R-2	1.5	0.6	0.53	0.97

Desalination

Desalination of brackish ground water is a potential alternative; however, due to its high capital and operational costs, it likely would not be considered when other potable water sources are available.

20202-5.2.2 Demand-Side Management

Development Density Control

The full build-out demand for the Hanalei ASYA based on County Zoning is 1.63 mgd which is 5 percent of the sustainable yield. This indicates that there are adequate water resources to sustain the level of development that is allowed by law. In the Hanalei ASYA, the average number of dwelling units allowed by County Zoning is 5.92 dwelling units per acre in residential districts and 12.37 dwelling units per acre in resort districts.

The full build-out demand for the Hanalei ASYA based on the General Plan is 3.04 mgd which is 9 percent of sustainable yield. Therefore, development density control may not be necessary. However, the County Planning Department could consider development density control for areas where there is the flexibility to do so, such as areas that are not yet zoned as residential or resort, and promote sustainable development. Further, it is noted that the full build-out scenario is unlikely to occur since it assumes all land is developed to the maximum extent.

20202-5.3 Recommended Alternatives

To optimize appropriate use of water resources, the quality of the water source should be matched to the quality of water required. The highest quality of water shall be reserved for the most valuable end use. Potable water is considered the highest quality water, and the sustenance of life is the most valuable end use. Recycled water, brackish water, untreated surface water, and other lower quality water sources should be used for landscaping and agriculture when available, thereby reserving potable water for human consumption. If there is a practical alternative water source available, that alternative source should be used in lieu of ground water or surface water. With this in mind, the following recommendations are made for the Hanalei ASYA:

Alternative Water Resources

Alternative water sources, such as recycled water generated from wastewater reclamation facilities, should be used where available to reduce demands on both ground and surface water resources and to conserve water resources as a whole. Recycled water is available from the Princeville WWRF; however, as discussed previously, successfully increasing the use of recycled water is dependent on several factors, including the number of viable users within close proximity to the facilities.

Conservation

Water resources are a finite resource that should be managed and used wisely. It should be conserved and not wasted. Implementation of conservation measures should continue to be encouraged.

Ground Water

Meeting future demands at a reasonable cost is a planning objective, and conventional sources, such as ground water, are typically the most cost-effective means for meeting projected water demands. Projected potable water needs are within the sustainable yield for this area. Therefore, ground water resources could continue to be used and developed to meet potable water needs now and into the future. However, as noted above, development of conventional water resource measures can have challenges, and water supply reliability and quality, feasibility, environmental and cultural impacts, and water rights shall be considered as projects and programs develop.

Development of ground water resources is the primary strategy to serve future potable demands in the Hanalei ASYA.

Surface Water

Surface water, where available, should be used to meet non-potable demands if alternative water resources are not available. To achieve this, it will be critical to maintain and improve existing irrigation systems. Making surface waters more readily available to meet non-potable water demands has the potential to minimize future dependence on the use of ground water. As mentioned previously, agriculture in the area is currently dependent on the use of ground water. It is therefore, recommended that the AWUDP provide information on the rehabilitation and maintenance needs of large irrigation systems.

Demand-Side Management

Full build-out demand based on the General Plan is 9 percent of sustainable yield. At this projection, implementation of development density control by the County Planning Department is not needed in this area. Although the projection is sustainable, the County Planning Department will need to consider potential impacts on available water resources when considering any future zoning modifications. Modifications that may result in increased development density within the area will increase demands on water resources.

Chapter 20203

Wainiha Aquifer System Area

CHAPTER 20203 - TABLE OF CONTENTS

FIGURES

TABLES

20203 WAINIHA AQUIFER SYSTEM AREA

20203-1 SYSTEM AREA PROFILE

20203-1.1 General

The Wainiha [20203] Aquifer System Area (ASYA) is roughly bound on the north by the Pacific ocean from about Hāʻena Point on the west to Makahoa Point on the east, from Makahoa Point proceeding along the east ridge above the Lumahaʻi River to the peak of Waiʻaleʻale along the east boundary, from Waiʻaleʻale though the ʻAlakai Swamp on the south, and proceeding back down to the ocean along the western ridge above Wainiha River along the western boundary.

Average annual rainfall ranges from 100 inches per year along the coast to 380 inches in the mountains. The sustainable yield is 24 mgd.

20203-1.2 Economy and Population

20203-1.2.1 Economy

The Wainiha ASYA, particularly in proximity to the shoreline, can be generally characterized as a rural residential area. A majority of lands located mauka (south) of Kūhiō Highway remains undeveloped.

Only a small percentage of lands within the Wainiha ASYA, primarily near the shoreline area, are currently in use for agriculture (grazing lands or cultivated land).

20203-1.2.2 Population

Most of the population within the Wainiha ASYA is concentrated along the areas close to the shoreline, north of Kūhiō Highway, in the Wainiha area. Historical population data for this ASYA is summarized in **Table 20203-1**. Population projections through the year 2035 are summarized in **Table 20203-2a**. As shown in **Table 20203-2b**, it is estimated that the area will continue to experience growth rates between 1 and 6 percent per decade.

Table 20203-1: Historical Population – Wainiha ASYA

	Year		
	1990	2000	2010
Population	602	673	815
Percent Change		11.70	21.15

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report. Data redistributed and evaluated for Wainiha ASYA.

Table 20203-2a: Population Projection – Wainiha ASYA

Growth Rate	Population by Year								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
A – Low	822	823	824	825	826	827	833	841	850
B – Med.	827	830	834	837	840	844	863	885	910
C – High	828	832	835	839	843	847	868	892	920

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report. Data redistributed and evaluated for Wainiha ASYA.

Table 20203-2b: Population Projection – Percent Change – Wainiha ASYA

Growth Rate	2015-2025 % Change	2025-2035 % Change
A – Low	1.3	2.0
B – Medium	4.3	5.4
C – High	4.8	6.0

20203-1.3 Land Use

20203-1.3.1 2000 Kaua'i General Plan

The 2000 Kaua'i County General Plan Land Use Designation Map for the Wainiha ASYA is shown on **Figure 20203-1**. The estimated land use allocation acreage for each land use designation within the system area is listed in **Table 20203-3**.

Table 20203-3: General Plan Estimated Land Use Allocation Acreage – Wainiha ASYA

General Plan Land Use Designation	Acreage	Percent of Total
Agricultural	0	0.0
Military	0	0.0
Open	24,667	99.1
Park	59	0.2
Residential Community	174	0.7
Resort	0	0.0
Transportation	0	0.0
Urban Center	0	0.0
DHHL	0	0.0
TOTAL	**24,900**	**100.0**

20203-1.3.2 Kaua'i Zoning

Kaua'i County Zoning Map for the Wainiha ASYA is shown on **Figure 20203-2**. The estimated land use allocation acreage for each zoning district within the system area is listed in **Table 20203-4**.

Table 20203-4: County Zoning Estimated District Allocation Acreage – Wainiha ASYA

Zoning District	Acreage	% of Total
Agriculture	835	3.3
Commercial – General	0	0.0
Commercial - Neighborhood	0	0.0
Conservation	24,003	94.5
Industrial – General	0	0.0
Industrial - Limited	0	0.0
Open	351	1.4
Residential	149	0.6
Resort	3	0.0
Project Development	0	0.0
Special Planning Area	0	0.0
Special Treatment	0	0.0
No Zoning	58	0.2
DHHL	0	0.0
TOTAL	**25,399**	**100.0**

The number of dwelling units allowed in residential and resort districts varies by the type of residential or resort district. The average number of dwelling units allowed in residential districts in the Wainiha ASYA is 2.49 dwelling units per acre. The average number of dwelling units allowed in resort districts in the Wainiha ASYA is 8.00 dwelling units per acre.

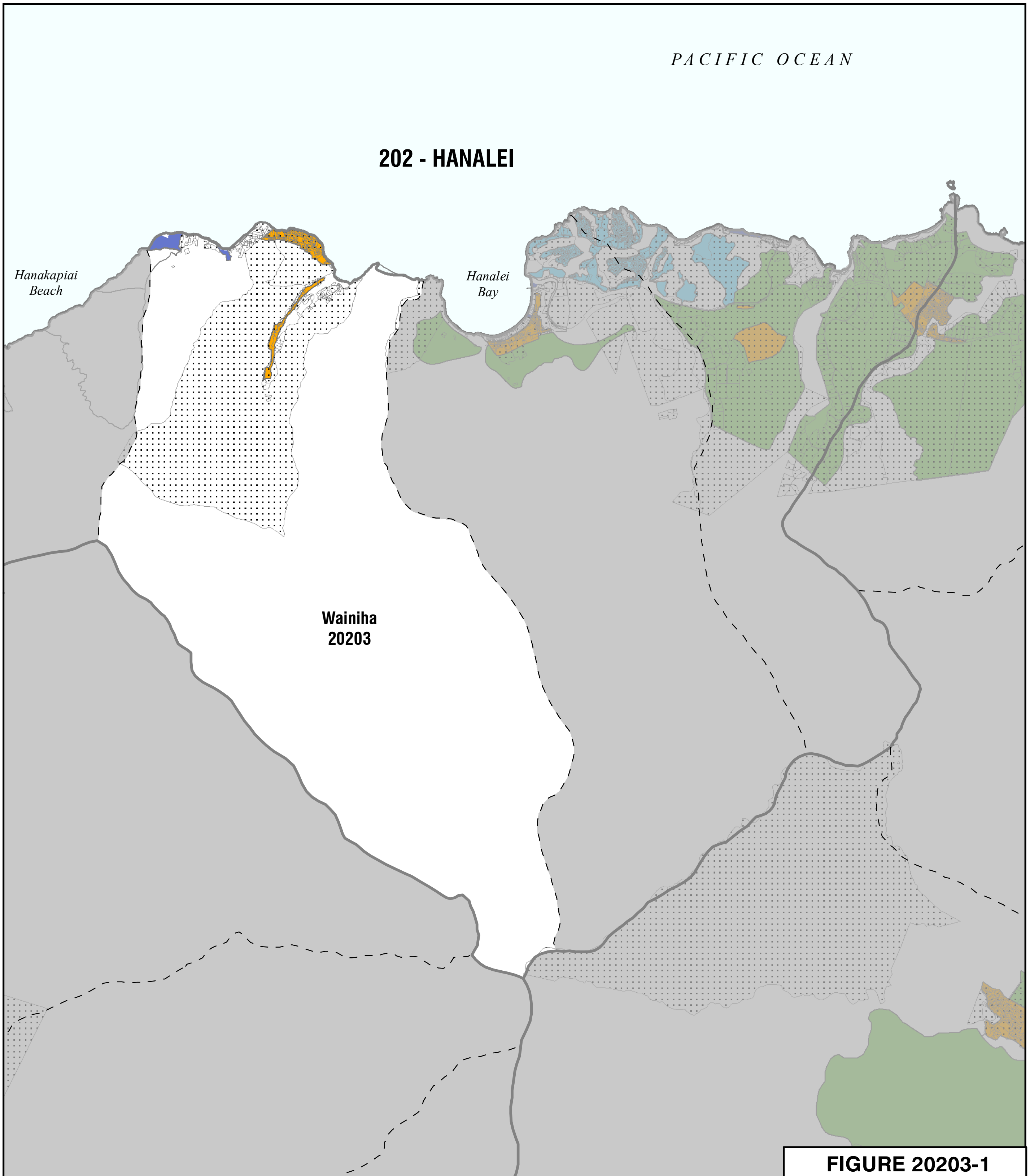
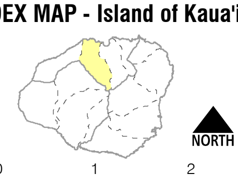


FIGURE 20203-1

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- Hawaiian Home Lands
- Developed Properties

Land Use Allocation Guide

- Agricultural
- Open
- Park
- Military
- Residential Community
- Resort
- Transportation
- Urban Center

GENERAL PLAN LAND USE MAP

Aquifer Sector: HANALEI - 202
Aquifer System:
WAINIHA - 20203

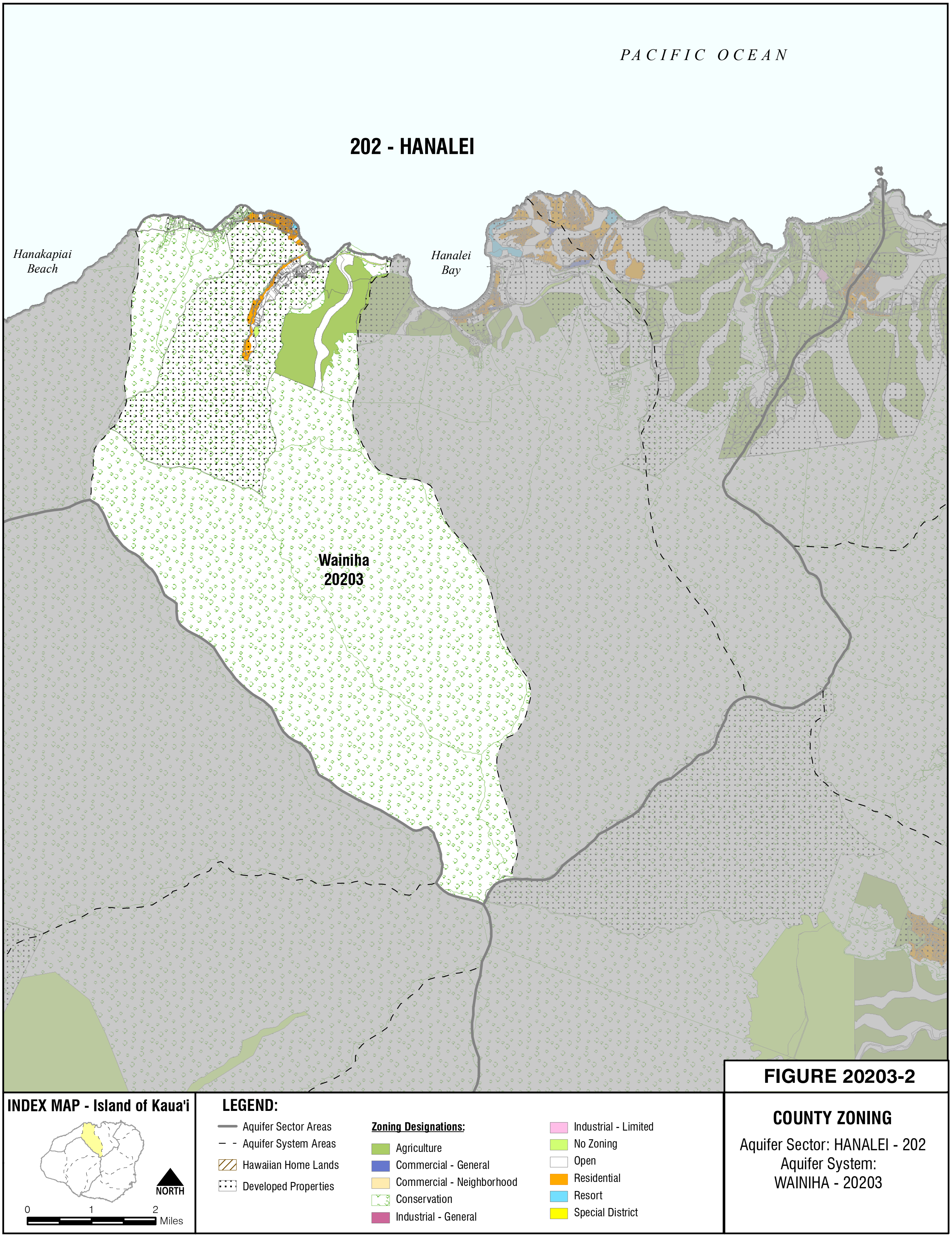


FIGURE 20203-2

COUNTY ZONING

Aquifer Sector: HANALEI - 202
Aquifer System:
WAINIHA - 20203

20203-2 EXISTING WATER RESOURCES

20203-2.1 Ground Water

The Wainiha ASYA has a sustainable yield of 24 mgd. According to the 2014 CWRM database, there are 4 production wells in the system, 3 municipal and 1 domestic well. Refer to **Appendix A** for this database. **Figure 20203-3** shows the well locations.

20203-2.2 Surface Water

There are 4 streams classified as perennial in the Wainiha ASYA, all of which are considered continuous. The perennial streams are Limahuli Stream, Mānoa Stream, Wainiha River, and Lumahaʻi River. The USGS has 1 active surface water gage in the system area. The gage is located on Wainiha River near Hanalei, which was previously listed in **Table 1-19**.

In accordance with the Code, the CWRM must establish and administer instream flow standards (IFS) on a stream-by-stream basis as necessary to protect public interests. IFS is defined as "a quantity or flow of water or depth of water which is required to be present at a specific location in a stream system at certain specified times of the year to protect fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses." Considerably more research and study need to be completed to accumulate the data and perspective necessary to conduct a thorough and meaningful assessment of IFS. Until permanent IFS are established, interim IFS have been adopted. The interim IFS are defined as the amount of water flowing in each stream at the time the administrative rules governing them were adopted in 1988 and 1989. In order to assess surface water sustainability, this KWUDP assumes that no additional diversions will be allowed from any stream without amendment of the interim IFS.

There are 37 declared stream diversions in the CWRM database shown on **Figure 20203-4**, which accounts for 13 percent of the 292 declared stream diversions on the island. The declared stream diversions are listed in **Appendix B**. The total declared flow for the Wainiha ASYA is 0.65 mgd.

20203-2.3 Water Conservation

Water conservation increases the amount of water available and helps to ensure the long-term viability of water resources. Water conservation measures for this ASYA are as described in **Section 1.5.7** of this report. There are no ASYA specific special conservation measures in place at this time.

20203-2.4 Rainwater Catchment

Rainwater catchment is a viable resource for areas that are not served by ground water or surface water. **Figure 20203-5** shows the possible catchment areas, or parcels with a building value greater than $20,000 and assumed to be developed but without a ground water or surface water source.

20203-2.5 Recycled Water

There are no wastewater reclamation facilities in the Wainiha ASYA.

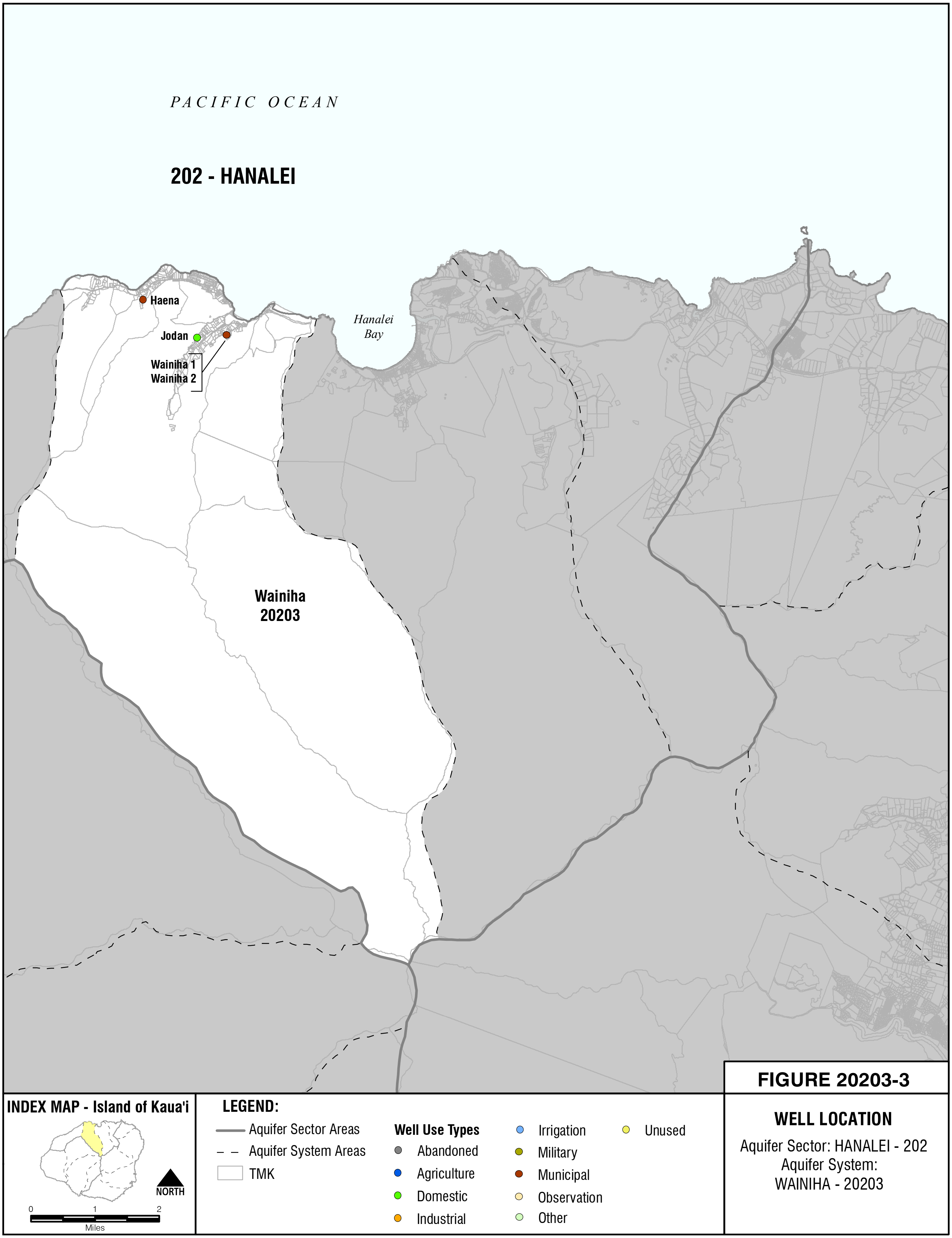


FIGURE 20203-3

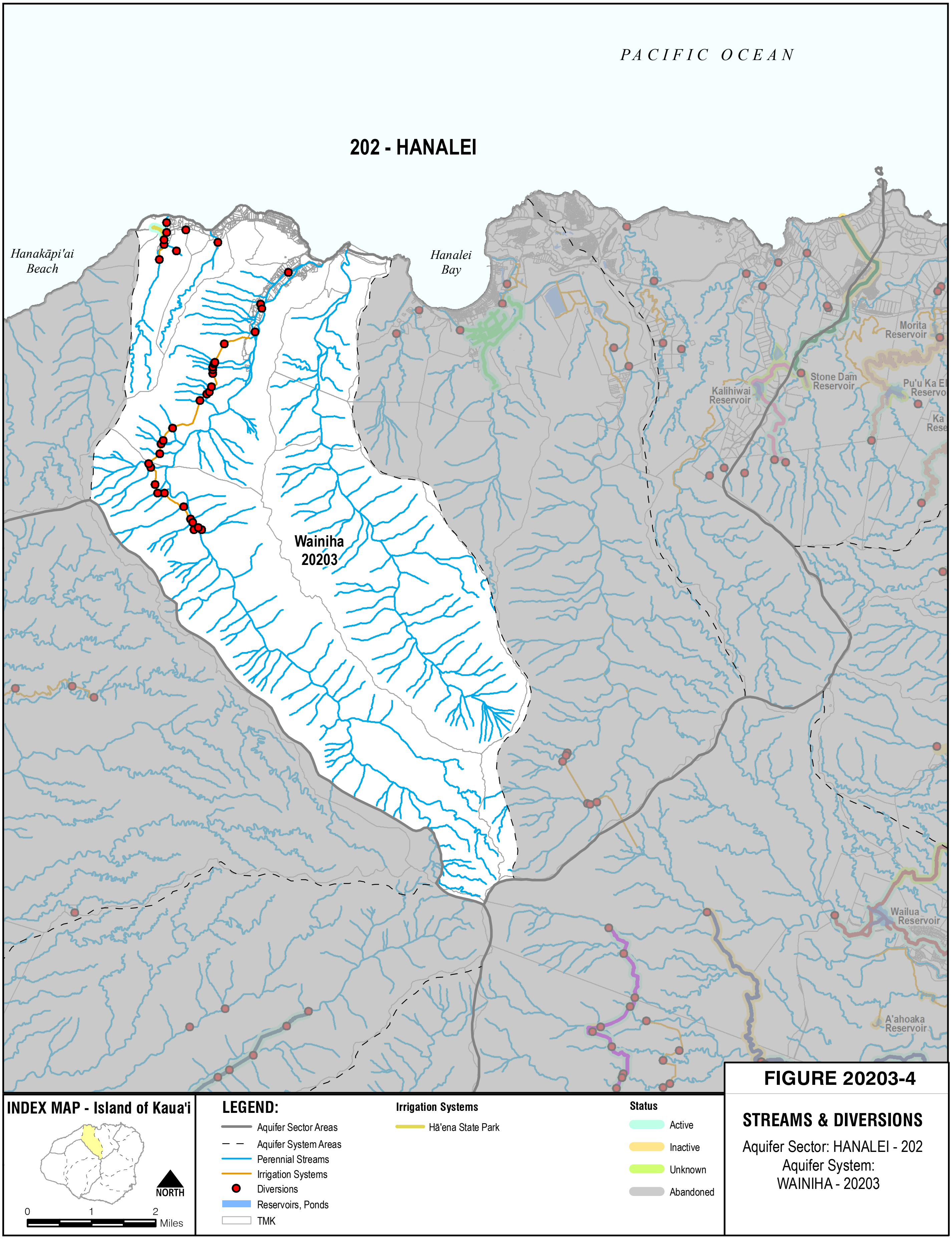
WELL LOCATION

Aquifer Sector: HANALEI - 202
Aquifer System:
WAINIHA - 20203

Fukunaga & Associates, Inc.
Consulting Engineers

Kaua'i County - Department of Water

KAUA'I WATER USE AND DEVELOPMENT PLAN UPDATE



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- Perennial Streams
- Irrigation Systems
- Diversions
- Reservoirs, Ponds
- TMK

Irrigation Systems

- Hā'ena State Park

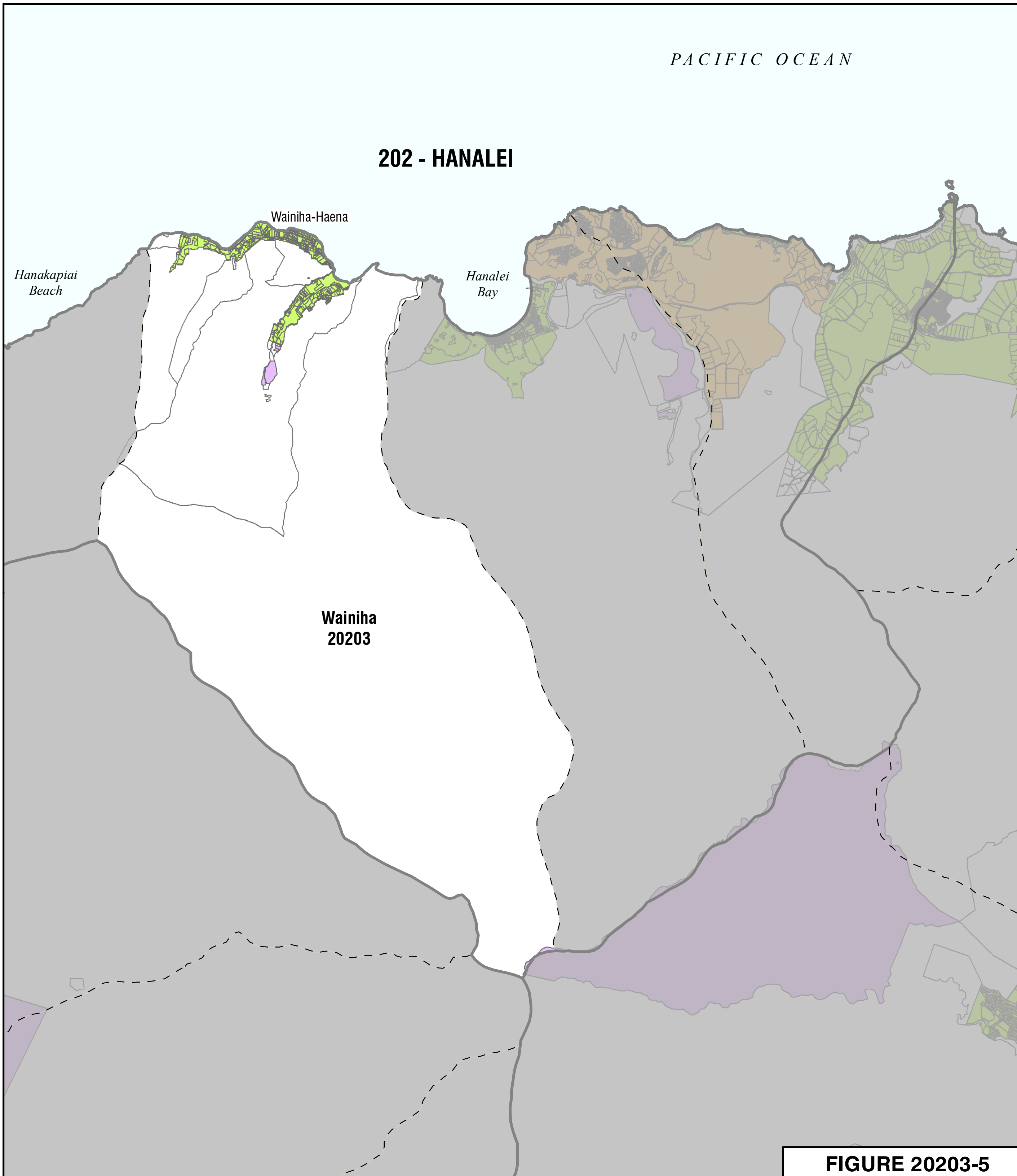
Status

- Active
- Inactive
- Unknown
- Abandoned

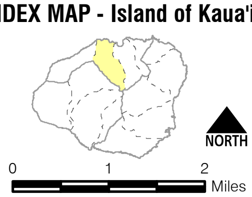
FIGURE 20203-4

STREAMS & DIVERSIONS

Aquifer Sector: HANALEI - 202
Aquifer System:
WAINIHA - 20203



INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- DOW Service Area
- Private Water System
- State Water System
- Federal Water System
- Possible Catchment Area (Building Value > $20,000)

FIGURE 20203-5

WATER SYSTEM & SERVICE AREA

Aquifer Sector: HANALEI - 202
Aquifer System: WAINIHA - 20203

Fukunaga & Associates, Inc.
Consulting Engineers

Kaua'i County - Department of Water

KAUA'I WATER USE AND DEVELOPMENT PLAN UPDATE

20203-3 EXISTING WATER USE

20203-3.1 General

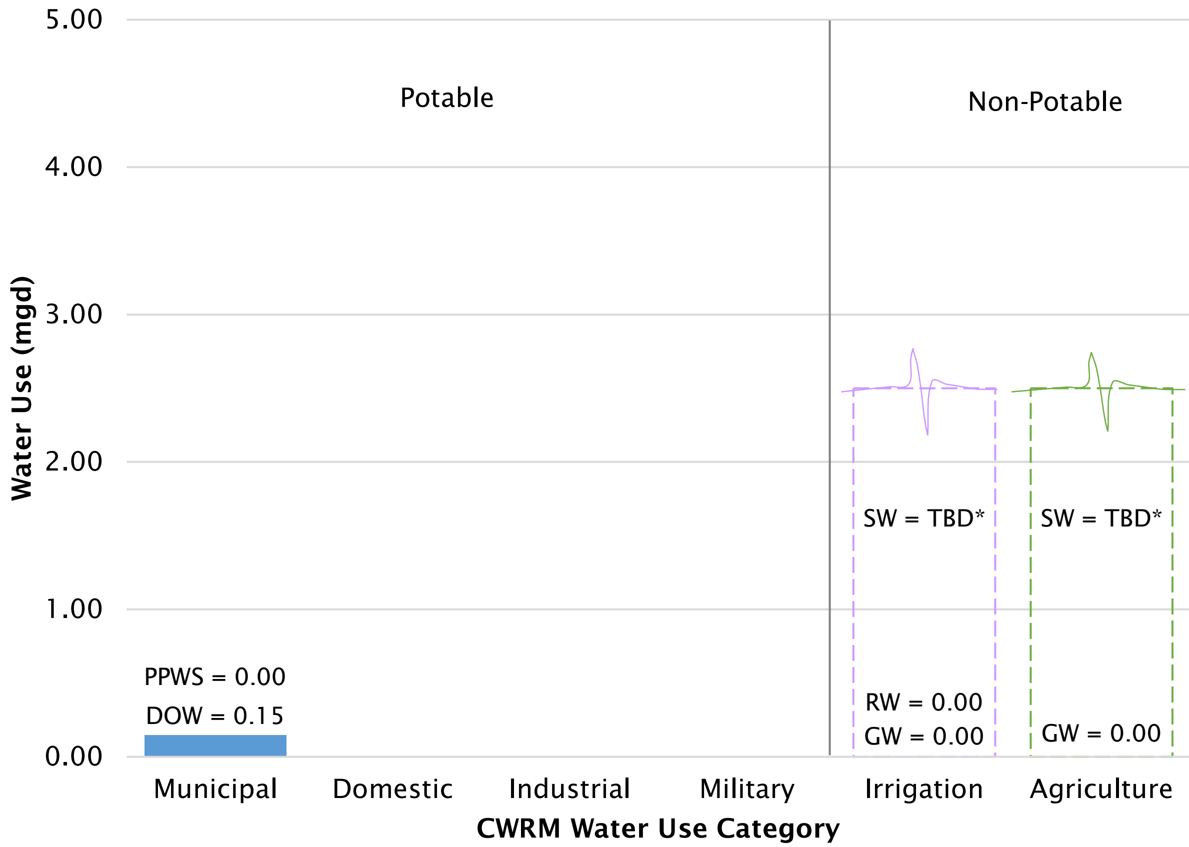
The following section presents the total estimated average water use within the Wainiha ASYA. The total estimated average water use was based on data from CWRM (well pumpage) and DOH (Sanitary Surveys for Public Water Systems and estimated recycled water usage) for the year of 2014. Well classification changes since 2014 are noted in the sub-sections below. **Table 20203-5** and **Figure 20203-6** summarize the water use in accordance with CWRM categories.

Table 20203-5: Existing Water Use by Category – Wainiha ASYA

CWRM Category	Ground Water (mgd)	Other Sources (mgd)	Total (mgd)	Percent of Total
Domestic	0.00		0.00	0.0
Industrial			0.00	0.0
Irrigation			0.00	0.0
Agriculture		TBD[1]	0.00	0.0
Military			0.00	0.0
Municipal				
DOW System	0.15		0.15	100.0
Private-Public WS			0.00	0.0
TOTAL	**0.15**		**0.15**	**100.0**

[1] Surface Water – TBD from AWUDP

Figure 20203-6: Existing Water Use by Category – Wainiha ASYA



*Values to be determined by other components of the Hawai'i Water Plan

20203-3.2 Domestic Use

There is 1 well classified as "Domestic" in the 2014 CWRM database; however, it has not reported pumpage.

One additional "Domestic" well was added to the 2017 CWRM database, increasing the "Domestic" well total to 2 wells. This well was drilled in 2016 to serve a private landowner.

20203-3.3 Industrial Use

There are no wells classified as "Industrial" in the Wainiha ASYA.

The Wainiha Hydropower plant was built by McBryde Sugar Company in 1906 and produces 3.7 MW of power. McBryde's plantation in Hanapēpē did not have access to sufficient surface water to irrigate its sugarcane fields so it developed ground water sources and storage reservoirs. In order to economically pump the water from the wells to the storage reservoirs and sugarcane fields, the Wainiha Hydropower plant was built, utilizing the Wainiha River. Together with Kalāheo Hydropower plant (discussed in **Section 20101**), the electricity generated powers the Kaua'i Coffee factory, visitor center, and offices in Numila. The hydropower plant is now owned and operated by

Kaua'i Coffee Company, Inc. Excess electricity is sold to the Kaua'i Island Utility Cooperative (KIUC).

20203-3.4 Irrigation Use

Irrigation use has been divided into ground water, recycled water, and surface water.

20203-3.4.1 Ground Water

There is no irrigation water use in the Wainiha ASYA.

20203-3.4.2 Recycled Water

There is no recycled water use in the Wainiha ASYA.

20203-3.4.3 Surface Water

Information on surface water use for irrigation is to be determined by the AWUDP. However, typically, due to the location of parks and other landscaped areas within communities, it is assumed that it is unlikely for landscaping to be irrigated with surface water.

20203-3.5 Agricultural Use

Agricultural use has been divided into ground water, recycled water, and surface water.

20203-3.5.1 Ground Water

There are no wells classified as "Agriculture" in the Wainiha ASYA.

20203-3.5.2 Recycled Water

There is no recycled water use in the Wainiha ASYA.

20203-3.5.3 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP.

20203-3.6 Military Use

There is no military water use in the Wainiha ASYA.

20203-3.7 Municipal Use

There are 3 wells in the CWRM database classified as "Municipal" (MUNCO – Municipal County). Municipal can be subcategorized into the other water use categories: Domestic, Industrial, Agricultural, Military, and Municipal.

20203-3.7.1 County Water Systems

Hāʻena-Wainiha Water System

The DOW has one major water system that serves the Wainiha ASYA. The Hāʻena-Wainiha water system is DOH Public Water System (PWS) No. 415 and spans the Wainiha ASYA. This water system serves 1,180 people in Wainiha Valley and the Hāʻena community through 357 service connections. Water for this system is supplied by 3 wells. **Table 20203-6** lists the water sources, well number, pumping capacity, pressure zone, and pumpage amount.

Table 20203-6: DOW Hāʻena-Wainiha Water System Water Sources

WELL NAME	WELL NUMBER	PUMPING CAPACITY (gpm)	PRESSURE ZONE (ft)	PUMPAGE (mgd)
Wainiha Well #1	2-1232-001	25	224	0.01
Wainiha Well #2	2-1232-002	250	144	0.08
Hāʻena Well	2-1333-001	150	144	0.06

There are 2 primary pressure zones (144 feet, 224 feet) and 2 storage tanks in the Hāʻena-Wainiha water system.

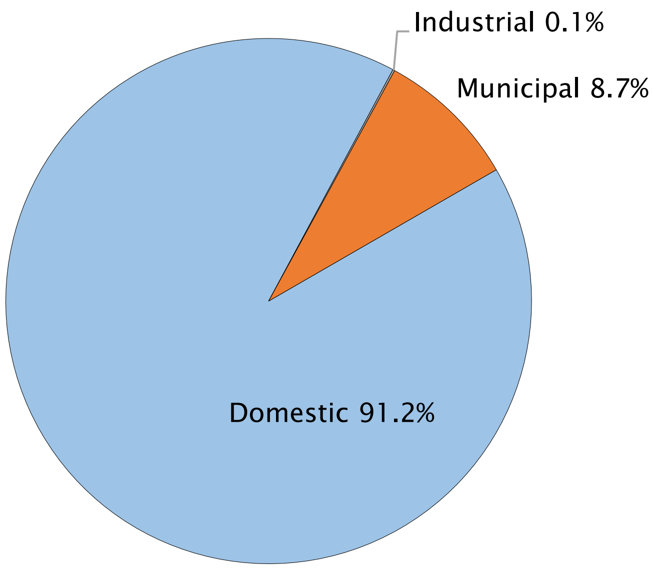
DOW Water Use by Category

DOW water use is subcategorized in **Table 20203-7** to the extent possible based on available meter data and is depicted in **Figure 20203-7**.

Table 20203-7: DOW Existing Water Use by Category – Wainiha ASYA

CWRM Water Use Category	DOW Metered Water Use (mgd)	Percent of Total
Agricultural	0.0000	0.0
Domestic	0.1360	91.2
Industrial	0.0002	0.1
Military	0.0000	0.0
Municipal	0.0130	8.7
Total	**0.1492**	**100.0**

Figure 20203-7: DOW Existing Water Use by Category – Wainiha ASYA



20203-3.7.2 State Water Systems

There are no State water systems in the Wainiha ASYA regulated by the DOH.

20203-3.7.3 Federal Water Systems

There are no Federal water systems in the Wainiha ASYA regulated by the DOH.

20203-3.7.4 Private-Public Water Systems

There are no private-public water systems in the Wainiha ASYA regulated by the DOH.

20203-3.7.5 Per Capita Use

The per capita existing water use consumption based on domestic DOW metered water use and private-public water system use is presented in **Table 20203-8**. The per capita use in the Wainiha ASYA is approximately 5.1% lower than the overall County of Kaua‘i per capita use.

Table 20203-8: Per Capita Use – Wainiha ASYA

	DOW Metered Water Use – Domestic (mgd)	Private-Public Water System (mgd)	90% of 2015 Population	Per Capita Use (gpd)
Wainiha ASYA	0.136	0	744	184
County of Kaua‘i	**9.360**	**2.951**	**63,462**	**194**

20203-3.8 Existing Water Use by Resource

20203-3.8.1 Ground Water

Table 20203-9 summarizes the current production, sustainable yield (SY), and percentage of SY for the current production. Current production is represented by the 2014 average yield calculated from the actual pumping data.

Table 20203-9: Pumpage – Wainiha ASYA

Pumpage (mgd)	SY (mgd)	Pumpage Portion of SY
0.15	24	0.6%

Based on available information from the CWRM database, the current ground water use is 0.6 percent of the sustainable yield.

20203-3.8.2 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP.

20203-3.8.3 Water Conservation

Water conservation, including water loss management, may reduce water use. See **Section 20203-2.3** for discussion of existing conservation efforts.

20203-3.8.4 Rainwater Catchment

Developed parcels that are not supplied by ground water or surface water are assumed to be supplied by rainwater catchment.

20203-3.8.5 Recycled Water

There is no recycled water use in the Wainiha ASYA.

20203-4 FUTURE WATER USE

20203-4.1 Full Build-Out Water Demand Projections

The full build-out water demand projections based on the General Plan and County Zoning for the Wainiha ASYA is listed in **Table 20203-10** and **20203-11**, respectively. Each land use class is associated with the most appropriate CWRM water use category.

Table 20203-10: General Plan Full Build-Out Water Demand Projection – Wainiha ASYA

General Plan Category	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	0.08
Open	Domestic	0.01
Military	Military	0.00
Park	Irrigation	0.23
Residential	Domestic/Municipal	0.22
Resort	Domestic/Irrigation/Municipal	0.00
Transportation	Municipal	0.00
Urban Center	Domestic/Industrial/Municipal	0.00
DHHL	Domestic	0.00
	TOTAL	**0.54**

Table 20203-11: Zoning Full Build-Out Water Demand Projection – Wainiha ASYA

Zoning Class	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	0.08
Commercial	Municipal	0.00
Industrial	Industrial/Municipal	0.00
Open	Domestic	0.01
Residential	Domestic/Municipal	0.18
Resort	Domestic/Irrigation/Municipal	0.02
DHHL	Domestic	0.00
	TOTAL	**0.29**

20203-4.1.1 Refined Land Use Based Water Projection

State Water Projects Plan

There are no future State water projects through the year 2034 within the Wainiha ASYA according to the 2021 SWPP Update.

State Department of Hawaiian Home Lands

There are no DHHL tracts in the Wainiha ASYA.

Agricultural Water Use and Development Plan

The AWUDP dated 2003 (revised 2004) was limited in scope. More recent, comprehensive information on agricultural lands is available in the County of Kaua'i Important Agricultural Lands (IAL) Study.

In 2019, a public review draft of the AWUDP was released and it is anticipated that the next phase of the AWUDP will provide agricultural water demand projections in greater detail and will supersede information in the KWUDP when it becomes available.

County of Kaua'i Important Agricultural Lands Study

57 acres of agricultural lands within the Wainiha ASYA received a score of 28 or better in the County of Kaua'i Important Agricultural Lands (IAL) Study. Lands that receive a score of 28 or better were determined to have met all eight IAL criteria to some degree. Only a subset of lands with a score of 28 or better is expected to be designated as IALs. **Table 20203-12** compares these lands that received a score of 28 or better to the declared surface water use from diversions and to the diversified water use rate of 3,400 gallons per acre per day (gpad) estimated in the 2004 AWUDP.

Table 20203-12: Irrigation of Agricultural Lands

(1) Declared Surface Water Use from Diversions (mgd)	0.65
(2) Agricultural Lands with a Score ≥ 28 (Acres)	57
- How many acres can be sustained by **(1)** at a water rate of 3,400 gpad? (Acres)	191
- What percent of **(2)** can be sustained with a water rate of 3,400 gpad?	338%
- If all of **(2)** were to be irrigated, what is the water unit rate? (gpad)	11,490

20203-4.1.2 Water Use Unit Rates

Water use unit rates are based on the *Water System Standards* (WSS), as discussed in Chapter 2.

The General Plan provides only broad density guidelines for residential and resort designations. For these designations, under the assumption that most residents would like their communities, including the development density, to remain similar in the future, the average number of dwelling units as allowed by zoning was used as the density (i.e., 2.49 dwelling units per acre for residential designation and 8.00 dwelling units per acre for resort designation).

20203-4.2 Water Demand Projections to the Year 2035

The following section presents water demand projections to the year 2035 for the Wainiha ASYA. The projected low, medium, and high growth rates are listed in **Table 20203-13** and are graphed in **Figure 20203-8**. Potable (domestic, industrial, municipal, and military water uses) and non-potable (irrigation) water demands are also differentiated.

Table 20203-13: Water Demand Projection – Wainiha ASYA

Water Use Category	Water Demand by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
GROWTH RATE C (HIGH)									
TOTAL	**0.15**	**0.15**	**0.15**	**0.15**	**0.15**	**0.15**	**0.16**	**0.16**	**0.17**
Potable	0.15	0.15	0.15	0.15	0.15	0.15	0.16	0.16	0.17
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GROWTH RATE B (MEDIUM)									
TOTAL	**0.15**	**0.15**	**0.15**	**0.15**	**0.15**	**0.15**	**0.16**	**0.16**	**0.16**
Potable	0.15	0.15	0.15	0.15	0.15	0.15	0.16	0.16	0.16
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GROWTH RATE A (LOW)									
TOTAL	**0.15**	**0.15**	**0.15**	**0.15**	**0.15**	**0.15**	**0.15**	**0.15**	**0.15**
Potable	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figure 20203-8: Water Demand Projection Summary – Wainiha ASYA

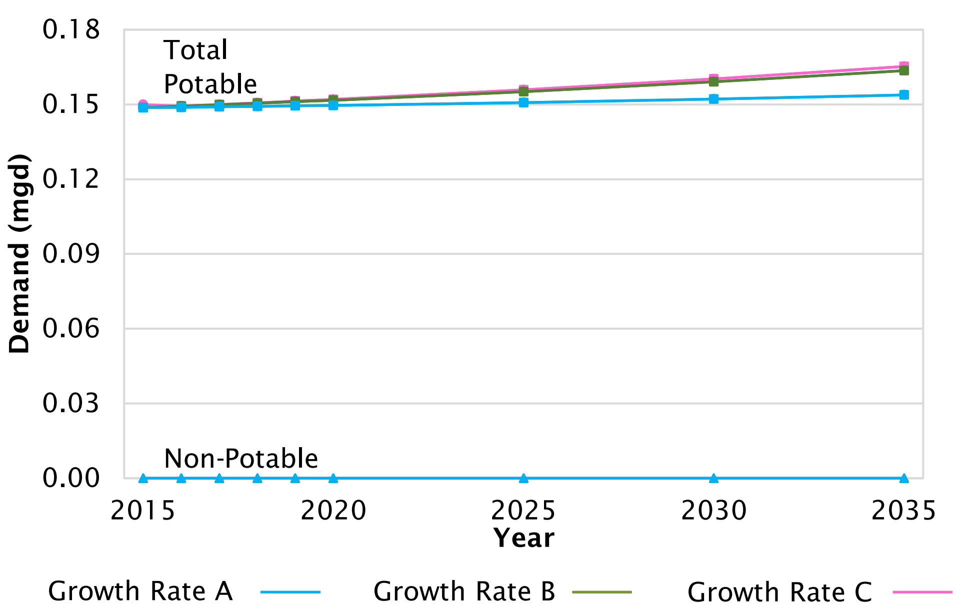


Figure 20203-9 shows the breakdown of water demand projections for a medium growth rate by CWRM categories through the year 2035. **Table 20203-14** summarizes this figure.

Figure 20203-9: Medium Growth Rate B Water Demand Projection by Category – Wainiha ASYA

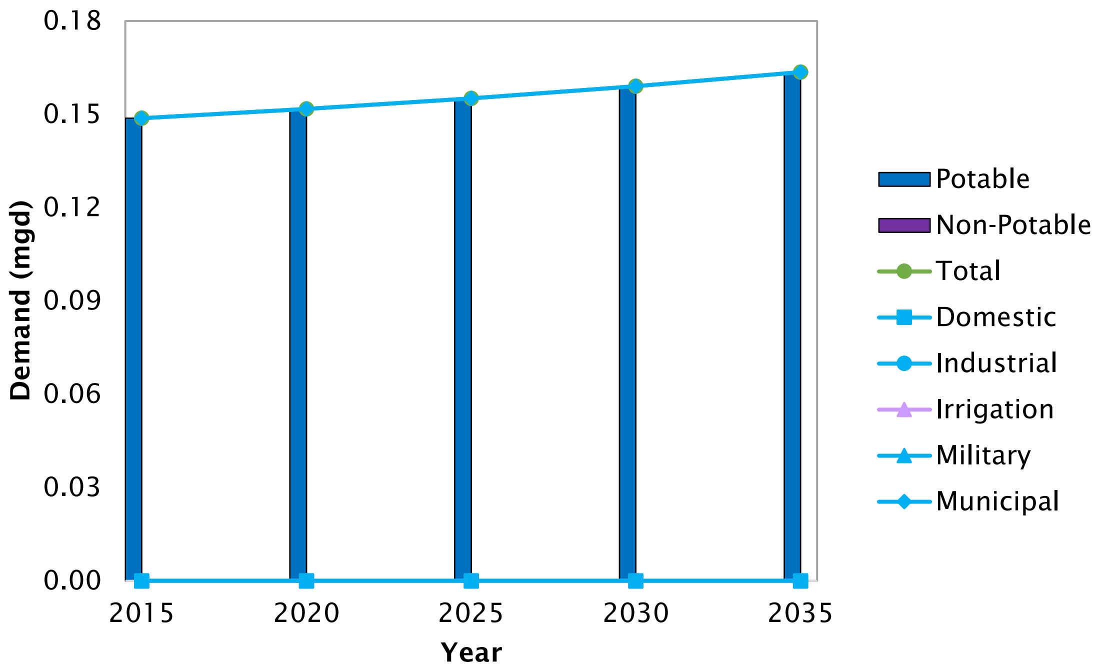


Table 20203-14: Medium Growth Rate B Water Demand Projection by Category – Wainiha ASYA

Water Use Category	Water Use by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
Total	**0.15**	**0.15**	**0.15**	**0.15**	**0.15**	**0.15**	**0.16**	**0.16**	**0.16**
Potable	0.15	0.15	0.15	0.15	0.15	0.15	0.16	0.16	0.16
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Domestic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Irrigation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Military	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Municipal	0.15	0.15	0.15	0.15	0.15	0.15	0.16	0.16	0.16
DOW	0.15	0.15	0.15	0.15	0.15	0.15	0.16	0.16	0.16

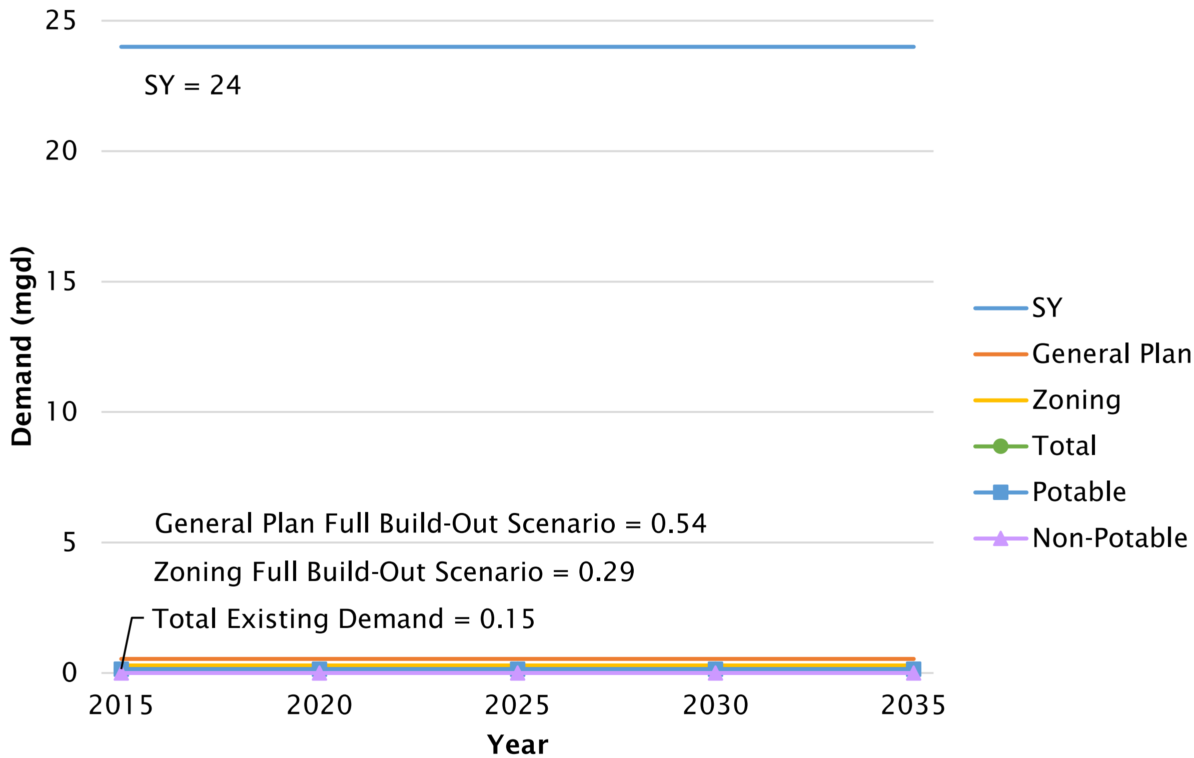
20203-4.3 Summary

Figure 20203-10 illustrates the magnitude of the sustainable yield, both General Plan and Zoning full build-out water use projections, and water use projection through the year 2035 focusing on Medium Growth Rate B. **Table 20203-15** summarizes the General Plan, Zoning, and 20-year water demand projection scenarios for the Wainiha ASYA. The sustainable yield is presented to draw comparisons. All demands are in mgd.

Table 20203-15: Summary of Demand Projections

SY (mgd)	FBO (mgd)		Medium Growth Rate Demand by Year (mgd)								
	GP	Zoning	2015	2016	2017	2018	2019	2020	2025	2030	2035
24	0.54	0.29	0.15	0.15	0.15	0.15	0.15	0.15	0.16	0.16	0.16

Figure 20203-10: Medium Growth Rate B Water Demand Projections and Full Build-Out – Wainiha ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use. For future agricultural water use analysis, please see Section 20203-4.1.1 County of Kaua'i Important Agricultural Lands Study.

20203-5 RESOURCE AND FACILITY RECOMMENDATIONS

20203-5.1 Water Source Adequacy

20203-5.1.1 Full Build-Out

Development to the highest extent allowed by the General Plan and County Zoning within the Wainiha ASYA is sustainable, with General Plan and County Zoning full build-out water demands requiring 2 and 1 percent of the 24 mgd sustainable yield, respectively.

20203-5.1.2 Twenty-Year Projection

The 2035 water demand projection for the Wainiha ASYA is sustainable and is only 0.6 percent of the 24 mgd sustainable yield.

20203-5.2 Source Development Requirements

20203-5.2.1 Supply-Side Management

Supply-side management, including conventional water resource measures, water conservation, and alternative water resource measures, were evaluated to meet projected water demands.

Conventional Water Resource Measures

Ground Water

The Wainiha ASYA contains basal and high level ground water. All reported pumpage is from the basal zone.

The 2035 water demand projection for the Wainiha ASYA is only 0.6 percent of the 24 mgd sustainable yield. This indicates that theoretically, more water could be pumped from the aquifer without impairing the utility or quality of the water resource if wells are optimally placed and the proper due diligence with regard to traditional and customary rights and impacts has been completed. However, it is noted that sustainable yield does not consider the feasibility of developing the ground water resources, and that the safe yield of an individual production well may be limited by localized ground water behavior near the well as a result of pumpage. Water supply reliability and quality, feasibility, environmental and cultural impacts, and water rights shall be considered as projects and programs develop. More detailed and site-specific evaluation of these impacts shall be required and accomplished through the environmental review process (HRS Chapter 343) for source development projects and programs utilizing public funding, and CWRM could consider requiring compliance with the environmental review process for private source development projects and programs also. **Section 1.5.3.1** provides additional information regarding the protection of traditional and customary rights.

The DOW's Hāʻena-Wainiha water system is the only public water system in the Wainiha ASYA. The DOW's Water Plan 2020 identified projects to meet future demands of its service areas. For the Hāʻena-Wainiha water system, one new well (Wainiha Well No. 4) is proposed.

The DOW's Water Plan 2020 also identified potential storage and distribution system upgrades. Proposed improvements include construction of a new tank and replacement mainlines along Wainiha Powerhouse Road and along Kūhiō Highway in west Hā'ena.

Surface Water

The Wainiha ASYA has 37 declared diversions. Until permanent instream flow standards are established, interim instream flow standards have been adopted. According to Section 13-169-46, Hawai'i Administrative Rules, "Interim Instream Flow Standard for all streams on Hawai'i, as adopted by the commission on water resource management on June 15, 1988, shall be that amount of water flowing in each stream on the effective date of this standard, and as that flow may naturally vary throughout the year and from year to year without further amounts of water being diverted off-stream through new or expanded diversions, and under the stream conditions existing on the effective date of the standard, except as may be modified [by the commission]." Therefore, for the purposes of assessing surface water availability, it is assumed that no additional diversions will be allowed without amendment of the interim IFS.

The existing declared diversions have the potential to meet additional demands. However, a challenge with developing surface water is transmission of these resources from source to location of need. Farmers generally grow what is feasible for the area; therefore, it is anticipated that agricultural water use will follow the availability of irrigation water. Increase in the availability of surface water would likely promote additional usage and could thereby minimize ground water being used for irrigation.

There are a couple of small existing irrigation lines in the Wainiha ASYA, as shown on **Figure 20203-4**, but there are no major irrigation systems.

Water Transfer

There is no apparent existing infrastructure to transfer water into or out of the Wainiha ASYA. It is unlikely that constructing infrastructure to transfer water into or out of the Wainiha ASYA will be necessary to meet the projected demands of the Wainiha ASYA or the adjacent ASYAs.

Water Conservation

The per capita use in the Wainiha ASYA is approximately 5.1% lower than the overall County of Kaua'i per capita use There are no ASYA-specific conservation measures in place at this time; however, there are general water conservation programs that are described in **Section 1.5.7**. Water conservation, including water loss management, can increase the amount of water available and help to ensure the long-term viability of water resources.

Alternative Water Resource Measures

Rainwater Catchment

Rainwater can be utilized as a water resource in several ways.

Rainwater can be harvested in rainwater catchment systems which can be utilized to supply domestic potable water needs. These systems are viable in areas that receive abundant rainfall and are a suitable source of potable water for individual domestic users in areas outside the limits of municipal water systems. Generally, these are remote areas and are not expected to expand significantly because most development is anticipated to be concentrated within existing urban areas. Therefore, use of rainwater catchment systems is not anticipated to increase significantly.

Rainwater can also be used to supplement or satisfy agricultural non-potable water needs through ambient rainfall.

See the Storm Water Reuse section below to see how rainwater as storm water runoff can be reclaimed and reused.

Storm Water Reuse

Rainfall can turn into storm water runoff. Storm water runoff from impervious surfaces in urban areas can be significant. This water could be captured, treated, and used as a source of non-potable water (e.g., irrigation), integrated with recycled water, or even as potable and/or non-potable ground water recharge. However, due to the lack of storm water reuse standards, the high initial infrastructure costs, and the treatment requirements, storm water reclamation and reuse on a small or large scale may not be feasible and requires further assessment as noted in the Water Resource Protection Plan. The U.S. Department of the Interior, Bureau of Reclamation published An Appraisal of Stormwater Reclamation and Reuse Opportunities in Hawai‘i (Storm Water Report) in 2008 but did not identify any storm water reclamation and reuse opportunities in the Wainiha ASYA.

Recycled Water

Recycled water is a valuable resource; an increase in its use may lower the dependence on potable sources. However, there are no wastewater reclamation facilities (WWRFs) in the Wainiha ASYA.

Desalination

Desalination of brackish ground water is a potential alternative; however, due to its high capital and operational costs, it likely would not be considered when other potable water sources are available.

20203-5.2.2 Demand-Side Management

Development Density Control

The full build-out demand for the Wainiha ASYA based on County Zoning is 0.29 mgd which is 1 percent of the sustainable yield. This indicates that there are adequate water resources to sustain the level of development that is allowed by law. In the Wainiha ASYA, the average number of dwelling units allowed by County Zoning is 2.49 dwelling units per acre in residential districts and 8.00 dwelling units per acre in resort districts.

The full build-out demand for the Wainiha ASYA based on the General Plan is 0.54 mgd which is 2 percent of sustainable yield. Therefore, development density control may not be necessary.

However, the County Planning Department could consider development density control for areas where there is the flexibility to do so, such as areas that are not yet zoned as residential or resort, and promote sustainable development. Further, it is noted that the full build-out scenario is unlikely to occur since it assumes all land is developed to the maximum extent.

20203-5.3 Recommended Alternatives

To optimize appropriate use of water resources, the quality of the water source should be matched to the quality of water required. The highest quality of water shall be reserved for the most valuable end use. Potable water is considered the highest quality water, and the sustenance of life is the most valuable end use. Recycled water, brackish water, untreated surface water, and other lower quality water sources should be used for landscaping and agriculture when available, thereby reserving potable water for human consumption. If there is a practical alternative water source available, that alternative source should be used in lieu of ground water or surface water. With this in mind, the following recommendations are made for the Wainiha ASYA:

Alternative Water Resources

Use of alternative water sources can reduce demands on both ground and surface water resources and conserve water resources as a whole. However, aside from rainwater, there are no available alternative water sources in the area. Alternative water sources are unlikely to be developed when other water resources are readily available.

Conservation

Water resources are a finite resource that should be managed and used wisely. It should be conserved and not wasted. Implementation of conservation measures should continue to be encouraged.

Ground Water

Meeting future demands at a reasonable cost is a planning objective, and conventional sources, such as ground water, are typically the most cost-effective means for meeting projected water demands. Projected potable water needs are within the sustainable yield for this area. Therefore, ground water resources could continue to be used and developed to meet potable water needs now and into the future. However, as noted above, development of conventional water resource measures can have challenges, and water supply reliability and quality, feasibility, environmental and cultural impacts, and water rights shall be considered as projects and programs develop.

Development of ground water resources is the primary strategy to serve future potable demands in the Wainiha ASYA.

Surface Water

Surface water, where available, should be used to meet non-potable demands if alternative water resources are not available. To achieve this, it will be critical to maintain and improve existing irrigation systems. Making surface waters more readily available to meet non-potable water demands has the potential to minimize future dependence on the use of ground water. It is therefore recommended that the AWUDP provide information on the rehabilitation and maintenance needs or large irrigation systems.

Demand-Side Management

Full build-out demand based on the General Plan is 2 percent of sustainable yield. At this projection, implementation of development density control by the County Planning Department is not needed in this area. Although the projection is sustainable, the County Planning Department will need to consider potential impacts on available water resources when considering any future zoning modifications. Modifications that may result in increased development density within the area will increase demands on water resources.

Chapter 20204

Nāpali Aquifer System Area

CHAPTER 20204 - TABLE OF CONTENTS

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20204 NĀPALI AQUIFER SYSTEM AREA

20204-1 SYSTEM AREA PROFILE

20204-1.1 General

The Nāpali [20204] Aquifer System Area (ASYA) is roughly bound on the north and west by the Pacific Ocean from about Kaʻīlio Point to about Hāʻeleʻele Valley, along the south by the south ridge above Hāʻeleʻele Valley until it meets up with Kōkeʻe Road, and along the east roughly following Kōkeʻe Road and back to Kaʻīlio Point. Except for residential areas located along the last stretch of Kūhiō Highway (Hāʻena to about Limahuli Stream) most of the Nāpali ASYA is largely uninhabited and undeveloped.

Average annual rainfall ranges from 35 inches per year along the coast to 140 inches in the mountains. The sustainable yield is 20 mgd.

20204-1.2 Economy and Population

20204-1.2.1 Economy

The Nāpali ASYA is largely uninhabited and undeveloped. The relatively small rural residential areas are located in relatively close proximity to Kuhio Highway and the shoreline. The area includes Hāʻena Beach Park and Hāʻena State Park – both popular tourist destinations.

20204-1.2.2 Population

The population within the Nāpali ASYA is very small and is not projected to increase significantly through the year 2035. Historical population data for the Nāpali ASYA is summarized in **Table 20204-1**. Population projections through the year 2035 are summarized in **Table 20204-2a**. As shown in **Table 20204-2b**, it is estimated that the area will continue to experience growth rates between 2 and 6 percent per decade.

Table 20204-1: Historical Population – Nāpali ASYA

	Year		
	1990	**2000**	**2010**
Population	22	25	28
Percent Change		15.8 (1990–2000)	10.2 (2000–2010)

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report. Data redistributed and evaluated for Nāpali ASYA.

Table 20204-2a: Population Projection – Nāpali ASYA

Growth Rate	Population by Year								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
A – Low	28	28	28	29	29	29	29	29	30
B – Med.	29	29	29	29	29	29	30	31	32
C – High	29	29	29	29	29	29	30	31	32

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report. Data redistributed and evaluated for Wainiha ASYA.

Table 20204-2b: Population Projection – Percent Change – Nāpali ASYA

Growth Rate	2015-2025 % Change	2025-2035 % Change
A – Low	2.4	3.0
B – Medium	5.4	6.4
C – High	5.9	6.9

20204-1.3 Land Use

20204-1.3.1 2000 Kauaʻi General Plan

The 2000 Kauaʻi County General Plan Land Use Designation Map for the Nāpali ASYA is shown on **Figure 20204-1**. The estimated land use allocation acreage for each land use designation within the system area is listed in **Table 20204-3**.

Table 20204-3: General Plan Estimated Land Use Allocation Acreage – Nāpali ASYA

General Plan Land Use Designation	Acreage	Percent of Total
Agricultural	0	0.0
Military	0	0.0
Open	22,580	100.0
Park	0	0.0
Residential Community	0	0.0
Resort	0	0.0
Transportation	0	0.0
Urban Center	0	0.0
DHHL	0	0.0
TOTAL	**22,580**	**100.0**

20204-1.3.2 Kauaʻi Zoning

Kauaʻi County Zoning Map for the Nāpali ASYA is shown on **Figure 20204-2**. The estimated land use allocation acreage for each zoning district within the system area is listed in **Table 20204-4**.

Table 20204-4: County Zoning Estimated District Allocation Acreage – Nāpali ASYA

Zoning District	Acreage	Percent of Total
Agriculture	0	0.0
Commercial – General	0	0.0
Commercial - Neighborhood	0	0.0
Conservation	23,005	100.0
Industrial – General	0	0.0
Industrial - Limited	0	0.0
Open	0	0.0
Residential	0	0.0
Resort	0	0.0
Project Development	0	0.0
Special Planning Area	0	0.0
Special Treatment	0	0.0
No Zoning	0	0.0
DHHL	0	0.0
TOTAL	**23,005**	**100.0**

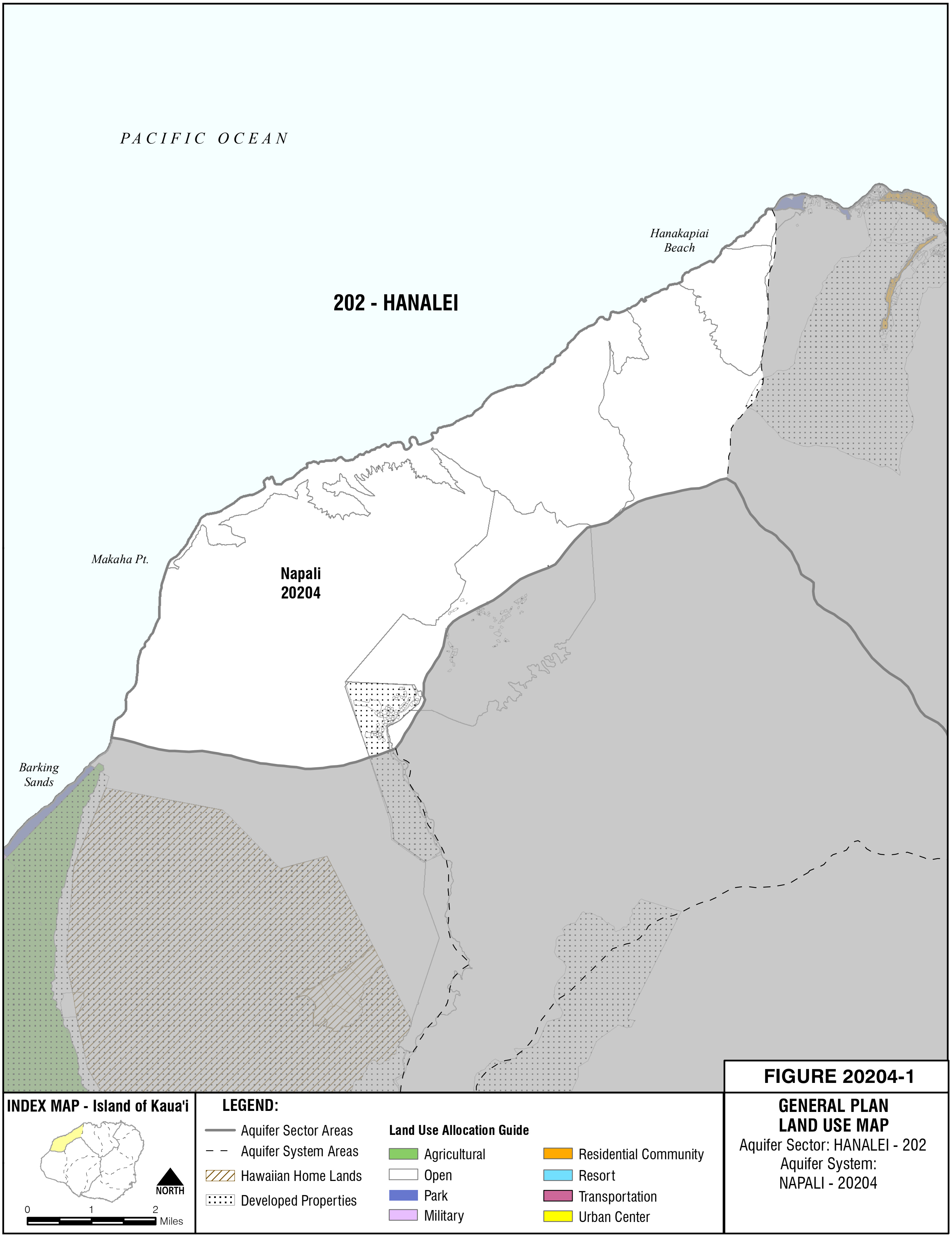

FIGURE 20204-1

GENERAL PLAN
LAND USE MAP
Aquifer Sector: HANALEI - 202
Aquifer System:
NAPALI - 20204

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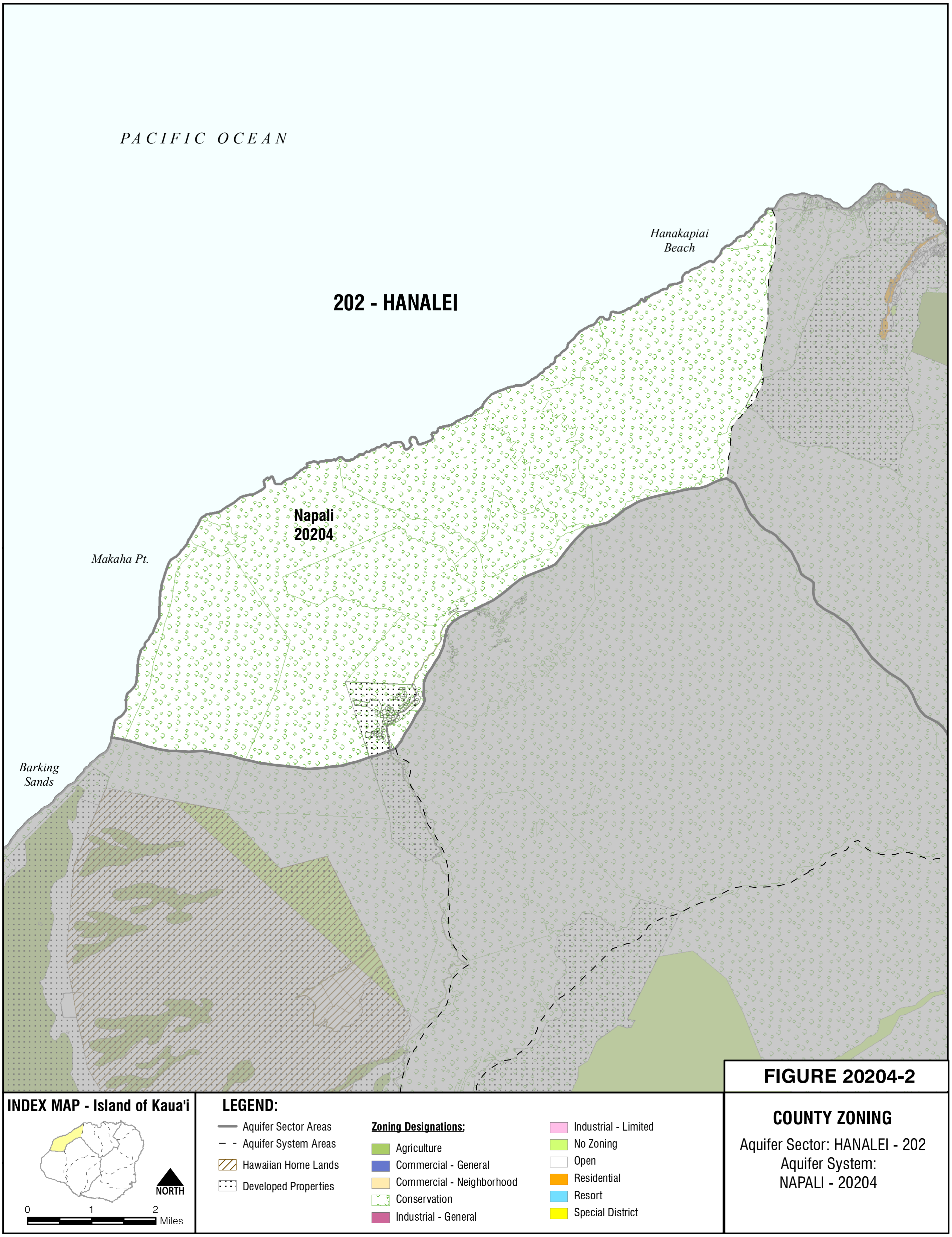


FIGURE 20204-2

COUNTY ZONING

Aquifer Sector: HANALEI - 202
Aquifer System:
NAPALI - 20204

20204-2 EXISTING WATER RESOURCES

20204-2.1 Ground Water

The Nāpali ASYA has a sustainable yield of 20 mgd. According to the 2014 CWRM database, there are 2 production wells in the system, 1 domestic and 1 military well. Refer to **Appendix A** for this database. **Figure 20204-3** shows the well locations.

20204-2.2 Surface Water

There are 14 streams classified as perennial in the Nāpali ASYA, 13 of which are considered continuous and 1 considered intermittent. The continuous streams are: Awa‘awapuhi Stream, Honopū Stream, Nakeikionaiwi Stream, Kalalau Stream, Pōhakuao Stream, Waiola‘a Stream, Hanakoa Stream, Waiahuakua Stream, Ho‘olulu Stream, Hanakāpī‘ai Stream, Maunapuluo Stream, Miloli‘i Stream, and Nu‘alolo Stream. The intermittent stream is the Kauhao Stream. The USGS has 3 active surface water gages in the system area. The gages are located on Kalalau Stream, Hanakoa Stream, and Hanakāpī‘ai Stream, which were previously listed in **Table 1-19**.

There are 2 declared stream diversions in the CWRM database shown on **Figure 20204-4**, which accounts for 1 percent of the 292 declared stream diversions on the island. The declared stream diversions are listed in **Appendix B**. The total declared flow for the Nāpali ASYA is 19 mgd.

20204-2.3 Water Conservation

Water conservation increases the amount of water available and helps to ensure the long-term viability of water resources. Water conservation measures for this ASYA are as described in **Section 1.5.7** of this report. There are no ASYA specific special conservation measures in place at this time.

20204-2.4 Rainwater Catchment

Rainwater catchment is a viable resource for areas that are not served by ground water or surface water. **Figure 20204-5** shows the possible catchment areas, or parcels with a building value greater than $20,000 and assumed to be developed but without a ground water or surface water source.

20204-2.5 Recycled Water

There are no wastewater reclamation facilities in the Nāpali ASYA.

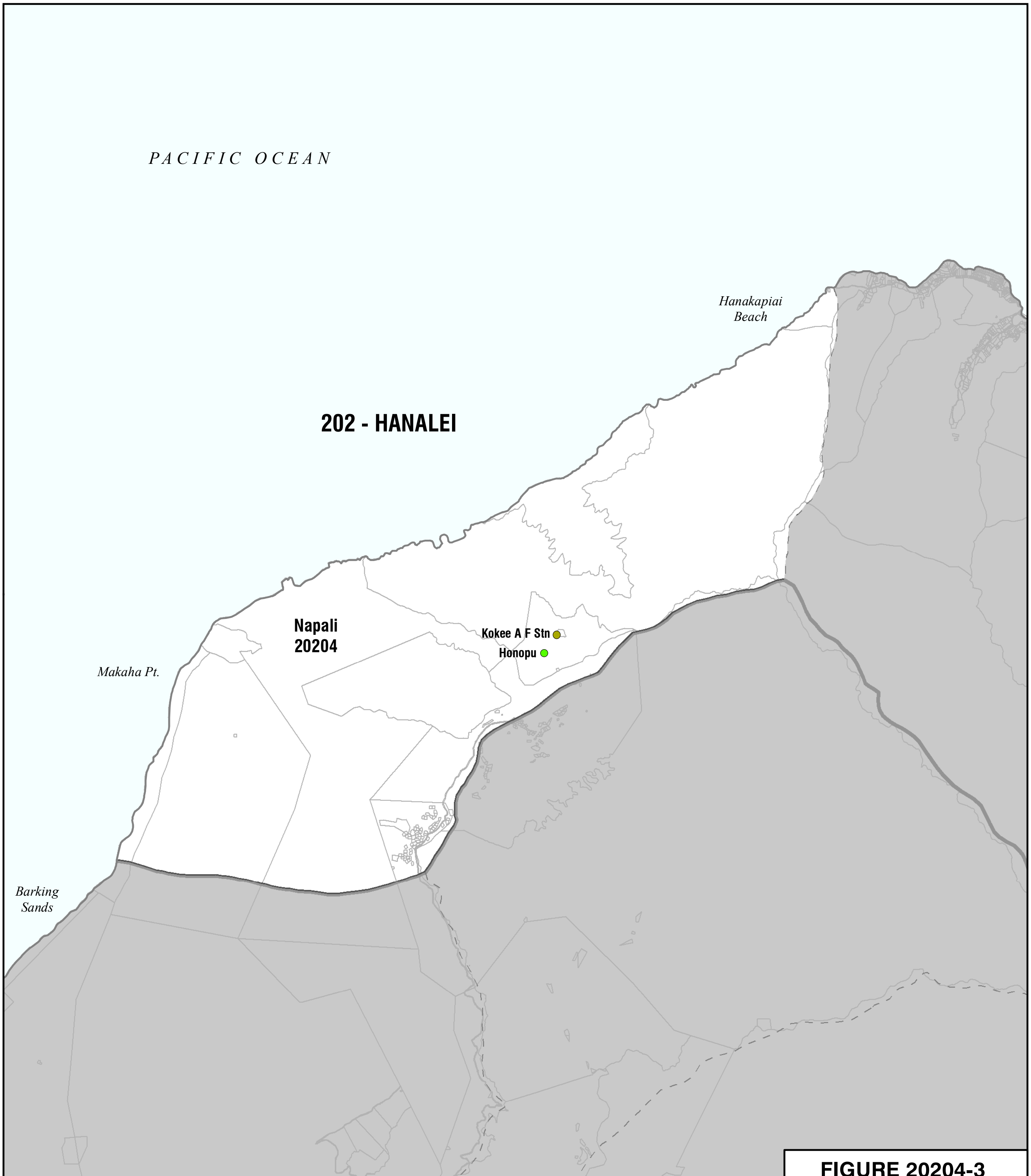
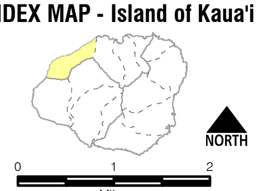


FIGURE 20204-3

INDEX MAP - Island of Kaua'i



LEGEND:

Aquifer Sector Areas
Aquifer System Areas
TMK

Well Use Types
Abandoned
Agriculture
Domestic
Industrial
Irrigation
Military
Municipal
Observation
Other
Unused

WELL LOCATION

Aquifer Sector: HANALEI - 202
Aquifer System:
NAPALI - 20204

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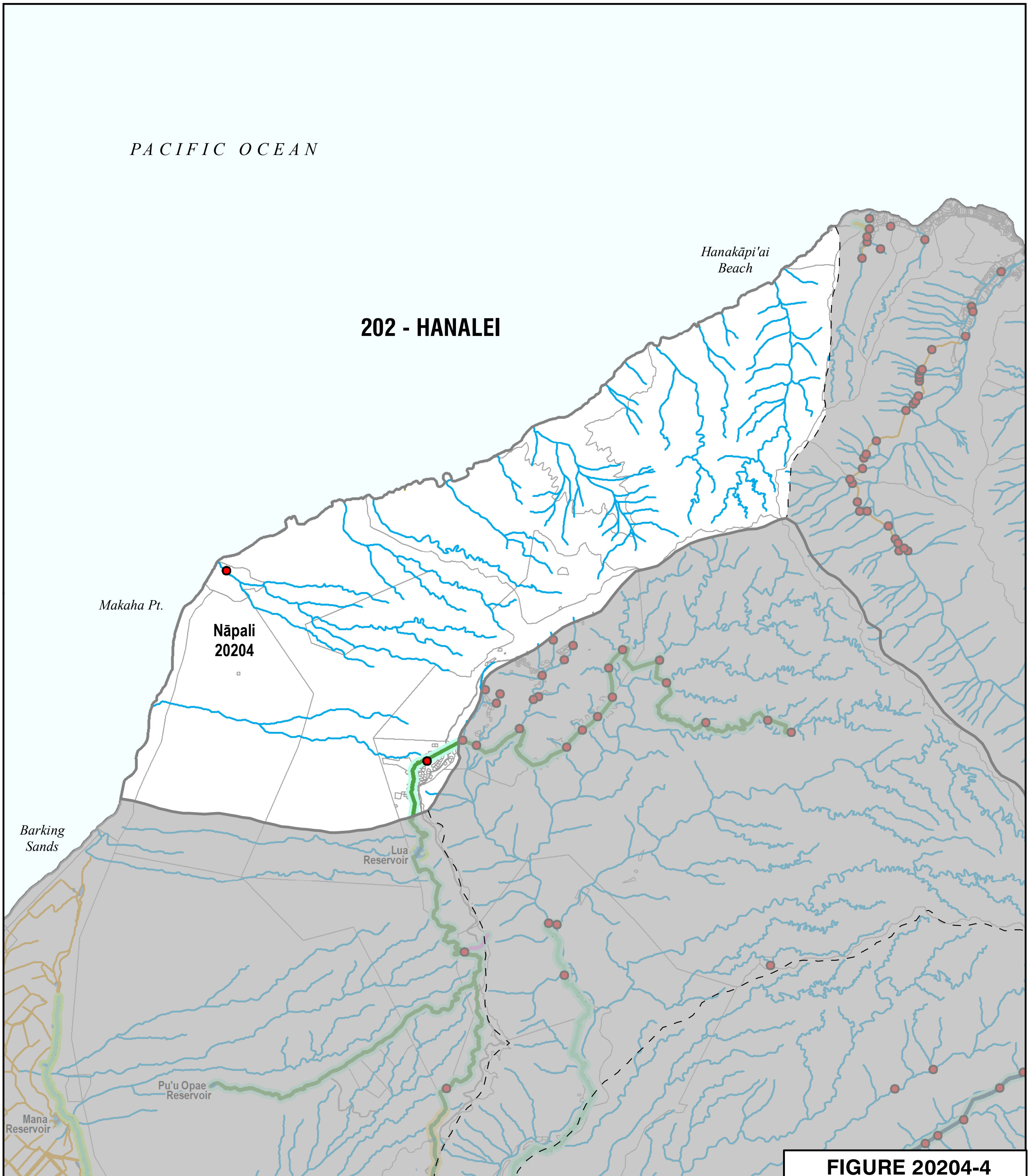
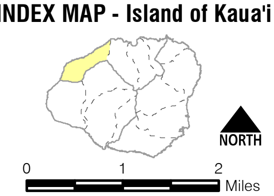


INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- Perennial Streams
- Irrigation Systems
- Diversions
- Reservoirs, Ponds
- TMK

Irrigation Systems

- Kōke'e Ditch

Status

- Active
- Inactive
- Unknown
- Abandoned

FIGURE 20204-4

STREAMS & DIVERSIONS

Aquifer Sector: HANALEI - 202
Aquifer System:
NĀPALI - 20204

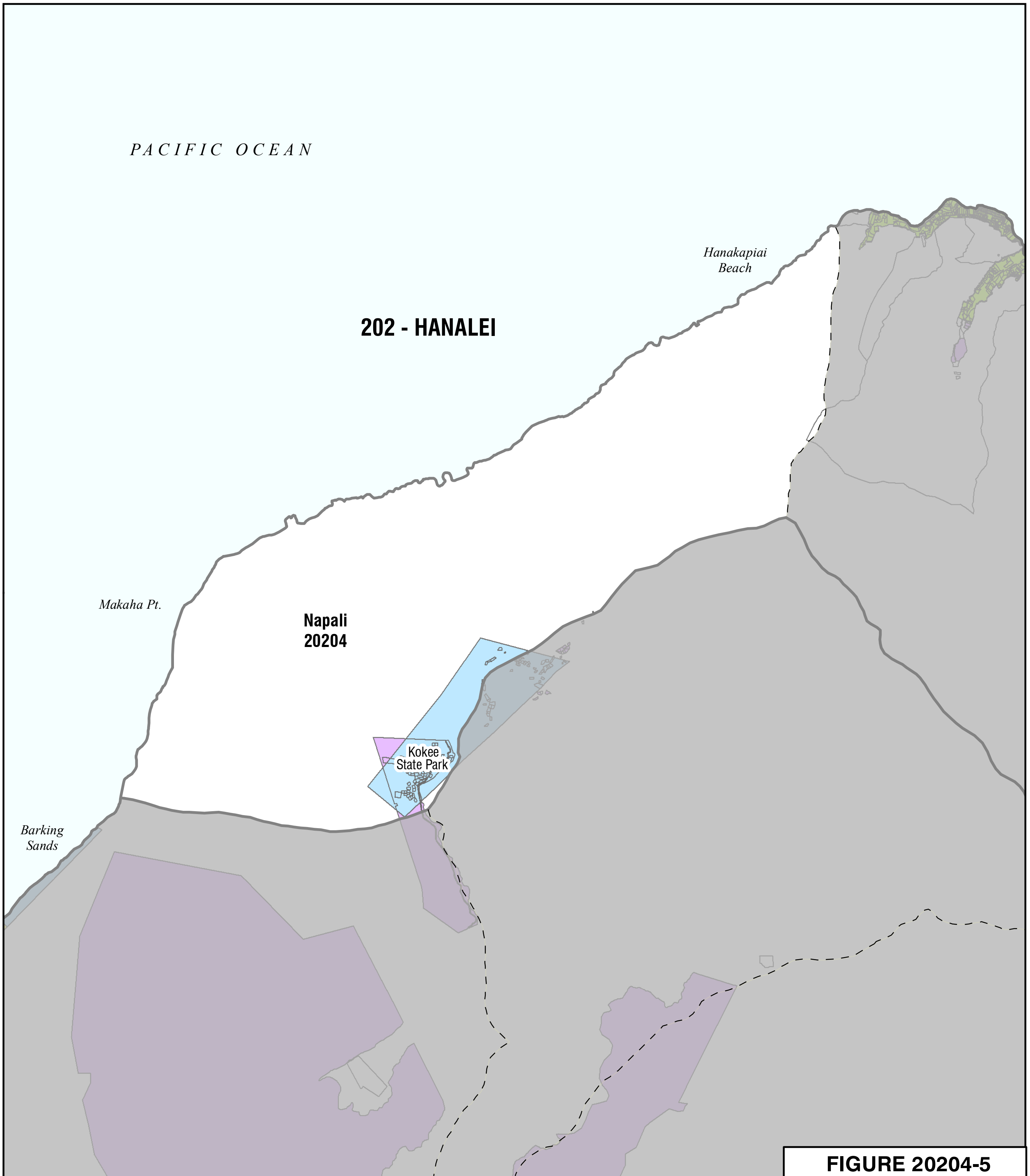
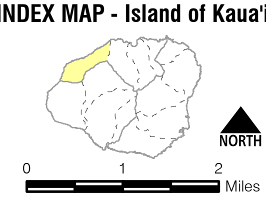


FIGURE 20204-5

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- DOW Service Area
- Private Water System
- State Water System
- Federal Water System
- Possible Catchment Area (Building Value > $20,000)

WATER SYSTEM & SERVICE AREA
Aquifer Sector: HANALEI - 202
Aquifer System:
NAPALI - 20204

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KAUA'I WATER USE AND DEVELOPMENT PLAN UPDATE

20204-3 EXISTING WATER USE

20204-3.1 General

The following section presents the total estimated average water use within the Nāpali ASYA. The total estimated average water use was based on data from CWRM (well pumpage) and DOH (Sanitary Surveys for Public Water Systems and estimated recycled water usage) for the year of 2014. **Table 20204-5** summarize the water use in accordance with CWRM categories.

Table 20204-5: Existing Water Use by Category – Nāpali ASYA

CWRM Category	Ground Water (mgd)	Other Sources (mgd)	Total (mgd)	Percent of Total
Domestic	0.00		0.00	0.0
Industrial			0.00	0.0
Irrigation			0.00	0.0
Agriculture		TBD[1]	0.00	0.0
Military	0.00		0.00	0.0
Municipal				
DOW System			0.00	0.0
Private-Public WS			0.00	0.0
TOTAL	**0.00**		**0.00**	**0.0**

[1] Surface Water – TBD from AWUDP

20204-3.2 Domestic Use

There is 1 well classified as "Domestic" in the CWRM database; however, it has not reported pumpage.

20204-3.3 Industrial Use

There are no wells classified as "Industrial" in the Nāpali ASYA.

20204-3.4 Irrigation Use

Irrigation use has been divided into ground water, recycled water, and surface water.

20204-3.4.1 Ground Water

There are no wells classified as "Irrigation" in the Nāpali ASYA.

20204-3.4.2 Recycled Water

There is no recycled water use in the Nāpali ASYA.

20204-3.4.3 Surface Water

Information on surface water use for irrigation is to be determined by the AWUDP.

20204-3.5 Agricultural Use

Agricultural use has been divided into ground water, recycled water, and surface water.

20204-3.5.1 Ground Water

There are no wells classified as "Agriculture" in the Nāpali ASYA.

20204-3.5.2 Recycled Water

There is no recycled water use in the Nāpali ASYA.

20204-3.5.3 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP.

20204-3.6 Military Use

There is 1 well classified as "Military" in the CWRM database owned by the United States Air Force; however, it has not reported any pumpage.

20204-3.7 Municipal Use

There is no municipal water use in the Nāpali ASYA.

20204-3.7.1 County Water Systems

There are no County water systems in the Nāpali ASYA regulated by the DOH.

20204-3.7.2 State Water Systems

There are no State water systems in the Nāpali ASYA regulated by the DOH.

20204-3.7.3 Federal Water Systems

There are no Federal water systems in the Nāpali ASYA regulated by the DOH.

20204-3.7.4 Private-Public Water Systems

There are no private-public water systems in the Nāpali ASYA regulated by the DOH.

20204-3.8 Existing Water Use by Resource

20204-3.8.1 Ground Water

Table 20204-6 summarizes the current production, sustainable yield (SY), and percentage of SY for the current production. Current production is represented by the 2014 average yield calculated from the actual pumping data.

Table 20204-6: Pumpage – Nāpali ASYA

Pumpage (mgd)	SY (mgd)	Pumpage Portion of SY
0	20	0%

Based on available information from the CWRM database, the current ground water use is 0 percent of the sustainable yield.

20204-3.8.2 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP.

20204-3.8.3 Water Conservation

Water conservation, including water loss management, may reduce water use. See **Section 20204-2.3** for discussion of existing conservation efforts.

20204-3.8.4 Rainwater Catchment

Developed parcels that are not supplied by ground water or surface water are assumed to be supplied by rainwater catchment.

20204-3.8.5 Recycled Water

There is no recycled water use in the Nāpali ASYA.

20204-4 FUTURE WATER USE

20204-4.1 Full Build-Out Water Demand Projections

The full build-out water demand projections based on the General Plan and County Zoning for the Nāpali ASYA is listed in **Table 20204-7** and **Table 20204-8**, respectively. Each land use class is associated with the most appropriate CWRM water use category.

Table 20204-7: General Plan Full Build-Out Water Demand Projection – Nāpali ASYA

GP Category	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	0
Open	Domestic	0
Military	Military	0
Park	Irrigation	0
Residential	Domestic/Municipal	0
Resort	Domestic/Irrigation/Municipal	0
Transportation	Municipal	0
Urban Center	Domestic/Industrial/Municipal	0
DHHL	Domestic	0
	TOTAL	**0**

Table 20204-8: Zoning Full Build-Out Water Demand Projection – Nāpali ASYA

Zoning Class	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	0
Commercial	Municipal	0
Industrial	Industrial/Municipal	0
Open	Domestic	0
Residential	Domestic/Municipal	0
Resort	Domestic/Irrigation/Municipal	0
DHHL	Domestic	0
	TOTAL	**0**

20204-4.1.1 Refined Land Use Based Water Projection

State Water Projects Plan

There are no future State water projects through the year 2034 within the Nāpali ASYA according to the 2021 SWPP Update.

State Department of Hawaiian Home Lands

There are no DHHL tracts in the Nāpali ASYA.

Agricultural Water Use and Development Plan

The AWUDP dated 2003 (revised 2004) was limited in scope. More recent, comprehensive information on agricultural lands is available in the County of Kauaʻi Important Agricultural Lands (IAL) Study.

In 2019, a public review draft of the AWUDP was released and it is anticipated that the next phase of the AWUDP will provide agricultural water demand projections in greater detail and will supersede information in the KWUDP when it becomes available.

County of Kauaʻi Important Agricultural Lands Study

There are no agricultural lands in the Nāpali ASYA that received a score of 28 or better in the County of Kauaʻi IAL Study.

20204-4.1.2 Water Use Unit Rates

Water use unit rates are based on the *Water System Standards* (WSS), as discussed in Chapter 2.

20204-4.2 Water Demand Projections to the Year 2035

The following section presents water demand projections to the year 2035 for the Nāpali ASYA. The projected low, medium, and high growth rates are listed in **Table 20204-9** and are graphed in **Figure 20204-6**. Potable (domestic, industrial, municipal, and military water uses) and non-potable (irrigation) water demands are also differentiated.

Table 20204-9: Water Demand Projection – Nāpali ASYA

Water Use Category	Water Demand by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
GROWTH RATE C (HIGH)									
TOTAL	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GROWTH RATE B (MEDIUM)									
TOTAL	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GROWTH RATE A (LOW)									
TOTAL	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figure 20204-6: Water Demand Projection Summary – Nāpali ASYA

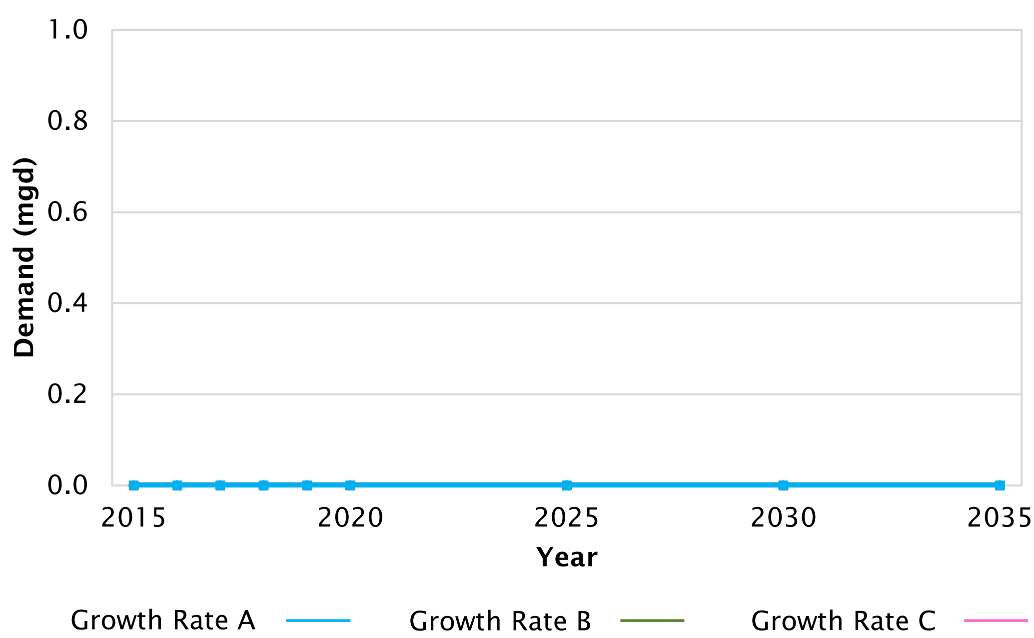


Table 20204-10 shows the breakdown of water demand projections for a medium growth rate by CWRM categories through the year 2035.

Table 20204-10: Medium Growth Rate B Water Demand Projection by Category – Nāpali ASYA

Water Use Category	Water Use by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Domestic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Irrigation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Military	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Municipal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DOW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

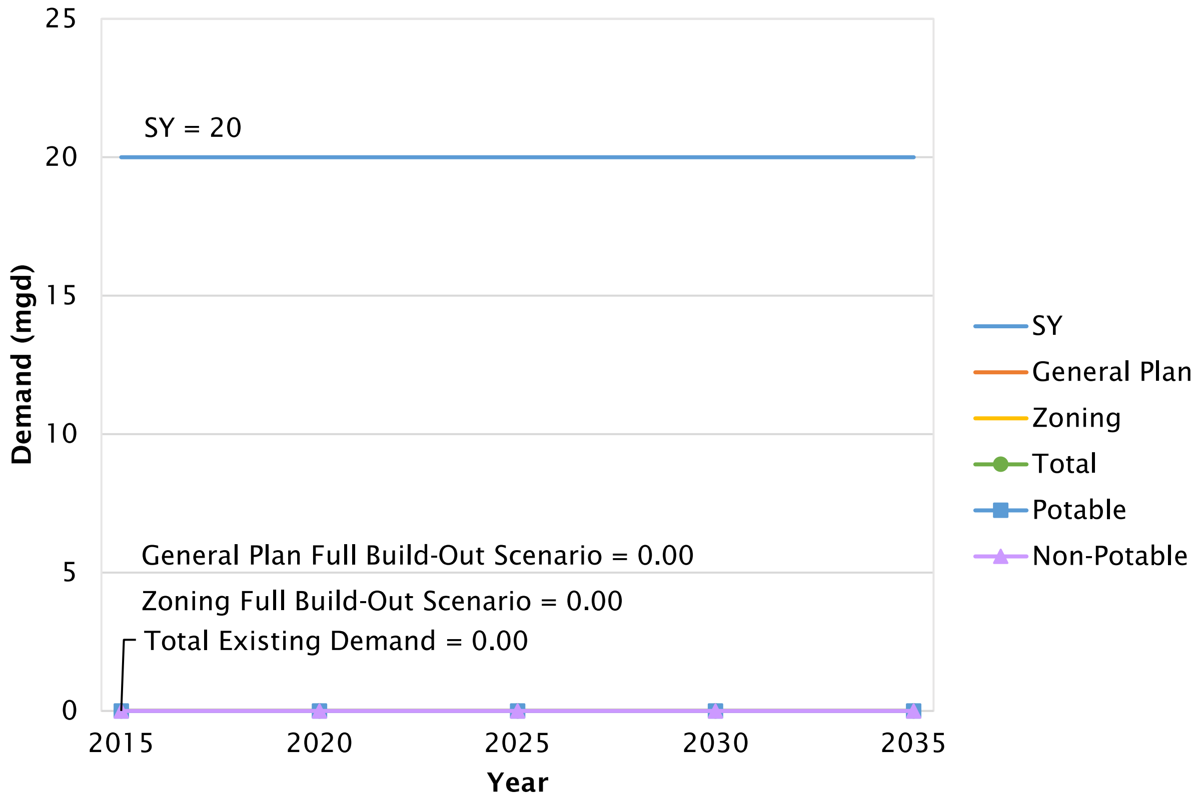
20204-4.3 Summary

Figure 20204-7 illustrates the magnitude of the sustainable yield, both General Plan and Zoning full build-out water use projections, and water use projection through the year 2035 focusing on Medium Growth Rate B. **Table 20204-11** summarizes the General Plan, Zoning, and 20-year water demand projection scenarios for the Nāpali ASYA. The sustainable yield is presented to draw comparisons. All demands are in mgd.

Table 20204-11: Summary of Demand Projections

SY (mgd)	FBO (mgd)		Medium Growth Rate by Year (mgd)								
	GP	Zoning	2015	2016	2017	2018	2019	2020	2025	2030	2035
20	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figure 20204-7: Medium Growth Rate B Water Demand Projections and Full Build-Out – Nāpali ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use.

20204-5 RESOURCE AND FACILITY RECOMMENDATIONS

20204-5.1 Water Source Adequacy

20204-5.1.1 Full Build-Out

Development to the highest extent allowed by the General Plan and County Zoning within the Nāpali ASYA is sustainable, with General Plan and County Zoning full build-out water demands both requiring 0 percent of the 20 mgd sustainable yield due to the remote location of the ASYA.

20204-5.1.2 Twenty-Year Projection

The 2035 water demand projection for the Nāpali ASYA is sustainable and is 0 percent of the 20 mgd sustainable yield.

20204-5.2 Source Development Requirements

20204-5.2.1 Supply-Side Management

Supply-side management, including conventional water resource measures, water conservation, and alternative water resource measures, were evaluated to meet projected water demands.

Conventional Water Resource Measures

Ground Water

There are two existing wells in the Nāpali ASYA. Both wells are located in the high-level zone and have no reported pumpage. The Nāpali ASYA is largely uninhabited and undeveloped, and there is no projected demand to be met based on population or land use. Therefore, no additional wells are needed.

Surface Water

The Nāpali ASYA has 2 declared diversions. Until permanent instream flow standards are established, interim instream flow standards have been adopted. According to Section 13-169-46, Hawai‘i Administrative Rules, "Interim Instream Flow Standard for all streams on Hawai‘i, as adopted by the commission on water resource management on June 15, 1988, shall be that amount of water flowing in each stream on the effective date of this standard, and as that flow may naturally vary throughout the year and from year to year without further amounts of water being diverted offstream through new or expanded diversions, and under the stream conditions existing on the effective date of the standard, except as may be modified [by the commission]." Therefore, for the purposes of assessing surface water availability, it is assumed that no additional diversions will be allowed without amendment of the interim IFS.

The Kōke‘e Ditch Irrigation System (KODIS) passes through the Nāpali ASYA, bringing surface water from the Waimea ASYA to its service area in the Kekaha ASYA. The KODIS gaging station is listed as one of the two diversions in the Nāpali ASYA and has a declared flow of 19 mgd. This declared flow is representative of the sum of flows diverted in the Waimea ASYA upstream of the gaging station.

Water Transfer

As aforementioned, the KODIS transfers water from the Waimea ASYA through the Nāpali ASYA to the Kekaha ASYA.

Water resources can also be transferred between ASYAs through public water systems. The Kōkeʻe State Park water system is partially in the Nāpali ASYA and partially in the Waimea ASYA. The sources for this water system are in the Waimea ASYA, and the water is then distributed to its service area in the Waimea ASYA and Nāpali ASYA.

Water Conservation

There are no ASYA-specific conservation measures in place at this time; however, there are general water conservation programs that are described in **Section 1.5.7**. Water conservation, including water loss management, can increase the amount of water available and help to ensure the long-term viability of water resources.

Alternative Water Resource Measures

Rainwater Catchment

Rainwater can be utilized as a water resource in several ways.

Rainwater can be harvested in rainwater catchment systems which can be utilized to supply domestic potable water needs. These systems are viable in areas that receive abundant rainfall and are a suitable source of potable water for individual domestic users in areas outside the limits of municipal water systems. Generally, these are remote areas and are not expected to expand significantly because most development should be concentrated within existing urban areas. Therefore, use of rainwater catchment systems is not anticipated to increase significantly.

Storm Water Reuse

Rainfall can turn into storm water runoff. Storm water runoff from impervious surfaces in urban areas can be significant. This water could be captured, treated, and used as a source of non-potable water (e.g. irrigation), integrated with recycled water, or even as potable and/or non-potable ground water recharge. However, due to the lack of storm water reuse standards, the high initial infrastructure costs, and the treatment requirements, storm water reclamation and reuse on a small or large scale may not be feasible and requires further assessment as noted in the Water Resource Protection Plan. The U.S. Department of the Interior, Bureau of Reclamation published An Appraisal of Stormwater Reclamation and Reuse Opportunities in Hawaiʻi (Storm Water Report) in 2008 but did not identify any storm water reclamation and reuse opportunities in the Nāpali ASYA.

Recycled Water

Recycled water is a valuable resource. However, there are no wastewater reclamation facilities (WWRFs) in the Nāpali ASYA.

Desalination

Desalination of brackish ground water is a potential alternative; however, due to its high capital and operational costs, it likely would not be considered when other potable water sources are available.

20204-5.2.2 Demand-Side Management

Development Density Control

As previously mentioned, the Nāpali ASYA is largely uninhabited and undeveloped, and there are no projected water demands.

20204-5.3 Recommended Alternatives

The Nāpali ASYA is largely uninhabited and undeveloped, and there are no projected water demands to be met. Rainwater catchment is the likely alternative for any remote domestic users in this area.

Chapter 20301

Kekaha Aquifer System Area

CHAPTER 20301 - TABLE OF CONTENTS

FIGURES

TABLES

20301 KEKAHA AQUIFER SYSTEM AREA

20301-1 SYSTEM AREA PROFILE

20301-1.1 General

The Kekaha [20301] Aquifer System Area (ASYA) is roughly bound on the west and south by the Pacific Ocean from the Hāʻeleʻele Valley to about Ola Road in Waimea Town, approximately along Waimea Canyon Drive and Kōkeʻe Road on the on the east, and from Kōkeʻe Road (east of the Lua Reservoir) back to the shoreline along the south ridge of the Hāʻeleʻele Valley.

The Kekaha ASYA includes the town of Kekaha and the west side of Waimea town. In addition, the area includes the Federal Barking Sands Pacific Missile Range Facility (PMRF) and the DHHL Waimea and Kekaha tracts.

Average annual rainfall ranges from 25 inches per year along the coast to 50 inches in the mountains. The sustainable yield is 10 mgd.

20301-1.2 Economy and Population

20301-1.2.1 Economy

Rural residential development and small commercial business areas are typically concentrated along the coastal areas of Kekaha and Waimea towns, in relatively close proximity to Kaumualiʻi Highway. Former sugarcane lands located in the lower elevations between Kekaha and PMRF are now largely used for seed crop cultivation. Largest industries in Kekaha are public administration, accommodation and food service, and heath care and social assistance.

20301-1.2.2 Population

The population contributing to the demand within the Kekaha ASYA is concentrated in the town of Kehaha and the west side of Waimea town. Additional water demand is attributed to PMRF.

Historical population data, as summarized in **Table 20301-1** shows that population growth has varied from a high of about 20 percent to a low of about -2 percent per decade over the past 20 years.

Population projections for the Kekaha ASYA are summarized through the year 2035 in **Table 20301-2a**. As summarized in **Table 20301-2b**, it is estimated that the area will experience growth rates between 3 to 8 percent per decade.

Table 20301-1: Historical Population – Kekaha ASYA

	Year		
	1990	2000	2010
Population	3,711	4,471	4,393
Percent Change		20.5	-1.7

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report. Data redistributed and evaluated for Kekaha ASYA.

Table 20301-2a: Population Projection – Kekaha ASYA

Growth Rate	Population by Year								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
A – Low	4,482	4,497	4,513	4,529	4,545	4,561	4,648	4,742	4,844
B – Med.	4,516	4,544	4,572	4,601	4,631	4,661	4,821	4,995	5,187
C – High	4,521	4,551	4,582	4,614	4,646	4,678	4,850	5,038	5,246

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report. Data redistributed and evaluated for Kekaha ASYA.

Table 20301-2b: Population Projection – Percent Change – Kekaha ASYA

Growth Rate	2015-2025 % Change	2025-2035 % Change
A – Low	3.7	4.2
B – Medium	6.8	7.6
C – High	7.3	8.2

20301-1.3 Land Use

20301-1.3.1 2000 Kaua'i General Plan

The 2000 Kaua'i County General Plan Land Use Designation Map for the Kekaha ASYA is shown on **Figure 20301-1**. The estimated land use allocation acreage for each land use designation within the system area is listed in **Table 20301-3**.

Table 20301-3: General Plan Estimated Land Use Allocation Acreage – Kekaha ASYA

General Plan Land Use Designation	Acreage	Percent of Total
Agricultural	8,221	21.2
Military	2,032	5.2
Open	12,329	31.8
Park	227	0.6
Residential Community	820	2.1
Resort	114	0.3
Transportation	0	0.0
Urban Center	0	0.0
DHHL	15,049	38.8
TOTAL	**38,792**	**100.0**

20301-1.3.2 Kaua'i Zoning

Kaua'i County Zoning Map for the Kekaha ASYA is shown on **Figure 20301-2**. The estimated land use allocation acreage for each zoning district within the system area is listed in **Table 20301-4**.

Table 20301-4: County Zoning Estimated District Allocation Acreage – Kekaha ASYA

Zoning District	Acreage	Percent of Total
Agriculture	9,973	27.0
Commercial – General	10	0.0
Commercial - Neighborhood	8	0.0
Conservation	6,877	18.5
Industrial – General	17	0.0
Industrial - Limited	0	0.0
Open	4,432	11.9
Residential	357	1.0
Resort	43	0.1
Project Development	25	0.1
Special Planning Area	0	0.0
Special Treatment	121	0.3
No Zoning	149	0.4
DHHL	15,107	40.7
TOTAL	**37,119**	**100.0**

The number of dwelling units allowed in residential and resort districts varies by the type of residential or resort district. The average number of dwelling units allowed in residential districts in the Kekaha ASYA is 4.66 dwelling units per acre. The average number of dwelling units allowed in resort districts in the Kekaha ASYA is 4.00 dwelling units per acre.

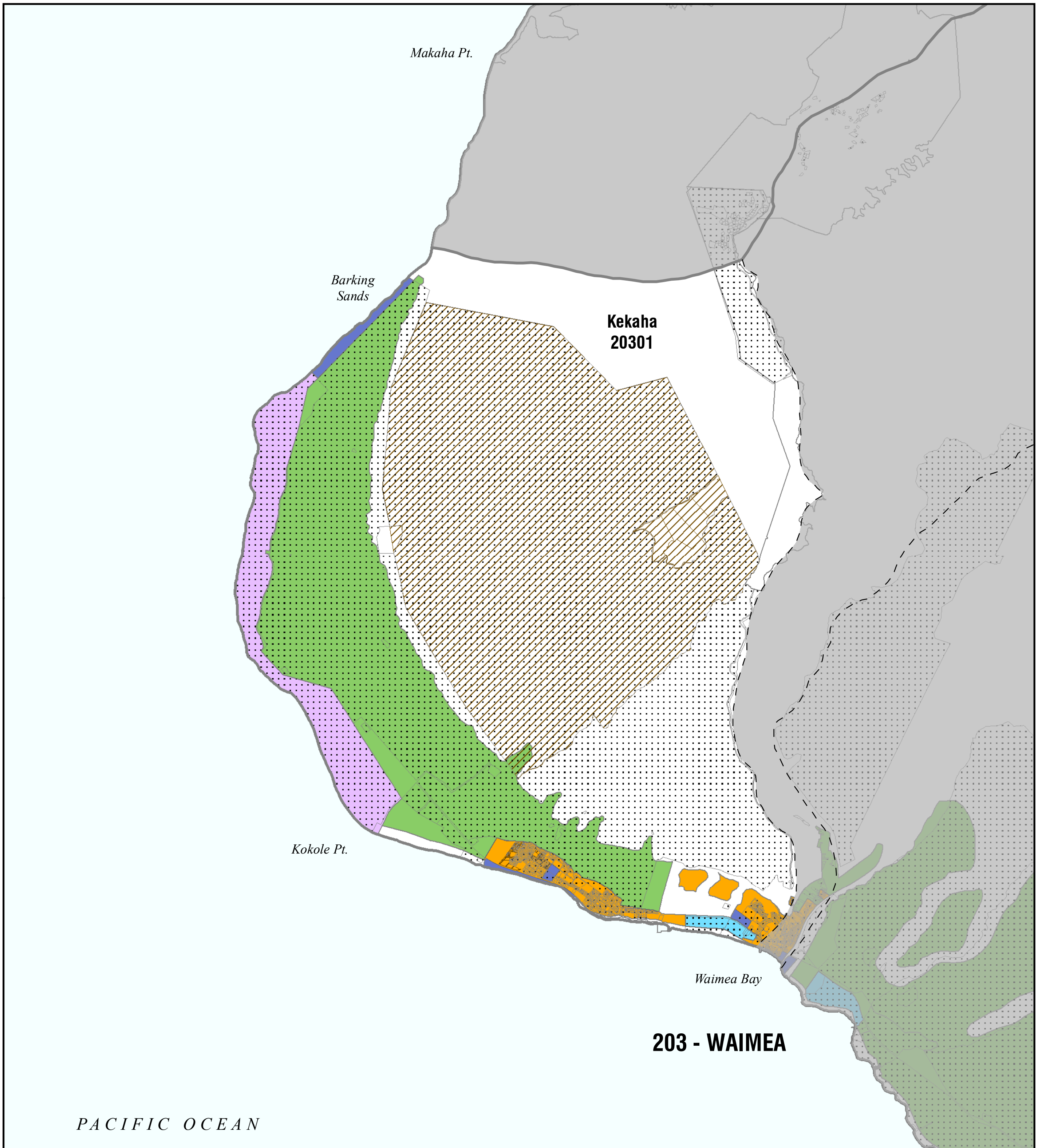
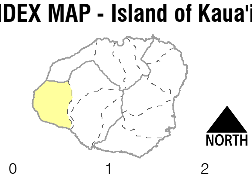


FIGURE 20301-1

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- Hawaiian Home Lands
- Developed Properties

Land Use Allocation Guide

- Agricultural
- Open
- Park
- Military
- Residential Community
- Resort
- Transportation
- Urban Center

GENERAL PLAN
LAND USE MAP
Aquifer Sector: WAIMEA - 203
Aquifer System:
KEKAHA - 20301

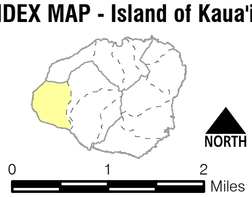
Fukunaga & Associates, Inc.
Consulting Engineers

Kaua'i County - Department of Water

KAUA'I WATER USE AND DEVELOPMENT PLAN UPDATE

FIGURE 20301-2

INDEX MAP - Island of Kaua'i



LEGEND:

Aquifer Sector Areas
Aquifer System Areas
Hawaiian Home Lands
Developed Properties

Zoning Designations:

Agriculture
Commercial - General
Commercial - Neighborhood
Conservation
Industrial - General
Industrial - Limited
No Zoning
Open
Residential
Resort
Special District

COUNTY ZONING

Aquifer Sector: WAIMEA - 203
Aquifer System:
KEKAHA - 20301

20301-2 EXISTING WATER RESOURCES

20301-2.1 Ground Water

The Kekaha ASYA has a sustainable yield of 10 mgd. According to the 2014 CWRM database, there are 27 production wells in the system, 16 agriculture, 6 municipal (DOW), 1 non-DOW municipal, 1 domestic, 1 irrigation, and 2 military wells. There are also 4 wells drilled and categorized as "unused". Refer to **Appendix A** for this database. **Figure 20301-3** shows the well locations.

20301-2.2 Surface Water

There are 5 streams classified as perennial in the Kekaha ASYA, of which 1 is considered continuous and 4 are considered intermittent. Kinekine Ditch is classified as a continuous stream. Kaʻawaloa Stream, Nahomalu Stream, Kaʻulaʻula Stream, and Hāʻeleʻele Stream are classified as intermittent streams. The USGS has 1 active surface water gage in the system area. The gage is located on Nahomalu Valley near Mana Stream, which was previously listed in **Table 1-19**. The CWRM has 2 active surface water gages in the system area. Gage 49 measures flow in the Kōkeʻe Ditch above the Puʻu Loa Reservoir. Gage 50 measures flow in Kekaha Ditch at the Hukipo flume, below the Waimea Hydroelectric Plant.

In accordance with the Code, the CWRM must establish and administer instream flow standards (IFS) on a stream-by-stream basis as necessary to protect public interests. IFS is defined as "a quantity or flow of water or depth of water which is required to be present at a specific location in a stream system at certain specified times of the year to protect fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses." Considerably more research and study need to be completed to accumulate the data and perspective necessary to conduct a thorough and meaningful assessment of IFS. Until permanent IFS are established, interim IFS have been adopted. The interim IFS are defined as the amount of water flowing in each stream at the time the administrative rules governing them were adopted in 1988 and 1989. In order to assess surface water sustainability, this KWUDP assumes that no additional diversions will be allowed from any stream without amendment of the interim IFS.

There are 3 declared stream diversions in the CWRM database shown on **Figure 20301-4**, which accounts for 1 percent of the 292 declared stream diversions on the island. The declared stream diversions are listed in **Appendix B**. The total declared flow for the Kekaha ASYA was originally 32.85 mgd. However, the interim IFS were amended as a result of a Waimea Watershed Agreement to resolve disputes arising out of the diversion of water from the Waimea River and its tributaries. The interim IFS were amended for the Waimea surface water hydrologic unit as noted in **Table 1-20**, and flow in the stream has the highest priority with diversions only as needed for other uses with the interim IFS numbers being the minimum stream flow to be provided.

The Kekaha Ditch Irrigation System (KEDIS) consists of three intakes, from the Koaiʻe and Waiahulu Streams, and from the Waimea River. The irrigation system provided water to the Kekaha Plantation, Kikiaola Land Company, and Knudsen Land Company for sugarcane irrigation. The KEDIS is currently used for diversified crop irrigation and is owned by the State of Hawaiʻi and managed by the Department of Agriculture. The Agribusiness Development Corporation (ADC) and the Kekaha Agriculture Association (KAA) currently operate the KEDIS.

The Kōke'e Ditch Irrigation System (KODIS) was built by the Kekaha Plantation for sugarcane irrigation above the Kekaha coastal plain. Source water is from four sequential intakes (Waiakoali Stream intake, Kawaikōī Stream intake, Kaua'ikinana Stream intake, and Kōke'e Stream intake) on headwaters of the Waimea River. The KODIS is owned by the State of Hawai'i and managed by the Department of Agriculture. The ADC and KAA operate and maintain KODIS. The total declared flow of the diversions that serve KODIS was originally 19 mgd. This total is recorded in the CWRM database at the KODIS gaging station which is within the Nāpali ASYA. However, as noted above, the interim IFS were amended and reduced the amount of water that can be diverted from the Waimea River and its tributaries.

20301-2.3 Water Conservation

Water conservation increases the amount of water available and helps to ensure the long-term viability of water resources. Water conservation measures for this ASYA are as described in **Section 1.5.7** of this report. There are no ASYA specific special conservation measures in place at this time.

20301-2.4 Rainwater Catchment

Rainwater catchment is a viable resource for areas that are not served by ground water or surface water. **Figure 20301-5** shows the possible catchment areas, or parcels with a building value greater than $20,000 and assumed to be developed but without a ground water or surface water source.

20301-2.5 Recycled Water

There is 1 wastewater reclamation facility in the Kekaha ASYA. **Table 20301-5** lists the wastewater facility, reclaimed water classification, facility treatment capacity, current reuse amount, facility type, and current application. **Figure 20301-6** shows the facility location.

Table 20301-5: Wastewater Reclamation Facilities – Kekaha ASYA

WWRF/ WWTP	Recycled Water Classification	Design Capacity (mgd)	Quantity Produced (mgd)	Current Reuse Amount (mgd)	Owner	Irrigation Application
Waimea WWRF	R-1	0.7	0.3	0.18	Public	Kikiaola Land Company (agriculture irrigation)

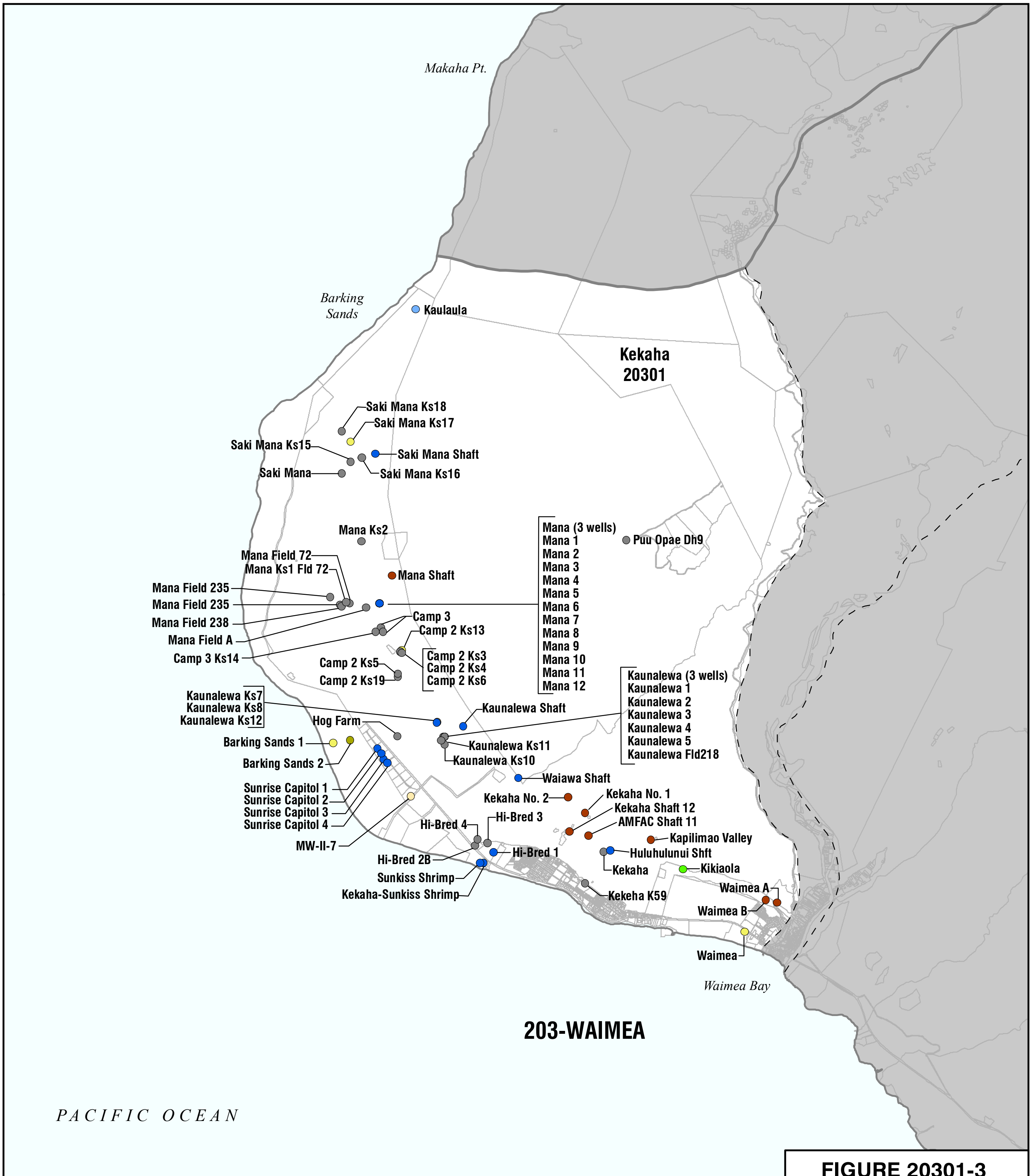
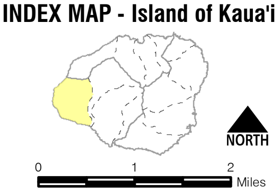


FIGURE 20301-3

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- TMK

Well Use Types

- Abandoned
- Agriculture
- Domestic
- Industrial
- Irrigation
- Military
- Municipal
- Observation
- Other
- Unused

WELL LOCATION

Aquifer Sector: WAIMEA - 203
Aquifer System:
KEKAHA - 20301

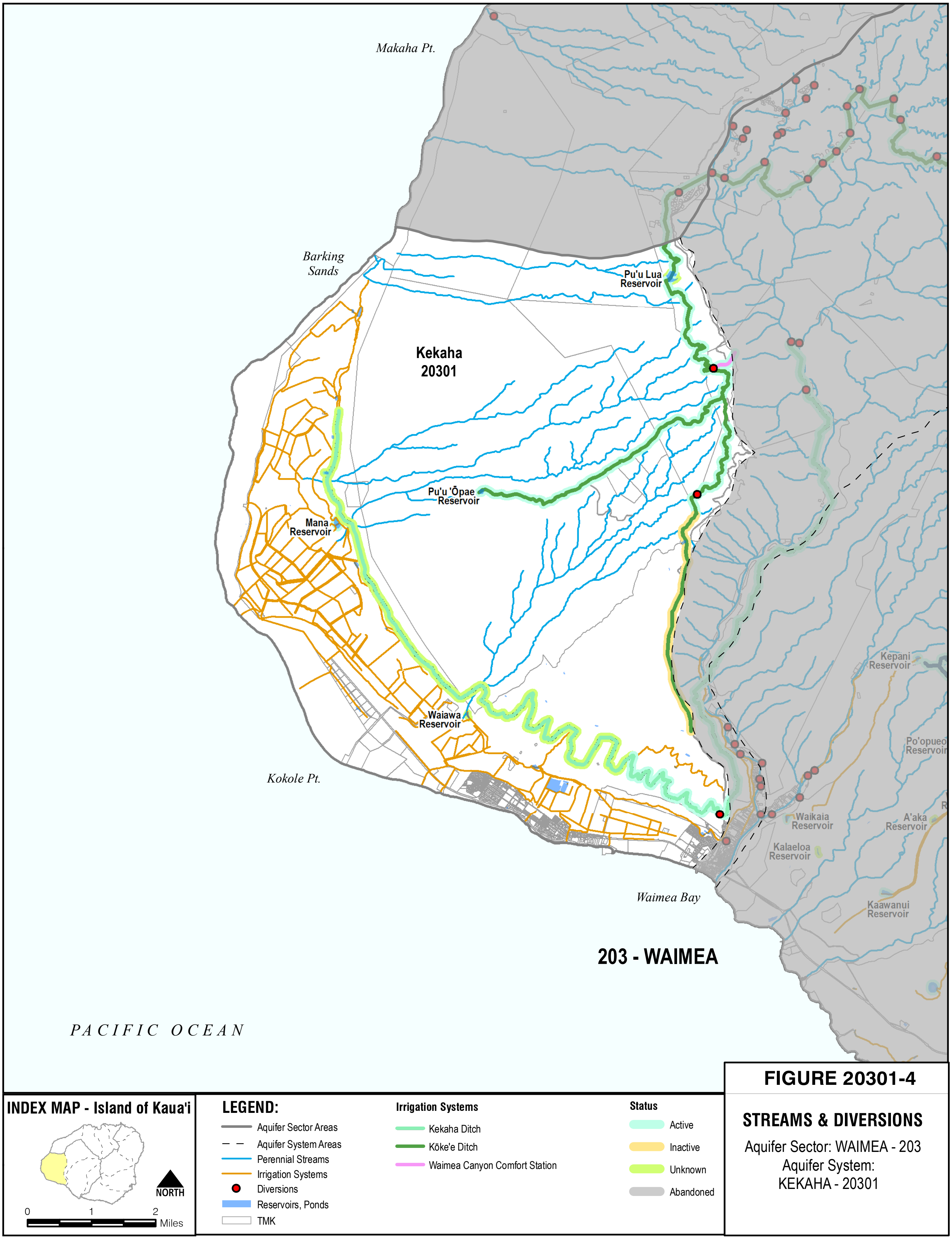


FIGURE 20301-4

STREAMS & DIVERSIONS

Aquifer Sector: WAIMEA - 203
Aquifer System:
KEKAHA - 20301

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KAUA'I WATER USE AND DEVELOPMENT PLAN UPDATE

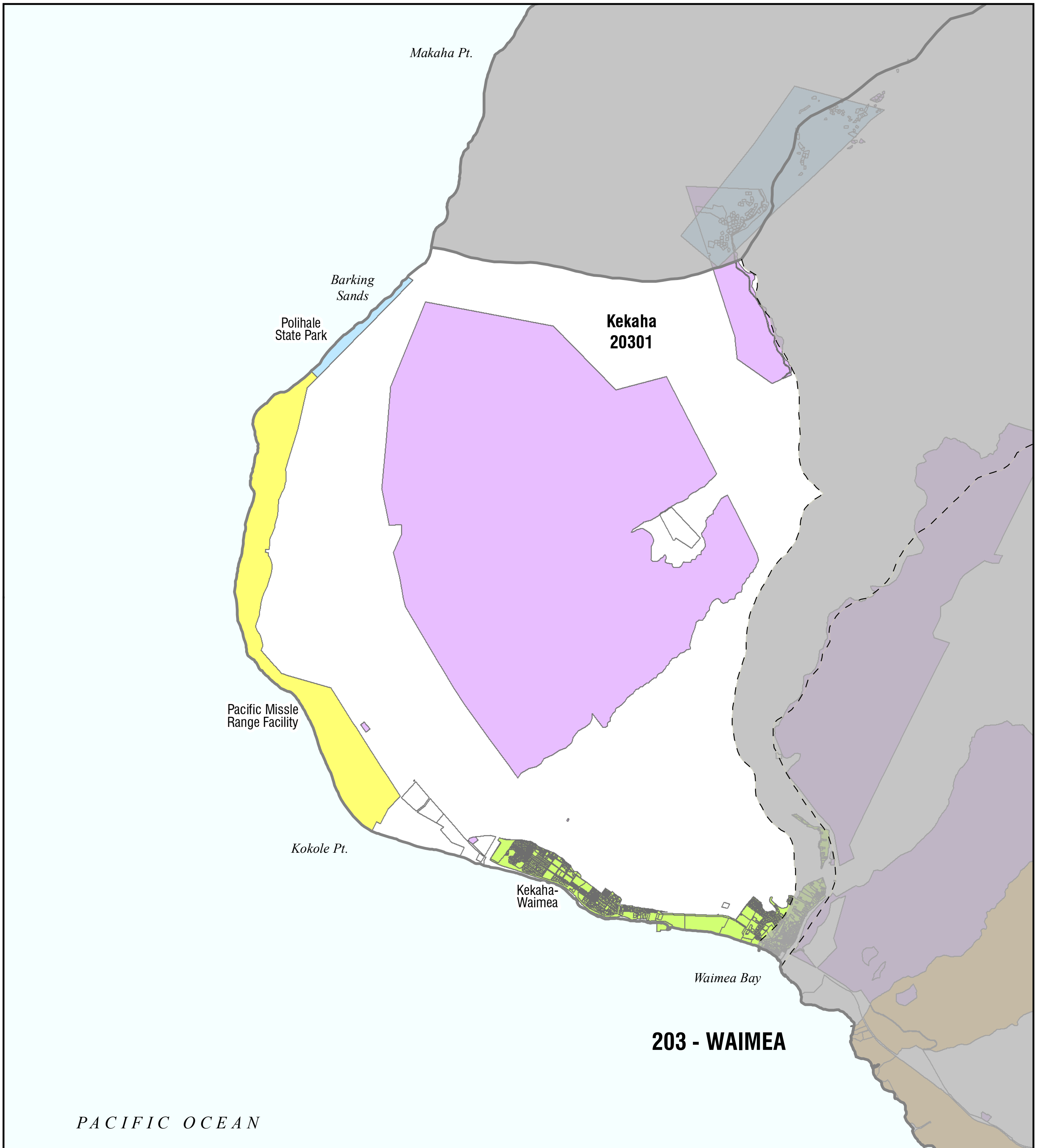
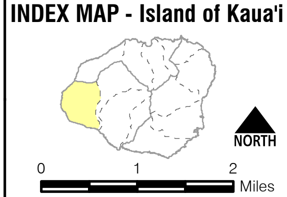


FIGURE 20301-5



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- DOW Service Area
- Private Water System
- State Water System
- Federal Water System
- Possible Catchment Area (Building Value > $20,000)

WATER SYSTEM & SERVICE AREA
Aquifer Sector: WAIMEA - 203
Aquifer System: KEKAHA - 20301

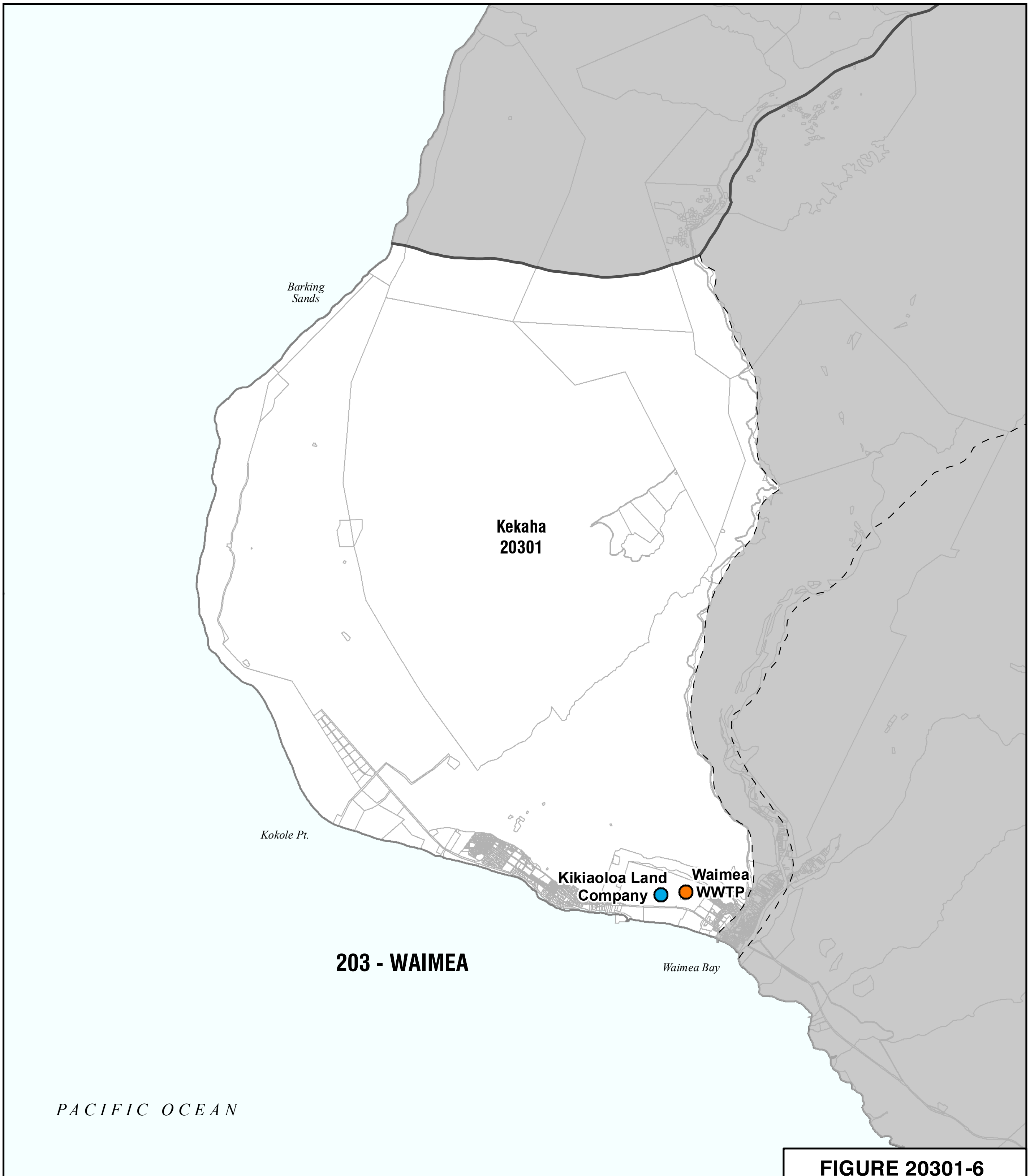
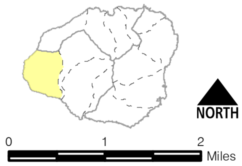


FIGURE 20301-6

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- TMK
- Wastewater Facilities
- Area irrigating with recycled water

WASTEWATER RECLAMATION FACILITIES

Aquifer Sector: WAIMEA - 203
Aquifer System:
Kekaha - 20301

20301-3 EXISTING WATER USE

20301-3.1 General

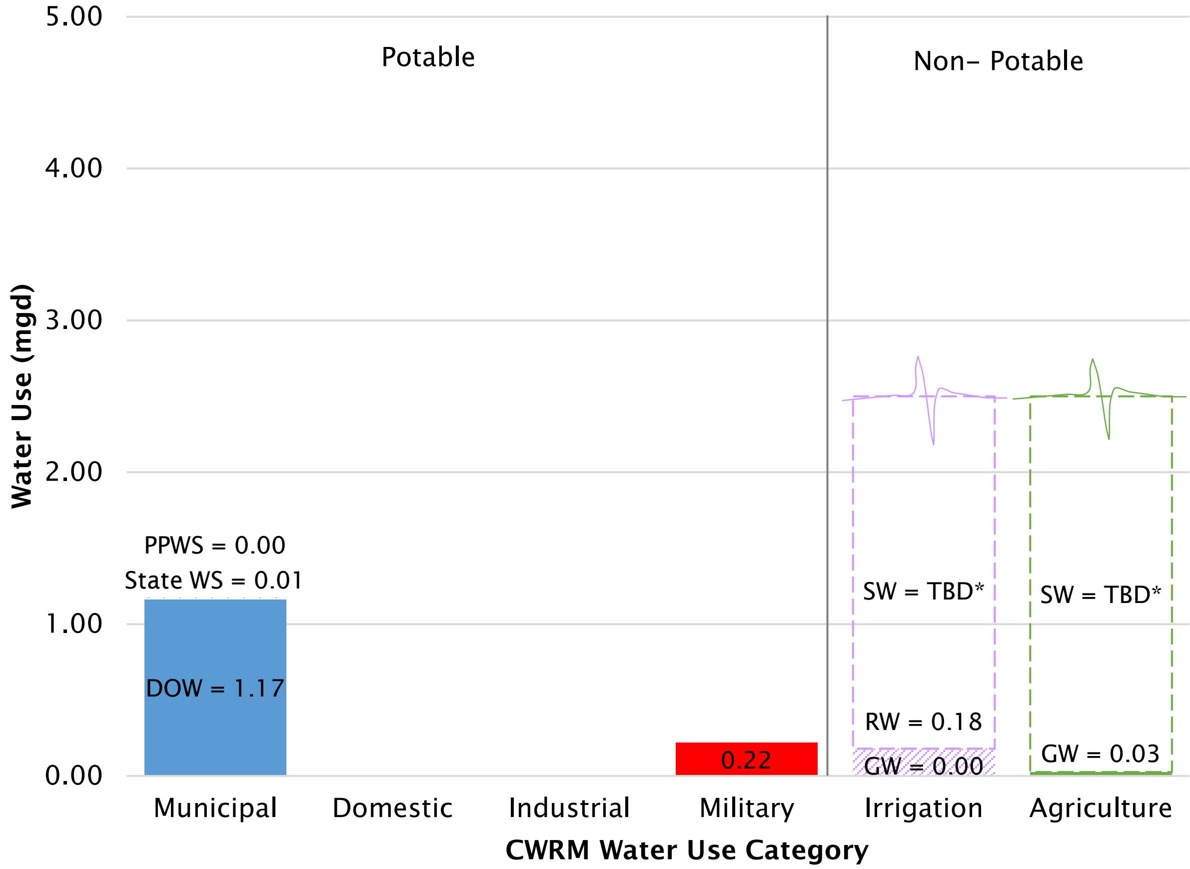
The following section presents the total estimated average water use within the Kekaha ASYA. The total estimated average water use was based on data from CWRM (well pumpage) and DOH (Sanitary Surveys for Public Water Systems and estimated recycled water usage) for the year of 2014. Well classification changes since 2014 are noted in the sub-sections below. **Table 20301-6** and **Figure 20301-7** summarize the water use in accordance with CWRM categories.

Table 20301-6: Existing Water Use by Category – Kekaha ASYA

CWRM Category	Ground Water (mgd)	Other Sources (mgd)	Total (mgd)	Percent of Total
Domestic	0.00		0.00	0.0
Industrial				
Irrigation	0.00	0.18[1]	0.18	11.2
Agriculture	0.03	TBD[2]	0.03	1.7
Military	0.22		0.22	13.7
Municipal				
DOW System	1.17		1.17	72.7
State System	0.01		0.01	0.7
Private-Public WS	0.00		0.00	0.0
TOTAL	**1.43**	**0.18**	**1.61**	**100.0**

[1] Recycled Water
[2] Surface Water – TBD from AWUDP

Figure 20301-7: Existing Water Use by Category – Kekaha ASYA



*Values to be determined by other components of the Hawai‘i Water Plan

20301-3.2 Domestic Use

There is 1 well classified as "Domestic" in the 2014 CWRM database; however, it has not reported pumpage.

20301-3.3 Industrial Use

There are no wells classified as "Industrial" in the CWRM database.

The Waiawa Hydropower plant was built in 1908 in the Kekaha Ditch System to boost water to upland sugarcane fields. The plant is owned and operated by the State Department of Agriculture's Agribusiness Development Corporation (ADC) and Kekaha Agricultural Association (KAA) and has the capacity to produce 0.50 MW of power.

The Westside Pumped Storage Hydropower plant is a proposed solar/pumped hydro storage project in Kōke‘e that will utilize water from the Kōke‘e Ditch Irrigation System. Once completed, the plant will produce up to 25 MW of power.

20301-3.4 Irrigation Use

Irrigation use has been divided into ground water, recycled water, and surface water.

20301-3.4.1 Ground Water

There is one well classified as "Irrigation – Parks" in the CWRM database and is owned by DLNR – State Parks Division. This well provides ground water for the Polihale State Park Water System and is discussed in **Section 20301-3.7.2**.

20301-3.4.2 Recycled Water

The Waimea WWRF provides agriculture irrigation R-1 water to the County of Kauaʻi. See **Section 20301-3.5.2** for additional information.

20301-3.4.3 Surface Water

Information on surface water use for irrigation is to be determined by the AWUDP. However, typically, due to the location of parks and other landscaped areas within communities, it is assumed that it is unlikely for landscaping to be irrigated with surface water.

20301-3.5 Agricultural Use

Agricultural use has been divided into ground water, recycled water, and surface water.

20301-3.5.1 Ground Water

There are 16 wells classified as "Agriculture" in the CWRM database, with 10 wells further classified as AGRCP - crops and processing and the other six wells further classified as AGRAQ – aquatic plants and animals. Nine of the AGRCP wells are owned by Kekaha Sugar with total reported pumpage of 0.02 mgd. The other AGRCP well is owned by Pioneer Hi-Bred International, Inc., with no reported pumpage. Four of the wells classified as AGRAQ are owned by Sunrise Capitol, and the two wells reporting pumpage pump salt water. There is no reported freshwater pumpage from the wells owned by Sunrise Capitol. The other two AGRAQ wells are owned by Sunkiss Shrimp Co., Ltd. with no reported pumpage.

20301-3.5.2 Recycled Water

The Waimea WWRF has provided agriculture irrigation R-2 water to the Kikiaola Land Company (KLC) since 1973 but currently provides R-1 water to the County of Kauaʻi.

20301-3.5.3 Surface Water

The Kekaha Ditch Irrigation System and Kōkeʻe Ditch Irrigation System were studied as part of the 2004 AWUDP. The service area and existing surface water use for both systems were not reported. Current surface water use for both systems is unknown.

20301-3.6 Military Use

There are two wells classified as "Military" in the CWRM database. One well is owned by Naval Facilities Engineering Command, Hawai'i (NAVFAC Hawai'i) and has not reported any pumpage.

The other well is owned by the U.S. Department of the Navy, and has reported pumpage of 0.22 mgd. This well partially supplies the Pacific Missile Range Facility water system and is further discussed in **Section 20301-4.7.3**.

20301-3.7 Municipal Use

There are 7 wells in the CWRM database classified as "Municipal," with 6 further classified as MUNCO – Municipal County and 1 further classified as MUNST – Municipal State. Municipal can be subcategorized into the other water use categories: Domestic, Industrial, Agricultural, Military, and Municipal.

20301-3.7.1 County Water Systems

Kekaha-Waimea Water System

The DOW has one major water system that serves the Kekaha ASYA. The Kekaha-Waimea water system is DOH Public Water System (PWS) No. 406 and services areas in both the Kekaha ASYA and Waimea ASYA. This water system serves the rural community of Kekaha and Waimea primarily for residential and agricultural needs. A service connection for the Pacific Missile Range Facility (PMRF) exists at the westernmost end of Kekaha town. Water for this system is supplied by 6 wells. **Table 20301-7** lists the water sources, well numbers, pumping capacities, pressure zones, and pumpage amount.

Table 20301-7: DOW Kekaha-Waimea Water System Water Sources

WELL NAME	WELL NUMBER	PUMPING CAPACITY (gpm)	PRESSURE ZONE (ft)	PUMPAGE (mgd)
Waipao Valley Well "B"	2-5943-002	700	Waimea 196	0.48
Paua Valley Well	2-5942-001	500	Kekaha 196	0.31
Kekaha Shaft No. 12	2-5843-001	300	Kekaha 196	0.02
Kapilimao Valley Well	2-5841-002	700	Kekaha 196	0.24
Waimea Well "A"	2-5840-001	200	Waimea 196	0.06
Waimea Well "B"	2-5840-002	210	Waimea 196	0.06

Except for a small high service area at 540' on the Waimea side, the primary pressure zone is at 196'. Both Waimea and Kekaha have 196' pressure zones. There are 6 storage tanks in the Kekaha-Waimea water system.

The Kekaha-Waimea Booster Station pumps water from the Kekaha 196' zone to the Waimea 196' zone due to the distance between the Kekaha and Waimea service areas, as needed. Flow can reportedly be reversed to feed the Kekaha system by gravity. The Waimea Heights Booster Pump

Station pumps water from the Waimea 0.25 MG tank at the 196' zone to the Waimea Heights 0.1 MG tank at the 540' zone.

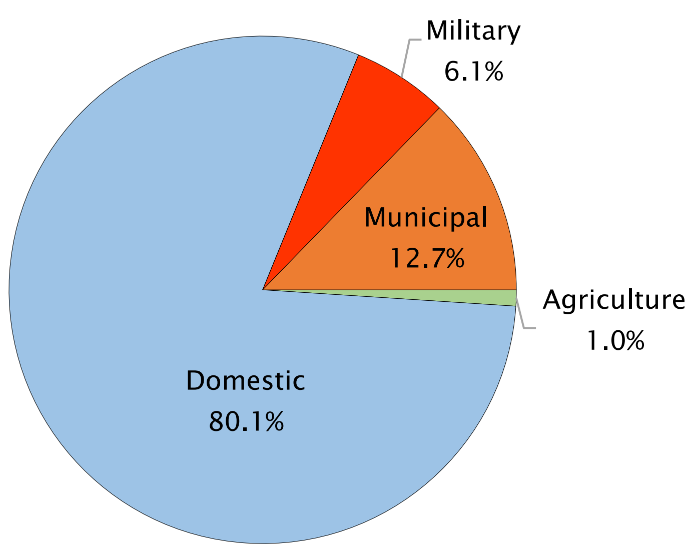
DOW Water Use by Category

DOW water use is subcategorized in **Table 20301-8** to the extent possible based on available meter data and is depicted in **Figure 20301-8**.

Table 20301-8: DOW Existing Water Use by Category – Kekaha Aquifer System Area

CWRM Water Use Category	DOW Metered Water Use (mgd)	Percent of Total
Agricultural	0.008	1.0
Domestic	0.605	80.1
Industrial	0.000	0.0
Military	0.046	6.1
Municipal	0.096	12.7
Total	**0.755**	**100.0**

Figure 20301-8: DOW Existing Water Use by Category – Kekaha ASYA



20301-3.7.2 State Water Systems

The Polihale State Park water system (PWS 426) is a transient, non-community water system and is the only State water system in the Kekaha ASYA regulated by the DOH. The water system is owned by the State Department of Land and Natural Resources' (DLNR) State Parks Division. The water system serves 300 people through a single service connection per the 2014 DOH Sanitary Survey. Water is provided to this remote park's toilets and showers via the Polihale (Ka'ula'ula) well (2-0545-001) with reported pumpage of 0.01 mgd.

20301-3.7.3 Federal Water Systems

The PMRF water system (PWS 430) is the only federal water system on the island of Kaua'i regulated by the DOH and is located in the Kekaha ASYA. The water system is owned by the U.S. Department of the Navy and is operated by Koa Lani Joint Venture. The water system serves 1,200 people through 185 service connections and provides drinking water to the entire PMRF base, including fire protection and mechanical/industrial use per the 2014 DOH Sanitary Survey. The water system receives water from two sources. The main water source is from Mana Shaft (2-0245-002) with reported pumpage of 0.22 mgd, which supplies the north side of the base. As previously mentioned, a service connection with the Kekaha-Waimea water system supplies the south side of the base. Water can be moved from the south side of the base to the north side of the base, but not in the reverse direction.

20301-3.7.4 Private-Public Water Systems

There are no private-public water systems in the Kekaha ASYA regulated by the DOH.

20301-3.7.5 Per Capita Use

The per capita existing water use consumption based on domestic DOW metered water use and federal water system use is presented in **Table 20301-9**. The per capita use in the Kekaha ASYA is approximately 4.4% higher than the overall County of Kaua'i per capita use.

Table 20301-9: Per Capita Use – Kekaha ASYA

	DOW Metered Water Use – Domestic (mgd)	Federal Water System (mgd)	90% of 2015 Population	Per Capita Use (gpd)
Kekaha ASYA	0.605	0.219	4,064	202
County of Kaua'i	**9.360**	**2.951**	**63,462**	**194**

20301-3.8 Existing Water Use by Resource

20301-3.8.1 Ground Water

Table 20301-10 summarizes the current production, sustainable yield (SY), and percentage of SY for the current production. Current production is represented by the 2014 average yield calculated from the actual pumping data.

Table 20301-10: Pumpage – Kekaha ASYA

Pumpage (mgd)	SY (mgd)	Pumpage Portion of SY
1.43	10	14.3%

Based on available information from the CWRM database, the current ground water use is 14.3 percent of the sustainable yield.

20301-3.8.2 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP.

The Kekaha Ditch Irrigation System and Kōke‘e Ditch Irrigation System provide irrigation water for agriculture. In 2015, it was estimated that the Waiawa Hydropower Plant on the Kekaha Ditch Irrigation System required approximately 21 mgd of water flowing through it to generate power to perform essential functions, such as pumping to lower the ground water table in the Mana Plain for farming and to prevent flooding of PMRF and local communities. However, according to the Waimea Watershed Agreement, dated April 18, 2017, no more than 10 mgd can be diverted at Hukipo Flume after three years from the agreement unless reasonable agricultural uses require more water and CWRM confirms that the additional waters can be provided consistent with the Interim Instream Flow Standards (IIFS).

20301-3.8.3 Water Conservation

Water conservation, including water loss management, may reduce water use. See **Section 20301-2.3** for existing conservation efforts.

20301-3.8.4 Rainwater Catchment

Developed parcels that are not supplied by ground water or surface water are assumed to be supplied by rainwater catchment.

20301-3.8.5 Recycled Water

Recycled wastewater from the Waimea wastewater reclamation facility is used for agriculture irrigation. Refer to **Table 20301-5** presented earlier.

20301-4 FUTURE WATER USE

20301-4.1 Full Build-Out Water Demand Projections

The full build-out water demand projections based on the General Plan and County Zoning for the Kekaha ASYA is listed in **Table 20301-11** and **20301-12**, respectively. Each land use class is associated with the most appropriate CWRM water use category.

Table 20301-11: General Plan Full Build-Out Water Demand Projection – Kekaha ASYA

General Plan Category	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	0.20
Open	Domestic	0.02
Military	Military	0.61
Park	Irrigation	0.88
Residential	Domestic/Municipal	1.91
Resort	Domestic/Irrigation/Municipal	0.32
Transportation	Municipal	0
Urban Center	Domestic/Industrial/Municipal	0
DHHL	Domestic	0.34
	TOTAL	**4.28**

Table 20301-12: Zoning Full Build-Out Water Demand Projection – Kekaha ASYA

Zoning Class	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	0.20
Commercial	Municipal	0.09
Industrial	Industrial/Municipal	0.07
Open	Domestic	0.02
Project Development	Domestic/Municipal	0.05
Residential	Domestic/Municipal	0.83
Resort	Domestic/Irrigation/Municipal	0.12
DHHL	Domestic	0.34
	TOTAL	**1.72**

20301-4.1.1 Refined Land Use Based Water Projection

State Water Projects Plan

Table 20301-13 lists future State water projects reported in the 2021 SWPP update. The total projected demand to the year 2034 for these five State water projects within the Kekaha ASYA is 26.143 mgd, 0.338 mgd using potable and 25.806 mgd using non-potable sources.

Table 20301-13: Future State Water Projects – Kekaha ASYA

Project Name	State of Hawai'i Department	Primary Use	Water Development Strategy	2034 Demand (mgd)
Kekaha	DHHL	Potable	REMAIN	0.0725
Waimea – Mauka Village	DHHL	Potable	NEWSWS	0.2635
Waimea (Non-Potable 1)	DHHL	Non-potable	EXSWS	12.4557
Waimea (Non-Potable 2)	DHHL	Non-potable	OTHER-STREAM DIVERSION	13.3500
Kekaha Armory	OHA	Potable	REMAIN	0.0015
			TOTAL REMAIN	0.0740
			TOTAL KEKAHA ASYA SWPP 2034 DEMAND	26.143

As mentioned in **Section 2.2.2.5.1**, State water projects with the water development strategy of REMAIN are located within the service areas of County water systems which need to be coordinated with the respective County water departments. Two of the five State projects within the Kekaha ASYA were assigned the REMAIN water development strategy and results in a total 2034 demand of 0.0740 mgd. This accounts for 0.74 percent of the 10 mgd sustainable yield for the Kekaha ASYA. See the following paragraph for more information on the DHHL projects within the Kekaha ASYA.

State Department of Hawaiian Home Lands

The Waimea Tract is the DHHL tract located within the Kekaha ASYA and is the largest DHHL tract on Kaua'i at approximately 15,000 acres in size. The State Water Projects Plan – DHHL Update (SWPP), dated May 2017, discusses the projected water demands for DHHL and the proposed water development strategies to meet these water demands. The DHHL demands have also been incorporated into the SWPP Update, dated May 2021. See **Table 20301-13** for a breakdown of the demands. The projected potable water demands for the Waimea tract is 0.336 mgd, which may be met by developing a new state water system.

The 2017 SWPP also discussed non-potable demands. It projects that non-potable demand for the Waimea Tract will be 25.806 mgd, and that the need may be met by the Kōke'e Ditch Irrigation System, if the Pu'u Ōpae Reservoir is restored and by diverting water from Kinekine Ditch. Part of the non-potable demand is based on estimated lo'i kalo area, which is subject to change when the quantity of available resources are determined.

Agricultural Water Use and Development Plan

The AWUDP dated 2003 (revised 2004) was limited in scope. More recent, comprehensive information on agricultural lands is available in the County of Kaua'i Important Agricultural Lands (IAL) Study.

In 2019, a public review draft of the AWUDP was released and it is anticipated that the next phase of the AWUDP will provide agricultural water demand projections in greater detail and will supersede information in the KWUDP when it becomes available.

County of Kaua'i Important Agricultural Lands Study

7,555 acres of agricultural lands within the Kekaha ASYA received a score of 28 or better in the County of Kaua'i Important Agricultural Lands (IAL) Study. Lands that receive a score of 28 or better were determined to have met all eight IAL criteria to some degree. Only a subset of lands with a score of 28 or better is expected to be designated as IALs. **Table 20301-14** compares these lands that received a score of 28 or better to the declared surface water use from diversions and to the diversified water use rate of 3,400 gallons per acre per day (gpad) estimated in the 2004 AWUDP.

Table 20301-14: Irrigation of Agricultural Lands

(1) Declared Surface Water Use from Diversions (mgd)	51.86*
(2) Agricultural Lands with a Score ≥ 28 (Acres)	7,555
- How many acres can be sustained by **(1)** at a water rate of 3,400 gpad? (Acres)	15,253
- What percent of **(2)** can be sustained with a water rate of 3,400 gpad?	202%
- If all of **(2)** were to be irrigated, what is the water unit rate? (gpad)	6,865

* Total declared flow originally associated with KODIS and KEDIS. However, as a result of the Waimea Watershed Agreement, the interim IFS were amended such that flow in the stream has highest priority with diversions only as needed for other uses with the interim IFS numbers being the minimum stream flow to be provided.

20301-4.1.2 Water Use Unit Rates

Water use unit rates are based on the *Water System Standards* (WSS), as discussed in Chapter 2.

The General Plan provides only broad density guidelines for residential and resort designations. For these designations, under the assumption that most residents would like their communities, including the development density, to remain similar in the future, the average number of dwelling units as allowed by zoning was used as the density (i.e., 4.66 dwelling units per acre for residential designation and 4.00 dwelling units per acre for resort designation).

20301-4.2 Water Demand Projections to the Year 2035

The following section presents water demand projections to the year 2035 for the Kekaha ASYA. The projected low, medium, and high growth rates are listed in **Table 20301-15** and are graphed in **Figure 20301-9**. Potable (domestic, industrial, municipal, and military water uses) and non-potable (irrigation) water demands are also differentiated.

Table 20301-15: Water Demand Projection – Kekaha ASYA

Water Use Category	Water Demand by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
GROWTH RATE C (HIGH)									
TOTAL	**1.58**	**1.59**	**1.60**	**1.61**	**1.62**	**1.63**	**1.69**	**1.76**	**1.83**
Potable	1.40	1.41	1.42	1.43	1.44	1.45	1.50	1.56	1.62
Non-Potable	0.18	0.18	0.18	0.18	0.18	0.18	0.19	0.20	0.21
GROWTH RATE B (MEDIUM)									
TOTAL	**1.58**	**1.59**	**1.60**	**1.61**	**1.62**	**1.63**	**1.69**	**1.75**	**1.82**
Potable	1.40	1.41	1.42	1.43	1.44	1.45	1.50	1.55	1.61
Non-Potable	0.18	0.18	0.18	0.18	0.18	0.19	0.19	0.20	0.21
GROWTH RATE A (LOW)									
TOTAL	**1.58**	**1.58**	**1.58**	**1.58**	**1.58**	**1.59**	**1.62**	**1.65**	**1.68**
Potable	1.40	1.40	1.40	1.40	1.40	1.41	1.44	1.47	1.50
Non-Potable	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18

Figure 20301-9: Water Demand Projection Summary – Kekaha ASYA

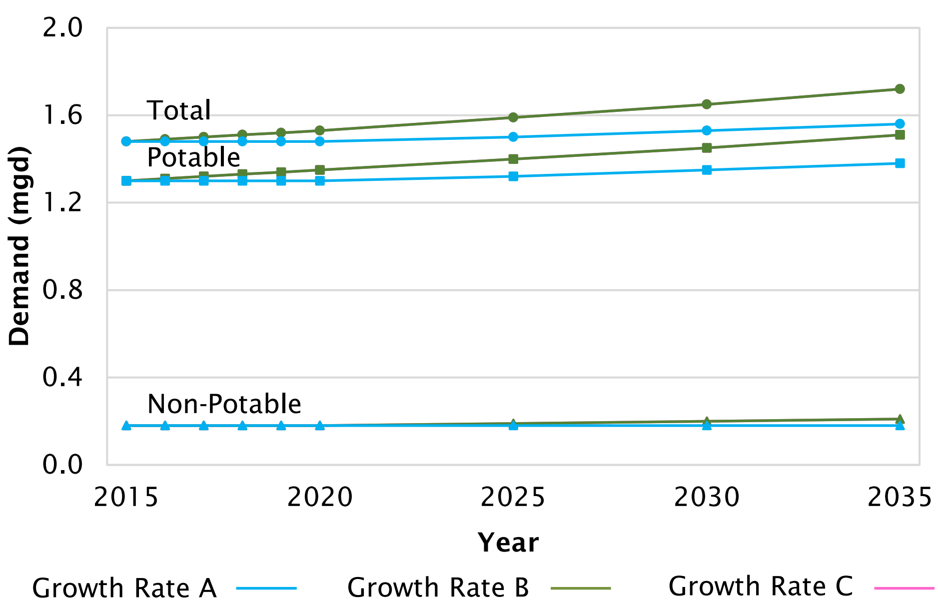


Figure 20301-10 shows the breakdown of water demand projections for a medium growth rate by CWRM categories through the year 2035. **Table 20301-16** summarizes this figure.

Figure 20301-10: Medium Growth Rate B Water Demand Projection by Category – Kekaha ASYA

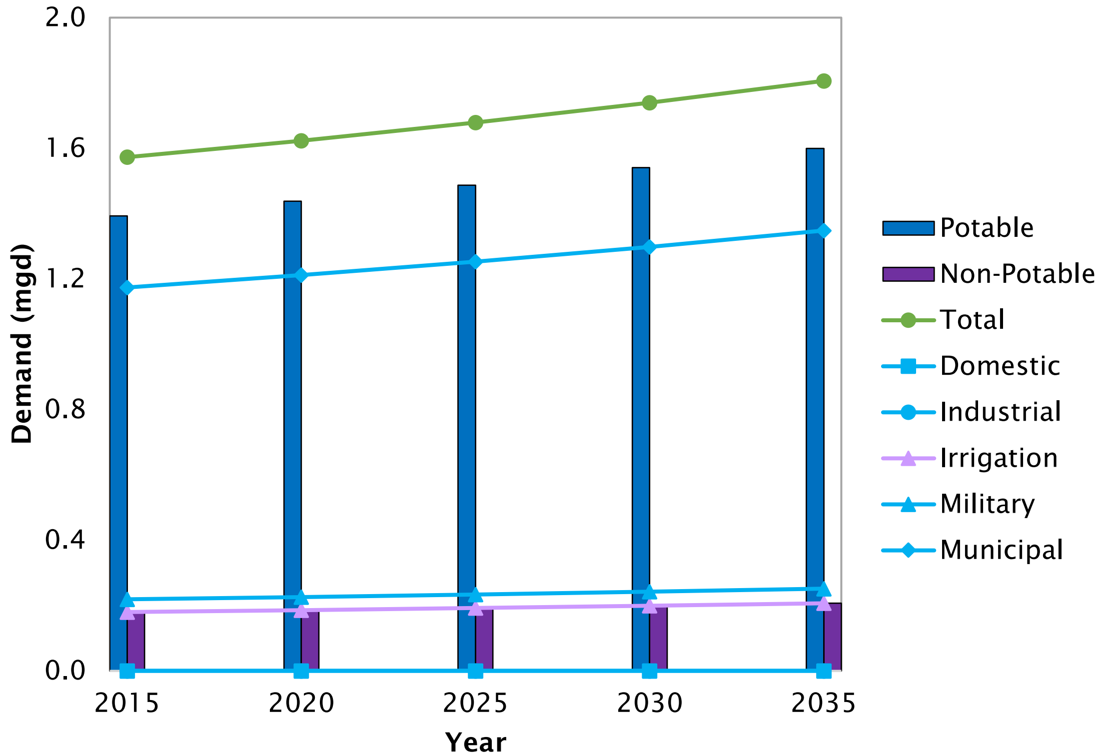


Table 20301-16: Medium Growth Rate B Water Demand Projection by Category – Kekaha ASYA

Water Use Category	Water Use by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
Total	**1.58**	**1.59**	**1.60**	**1.61**	**1.62**	**1.63**	**1.69**	**1.75**	**1.82**
Potable	1.40	1.41	1.42	1.43	1.43	1.44	1.49	1.55	1.61
Non-Potable	0.18	0.18	0.18	0.18	0.18	0.18	0.19	0.20	0.21
Domestic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Irrigation	0.18	0.18	0.18	0.18	0.18	0.18	0.19	0.20	0.21
Military	0.22	0.22	0.22	0.22	0.23	0.23	0.24	0.24	0.25
Municipal	1.18	1.19	1.19	1.20	1.21	1.22	1.26	1.31	1.36
DOW	1.17	1.17	1.18	1.19	1.20	1.20	1.24	1.29	1.34

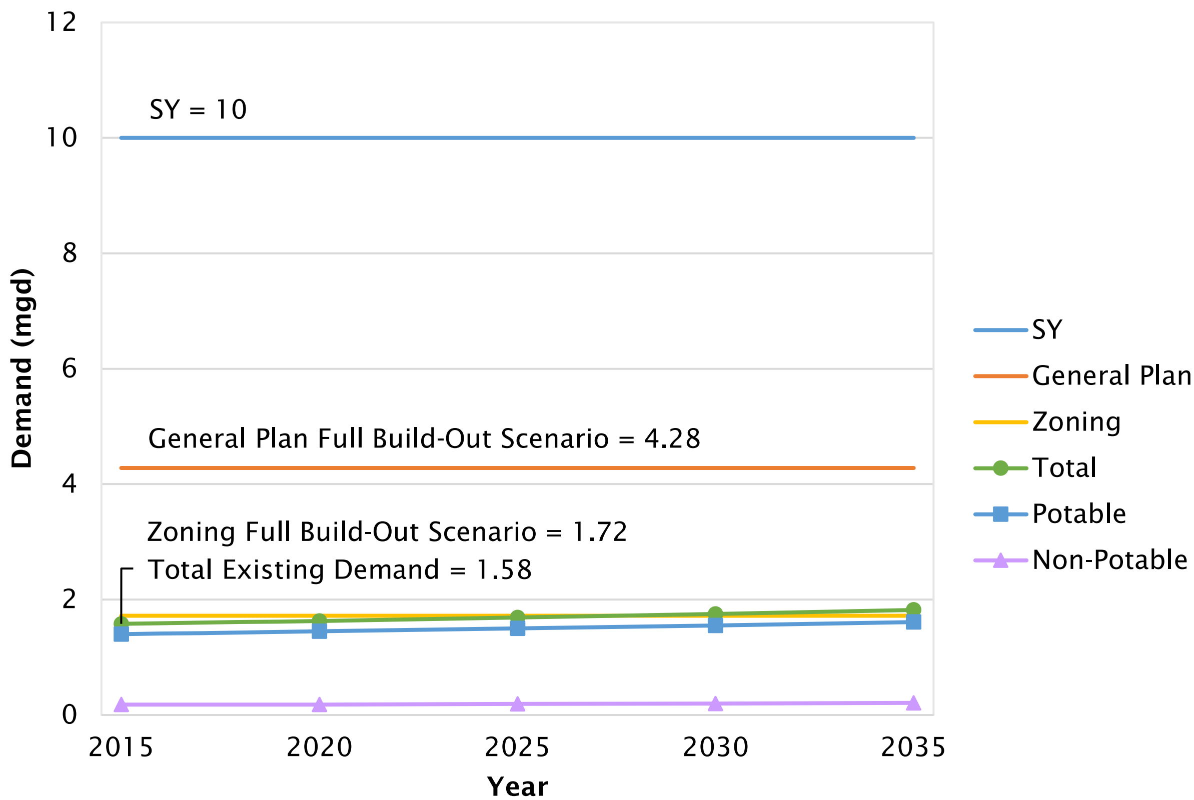
20301-4.3 Summary

Figure 20301-11 illustrates the magnitude of the sustainable yield, both General Plan and Zoning full build-out water use projections, and water use projection through the year 2035 focusing on Medium Growth Rate B. **Table 20301-17** summarizes the General Plan, Zoning, and 20-year water demand projection scenarios for the Kekaha ASYA. The sustainable yield is presented to draw comparisons. All demands are in mgd.

Table 20301-17: Summary of Demand Projections

SY (mgd)	FBO (mgd)		Medium Growth Rate Demand by Year (mgd)								
	GP	Zoning	2015	2016	2017	2018	2019	2020	2025	2030	2035
10	4.28	1.72	1.58	1.59	1.60	1.61	1.62	1.63	1.69	1.75	1.82

Figure 20301-11: Medium Growth Rate B Water Demand Projections and Full Build-Out – Kekaha ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use. For future agricultural water use analysis, please see Section 20301-4.1.1 County of Kaua 'i Important Agricultural Lands Study.

20301-5 RESOURCE AND FACILITY RECOMMENDATIONS

20301-5.1 Water Source Adequacy

20301-5.1.1 Full Build-Out

Development to the highest extent allowed by the General Plan and County Zoning within the Kekaha ASYA is sustainable, with General Plan and County Zoning full build-out water demands requiring 42 and 17 percent of the 10 mgd sustainable yield, respectively.

20301-5.1.2 Twenty-Year Projection

The 2035 water demand projection for the Kekaha ASYA is sustainable and is only 18 percent of the 10 mgd sustainable yield.

20301-5.2 Source Development Requirements

20301-5.2.1 Supply-Side Management

Supply-side management, including conventional water resource measures, water conservation, and alternative water resource measures, were evaluated to meet projected water demands.

Conventional Water Resource Measures

Ground Water

The Kekaha ASYA contains basal ground water. The basal lens is protected by a thick sedimentary caprock along the coast.

The 2035 water demand projection for the Kekaha ASYA is only 18 percent of the 10 mgd sustainable yield. This indicates that theoretically, more water could be pumped from the aquifer without impairing the utility or quality of the water resource if wells are optimally placed and the proper due diligence with regard to traditional and customary rights and impacts has been completed. However, it is noted that sustainable yield does not consider the feasibility of developing the ground water resources, and that the safe yield of an individual production well may be limited by localized ground water behavior near the well as a result of pumpage. Water supply reliability and quality, feasibility, environmental and cultural impacts, and water rights shall be considered as projects and programs develop. More detailed and site-specific evaluation of these impacts shall be required and accomplished through the environmental review process (HRS Chapter 343) for source development projects and programs utilizing public funding, and CWRM could consider requiring compliance with the environmental review process for private source development projects and programs also. **Section 1.5.3.1** provides additional information regarding the protection of traditional and customary rights.

The DOW's Kekaha-Waimea water system serves the rural communities of Kekaha and Waimea and the PMRF. The DOW's Water Plan 2020 identified projects to meet future demands of its service areas. DOW has completed most of the water supply projects that were proposed for the Kekaha-Waimea water system, including construction of the Kapilimao Valley Well and rehabilitation of the Kekaha Shaft No. 12. Due to the completed source development projects and the area's slow growth, no additional source development projects are required to meet near-future demands.

The DOW's Water Plan 2020 also identified potential storage and distribution system upgrades. Proposed improvements include rehabilitation of the Paua Valley Tank No. 1 and replacement of older and undersized mains in Kekaha, Waimea Town, Waimea Heights, and Waimea Valley.

It is noted that there are 16 wells classified as agriculture in the Kekaha ASYA. Generally, the quality of the water source should be matched to the quality of the water needed, and it is recommended that ground water sources be primarily used as potable drinking water for human consumption.

Surface Water

There are three declared diversions within the Kekaha ASYA, and there are two existing irrigation systems that serve the Kekaha ASYA. The two irrigation systems are the Kekaha Ditch Irrigation System (KEDIS) and the Kōkeʻe Ditch Irrigation System (KODIS). Both irrigation systems have their intakes in the Waimea ASYA and deliver the water to their service areas in the Kekaha ASYA.

In 2017, interim instream flow standards (IIFS) related to these irrigation systems were established through the Waimea Watershed Agreement to take steps to restore flows in streams. The agreement notes that diversions must be justified with no more water taken than is needed for other beneficial uses. Beneficial uses include agriculture and renewable energy, and the irrigation systems should continue to be maintained to allow for present and future uses. Water for agricultural uses by ADC (and its licensees) and water for uses by DHHL will be provided as long as the amounts are reasonable in their consumption levels and in relation to the water provided to the streams. DHHL has a water reservation of 6.903 mgd, and additional reservations are planned based on the 2017 SWPP projected demands. The 2017 SWPP identifies KODIS as the potential source for the projected potable and non-potable demands of DHHL's Waimea tract.

The Kauaʻi Island Utility Cooperative (KIUC) is exploring an energy project in West Kauaʻi. If the hydropower project is developed, the second phase of the IIFS numbers from the Waimea Watershed Agreement will go into effect. In this second phase, KIUC will receive a rolling average of 11 mgd from KODIS. This will support both KIUC's Puʻu Ōpae project and DHHL's water needs that are to be served by KIUC's project infrastructure.

Water Transfer

As mentioned above, the intakes for the KEDIS and KODIS are located in the Waimea ASYA, and irrigation water from these systems is transferred to service areas in the Kekaha ASYA.

Water can also be transferred between ASYAs through public water systems. The DOW's Kekaha-Waimea water system services areas in the Kekaha ASYA and the Waimea ASYA, with all of its water sources located in the Kekaha ASYA. The water sources feeding into this system are located in the Kekaha ASYA. The Waimea Booster Station has the capability to transfer water from Kekaha to Waimea. The system does not currently have the capability to transfer water in the reverse direction, from Waimea to Kekaha.

Water Conservation

The per capita use in the Kekaha ASYA is approximately 4.4% higher than the overall County of Kaua'i per capita use. There are no ASYA-specific conservation measures in place at this time; however, there are general water conservation programs that are described in **Section 1.5.7**. Water conservation, including water loss management, can increase the amount of water available and help to ensure the long-term viability of water resources.

Alternative Water Resource Measures

Rainwater Catchment

Rainwater can be utilized as a water resource in several ways.

Rainwater can be harvested in rainwater catchment systems which can be utilized to supply domestic potable water needs. These systems are viable in areas that receive abundant rainfall and are a suitable source of potable water for individual domestic users in areas outside the limits of municipal water systems. Generally, these are remote areas and are not expected to expand significantly because most development is anticipated to be concentrated within existing urban areas. Therefore, use of rainwater catchment systems is not anticipated to increase significantly.

Rainwater can also be used to supplement or satisfy agricultural non-potable water needs through ambient rainfall.

See the Storm Water Reuse section below to see how rainwater as storm water runoff can be reclaimed and reused.

Storm Water Reuse

Rainfall can turn into storm water runoff. Storm water runoff from impervious surfaces in urban areas can be significant. This water could be captured, treated, and used as a source of non-potable water (e.g. irrigation), integrated with recycled water, or even as potable and/or non-potable ground water recharge. However, due to the lack of storm water reuse standards, the high initial infrastructure costs, and the treatment requirements, storm water reclamation and reuse on a small or large scale may not be feasible and requires further assessment as noted in the Water Resource Protection Plan. The U.S. Department of the Interior, Bureau of Reclamation published An Appraisal of Stormwater Reclamation and Reuse Opportunities in Hawai'i (Storm Water Report) in 2008 but did not identify any storm water reclamation and reuse opportunities in the Kekaha ASYA.

Recycled Water

Recycled water is a valuable resource; an increase in its use may lower the dependence on potable sources. The Waimea wastewater reclamation facilities (WWRF) is the only WWRF in the Kekaha ASYA, and it produces R-1 water. Comparing the current reuse amount from this facility to its design capacity, it appears that there is recycled water available to meet additional demands, see **Table 20301-18** below. However, the actual additional recycled water use is dependent on several factors, including the quantity of wastewater generated (which may be significantly less than the design capacity), the local demand for recycled water, and the number of viable users within close proximity to the facility.

Table 20301-18: Wastewater Reclamation Facilities Available Capacity – Kekaha ASYA

WWRF/ WWTP	Reclaimed Water Classification	Design Capacity (mgd)	Quantity Produced (mgd)	Current Reuse Amount (mgd)	Available Capacity (mgd)
Waimea WWRF	R-1	0.7	0.3	0.18	0.52

The County is constructing onsite storage at the Waimea WWRF that will allow for the irrigation of Waimea Athletic Field with recycled water. The field is currently irrigated with potable water; therefore, recycled water will replace potable water as the source of irrigation water for this area.

Desalination

Desalination of brackish ground water is a potential alternative; however, due to its high capital and operational costs, it likely would not be considered when other potable water sources are available.

20301-5.2.2 Demand-Side Management

Development Density Control

The full build-out demand for the Kekaha ASYA based on County Zoning is 1.72 mgd which is 17 percent of the sustainable yield. This indicates that there are adequate water resources to sustain the level of development that is allowed by law. In the Kekaha ASYA, the average number of dwelling units allowed by County Zoning is 4.66 dwelling units per acre in residential districts and 4.00 dwelling units per acre in resort districts.

The full build-out demand for the Kekaha ASYA based on the General Plan is 4.28 mgd which is 42 percent of sustainable yield. Therefore, development density control may not be necessary. However, the County Planning Department could consider development density control for areas where there is the flexibility to do so, such as areas that are not yet zoned as residential or resort, and promote sustainable development. Further, it is noted that the full build-out scenario is unlikely to occur since it assumes all land is developed to the maximum extent.

20301-5.3 Recommended Alternatives

To optimize appropriate use of water resources, the quality of the water source should be matched to the quality of water required. The highest quality of water shall be reserved for the most valuable end use. Potable water is considered the highest quality water, and the sustenance of life is the most valuable end use. Recycled water, brackish water, untreated surface water, and other lower quality water sources should be used for landscaping and agriculture when available, thereby reserving potable water for human consumption. If there is a practical alternative water source available, that alternative source should be used in lieu of ground water or surface water. With this in mind, the following recommendations are made for the Kekaha ASYA:

Alternative Water Resources

Alternative water sources, such as recycled water generated from wastewater reclamation facilities, should be used where available to reduce demands on both ground and surface water resources and to conserve water resources as a whole. Recycled water is available from the Waimea WWRF; however, as discussed previously, successfully increasing the use of recycled water is dependent on several factors, including the number of viable users within close proximity to the facilities.

Conservation

Water resources are a finite resource that should be managed and used wisely. It should be conserved and not wasted. Implementation of conservation measures should continue to be encouraged.

Ground Water

Meeting future demands at a reasonable cost is a planning objective, and conventional sources, such as ground water, are typically the most cost-effective means for meeting projected water demands. Projected potable water needs are within the sustainable yield for this area. Therefore, ground water resources could continue to be used and developed to meet potable water needs now and into the future. However, as noted above, development of conventional water resource measures can have challenges, and water supply reliability and quality, feasibility, environmental and cultural impacts, and water rights shall be considered as projects and programs develop.

Development of ground water resources is the primary strategy to serve future potable demands in the Kekaha ASYA. However, due to the completed ground water development projects and the area's slow growth, no additional source development projects are anticipated to be required to meet near-future demands.

Surface Water

Surface water, where available, should be used to meet non-potable demands if alternative water resources are not available. As discussed in the Waimea Watershed Agreement, diversions must be justified with no more water being taken than is needed for beneficial uses, such as for agriculture and renewable energy, and the established interim instream flow standards (IIFS) shall be met. In addition, it is critical that the KODIS and KEDIS continue to be maintained to allow for present and future uses. Utilization of surface waters for non-potable water demands has the potential to minimize future dependence on the use of ground water.

Demand-Side Management

Full build-out demand based on the General Plan is 42 percent of sustainable yield. At this projection, implementation of development density control by the County Planning Department is not needed in this area. Although the projection is sustainable, the County Planning Department will need to consider potential impacts on available water resources when considering any future zoning modifications. Modifications that may result in increased development density within the area will increase demands on water resources.

Chapter 20302

Waimea Aquifer System Area

CHAPTER 20302 - TABLE OF CONTENTS

FIGURES

TABLES

20302 WAIMEA AQUIFER SYSTEM AREA

20302-1 SYSTEM AREA PROFILE

20302-1.1 General

The Waimea [20302] Aquifer System Area (ASYA) is roughly bound on the west and northwest by Waimea Canyon Drive and Kōkeʻe Road from Waimea town to past the end of Kōkeʻe Road, along the northeast side along the west ridge above the Wainiha River and through a portion of the ʻAlakai Swamp near the head of the Halepaʻakai Stream, and back down to Waimea town along the east ridge of the Mokihana Stream and Waimea River.

The Waimea ASYA includes the east side of Waimea Town, Kōkeʻe State Park, and the Waimea Canyon.

Average annual rainfall ranges from 25 inches per year along the coast to 320 inches in the mountains. The sustainable yield is 37 mgd.

20302-1.2 Economy and Population

20302-1.2.1 Economy

Lands within the Waimea ASYA are largely uninhabited and undeveloped. Rural residential and community commercial areas are concentrated in proximity to Waimea Town, nearer to the shoreline area and Kaumualiʻi Highway. The largest industries in Waimea are related to accommodations and food service, healthcare and social assistance and retail trade.

20302-1.2.2 Population

The population contributing to the demand within the Waimea ASYA is almost completely located in the residential area located in Waimea town. Scattered residences located in proximity to Kōkeʻe State Park mainly rely on catchment systems and therefore do not contribute to water demand in this ASYA.

Historical population data for the Waimea ASYA is summarized in **Table 20302-1**. Population projections through the year 2035 are summarized in **Table 20302-2a**. As summarized in **Table 20302-2b**, it is estimated that the area will experience growth rates between 3 to 8 percent per decade.

Table 20302-1: Historical Population – Waimea ASYA

	Year		
	1990	**2000**	**2010**
Population	982	1,183	1,163
Percent Change		20.47	-1.72

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report.
Data redistributed and evaluated for Waimea ASYA.

Table 20302-2a: Population Projection – Waimea ASYA

Growth Rate	Population by Year								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
A – Low	1,186	1,191	1,195	1,199	1,203	1,207	1,230	1,255	1,282
B – Med.	1,195	1,203	1,210	1,218	1,226	1,234	1,276	1,322	1,373
C – High	1,197	1,205	1,213	1,221	1,230	1,238	1,284	1,334	1,389

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report. Data redistributed and evaluated for Waimea ASYA.

Table 20302-2b: Population Projection – Percent Change – Waimea ASYA

Growth Rate	2015-2025 % Change	2025-2035 % Change
A – Low	3.7	4.2
B – Medium	6.8	7.6
C – High	7.3	8.2

20302-1.3 Land Use

20302-1.3.1 2000 Kauaʻi General Plan

The 2000 Kauaʻi County General Plan Land Use Designation Map for the Waimea ASYA is shown on **Figure 20302-1**. The estimated land use allocation acreage for each land use designation within the system area is listed in **Table 20302-3**.

Table 20302-3: General Plan Estimated Land Use Allocation Acreage – Waimea ASYA

General Plan Land Use Designation	Acreage	Percent of Total
Agricultural	161	0.5
Military	0	0.0
Open	32,459	99.0
Park	9	0.0
Residential Community	175	0.5
Resort	0	0.0
Transportation	0	0.0
Urban Center	0	0.0
DHHL	0	0.0
TOTAL	**32,803**	**100.0**

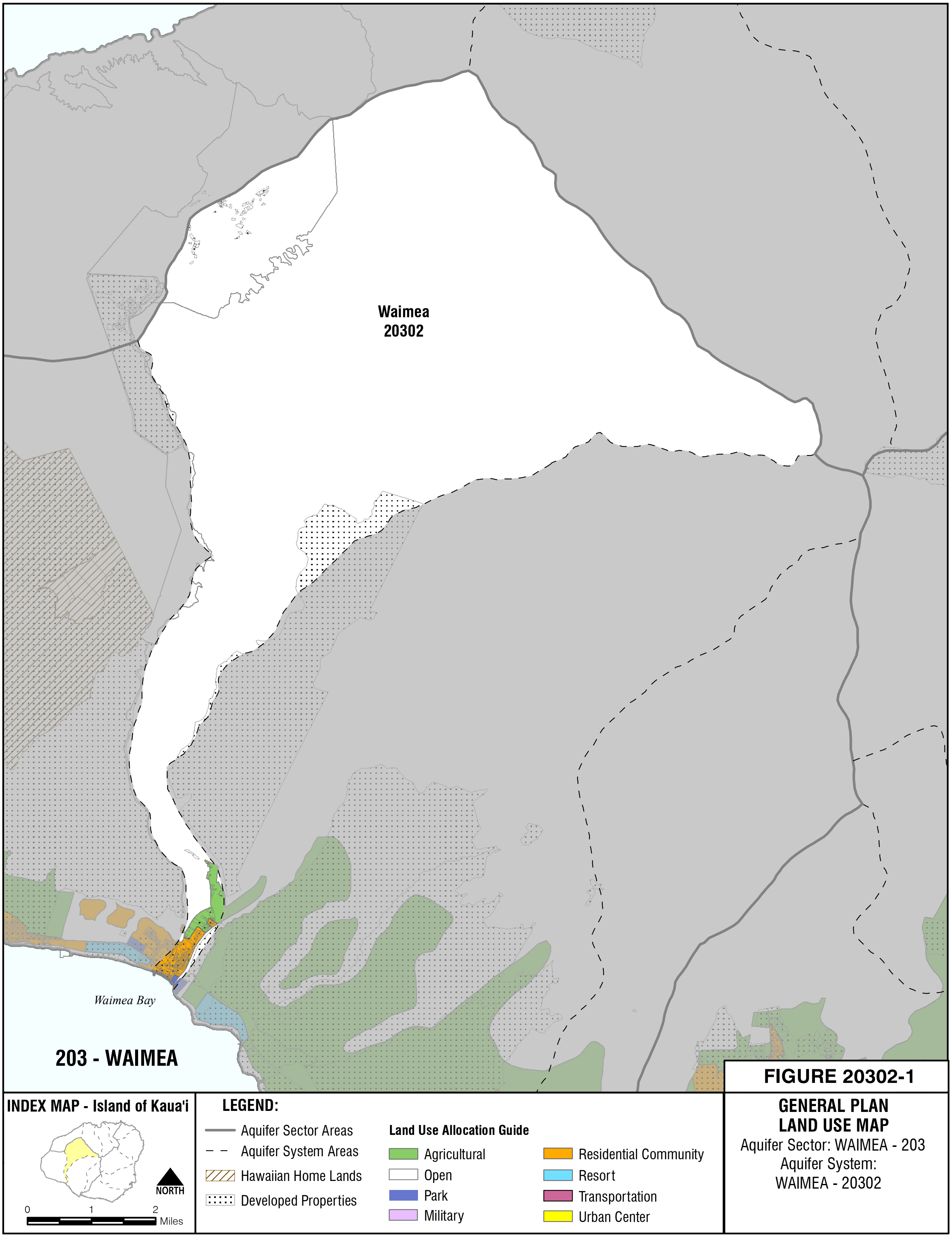
20302-1.3.2 Kauaʻi Zoning

Kauaʻi County Zoning Map for the Waimea ASYA is shown on **Figure 20302-2**. The estimated land use allocation acreage for each zoning district within the system area is listed in **Table 20302-4**.

Table 20302-4: County Zoning Estimated District Allocation Acreage – Waimea ASYA

Zoning District	Acreage	Percent of Total
Agriculture	1	0.0
Commercial – General	13	0.0
Commercial - Neighborhood	0	0.0
Conservation	32,025	98.8
Industrial – General	0	0.0
Industrial - Limited	0	0.0
Open	172	0.5
Residential	159	0.5
Resort	0	0.0
Project Development	0	0.0
Special Planning Area	0	0.0
Special Treatment	0	0.0
No Zoning	57	0.2
DHHL	0	0.0
TOTAL	**32,427**	**100.0**

The number of dwelling units allowed in residential and resort districts varies by the type of residential or resort district. The average number of dwelling units allowed in residential districts in the Waimea ASYA is 3.24 dwelling units per acre.


Waimea
20302
Waimea Bay
203 - WAIMEA
FIGURE 20302-1
INDEX MAP - Island of Kaua'i
NORTH
0
1
2
Miles
LEGEND:
Aquifer Sector Areas
Aquifer System Areas
Hawaiian Home Lands
Developed Properties
Land Use Allocation Guide
Agricultural
Open
Park
Military
Residential Community
Resort
Transportation
Urban Center
GENERAL PLAN
LAND USE MAP
Aquifer Sector: WAIMEA - 203
Aquifer System:
WAIMEA - 20302

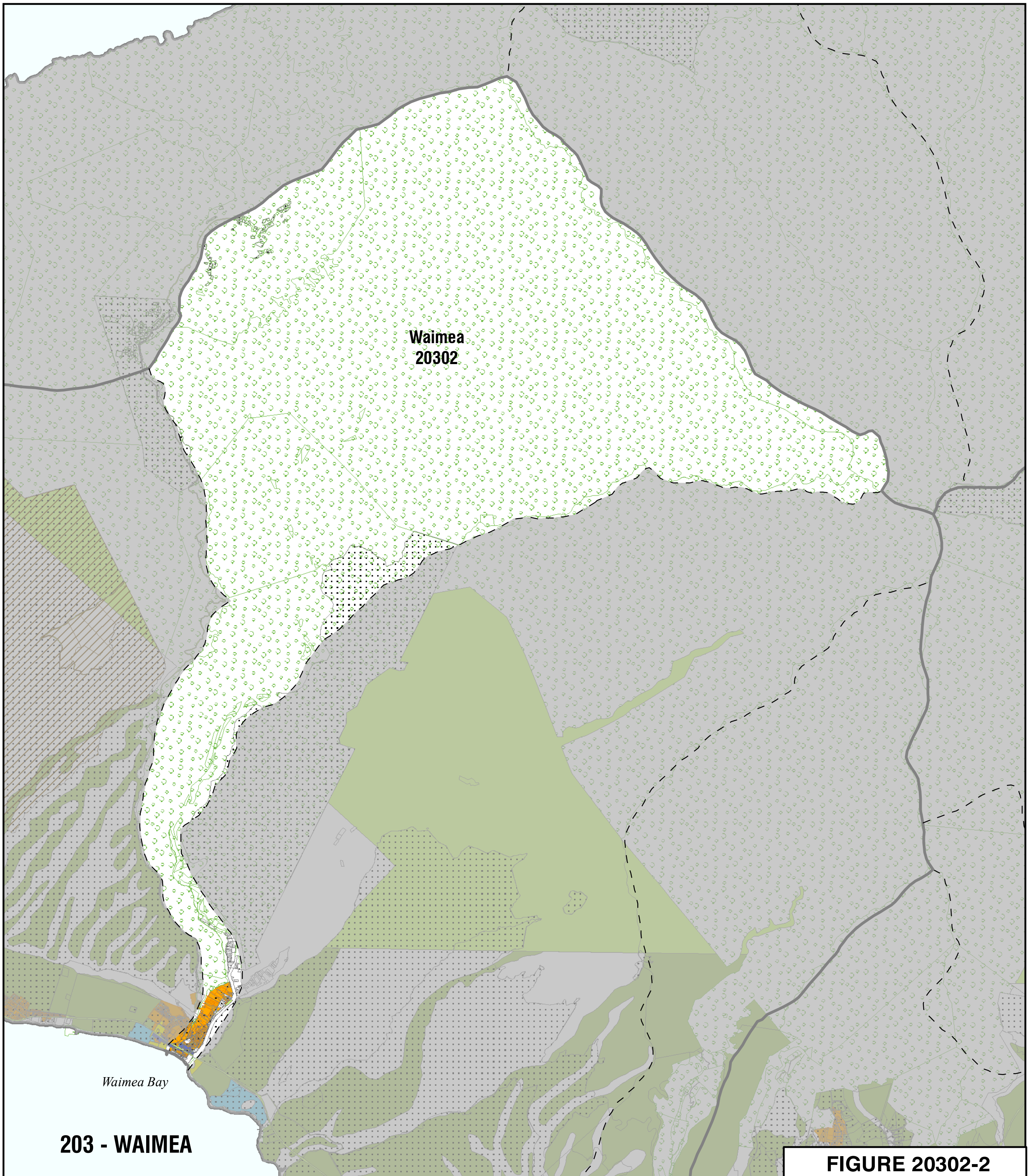


FIGURE 20302-2

INDEX MAP - Island of Kaua'i

NORTH

0 1 2 Miles

LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- Hawaiian Home Lands
- Developed Properties

Zoning Designations:

- Agriculture
- Commercial - General
- Commercial - Neighborhood
- Conservation
- Industrial - General
- Industrial - Limited
- No Zoning
- Open
- Residential
- Resort
- Special District

COUNTY ZONING

Aquifer Sector: WAIMEA - 203
Aquifer System:
WAIMEA - 20302

20302-2 EXISTING WATER RESOURCES

20302-2.1 Ground Water

The Waimea ASYA has a sustainable yield of 37 mgd. According to the 2014 CWRM database, there are 2 production wells in the system, both classified as municipal,. There are also 3 wells drilled and categorized as "unused." Refer to **Appendix A** for this database. **Figure 20302-3** shows the well locations.

20302-2.2 Surface Water

There are no streams classified as perennial in the Waimea ASYA.

In accordance with the Code, the CWRM must establish and administer instream flow standards (IFS) on a stream-by-stream basis as necessary to protect public interests. IFS is defined as "a quantity or flow of water or depth of water which is required to be present at a specific location in a stream system at certain specified times of the year to protect fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses." Considerably more research and study need to be completed to accumulate the data and perspective necessary to conduct a thorough and meaningful assessment of IFS. Until permanent IFS are established, interim IFS have been adopted. The interim IFS are defined as the amount of water flowing in each stream at the time the administrative rules governing them were adopted in 1988 and 1989. In order to assess surface water sustainability, this KWUDP assumes that no additional diversions will be allowed from any stream without amendment of the interim IFS.

There are 34 declared stream diversions in the CWRM database shown on **Figure 20302-4**, which accounts for 12 percent of the 292 declared stream diversions on the island. The declared stream diversions are listed in **Appendix B**. The total declared flow for the Waimea ASYA is 0.28 mgd.

The Kekaha Ditch Irrigation System (KEDIS) and the Kōke‘e Ditch Irrigation System (KODIS) both start in the Waimea ASYA and include several diversions from this ASYA.

20302-2.3 Water Conservation

Water conservation increases the amount of water available and helps to ensure the long-term viability of water resources. Water conservation measures for this ASYA are as described in **Section 1.5.7** of this report. There are no ASYA specific special conservation measures in place at this time.

20302-2.4 Rainwater Catchment

Rainwater catchment is a viable resource for areas that are not served by ground water or surface water. **Figure 20302-5** shows the possible catchment areas, or parcels with a building value greater than $20,000 and assumed to be developed but without a ground water or surface water source.

20302-2.5 Recycled Water

There are no wastewater reclamation facilities in the Waimea ASYA.

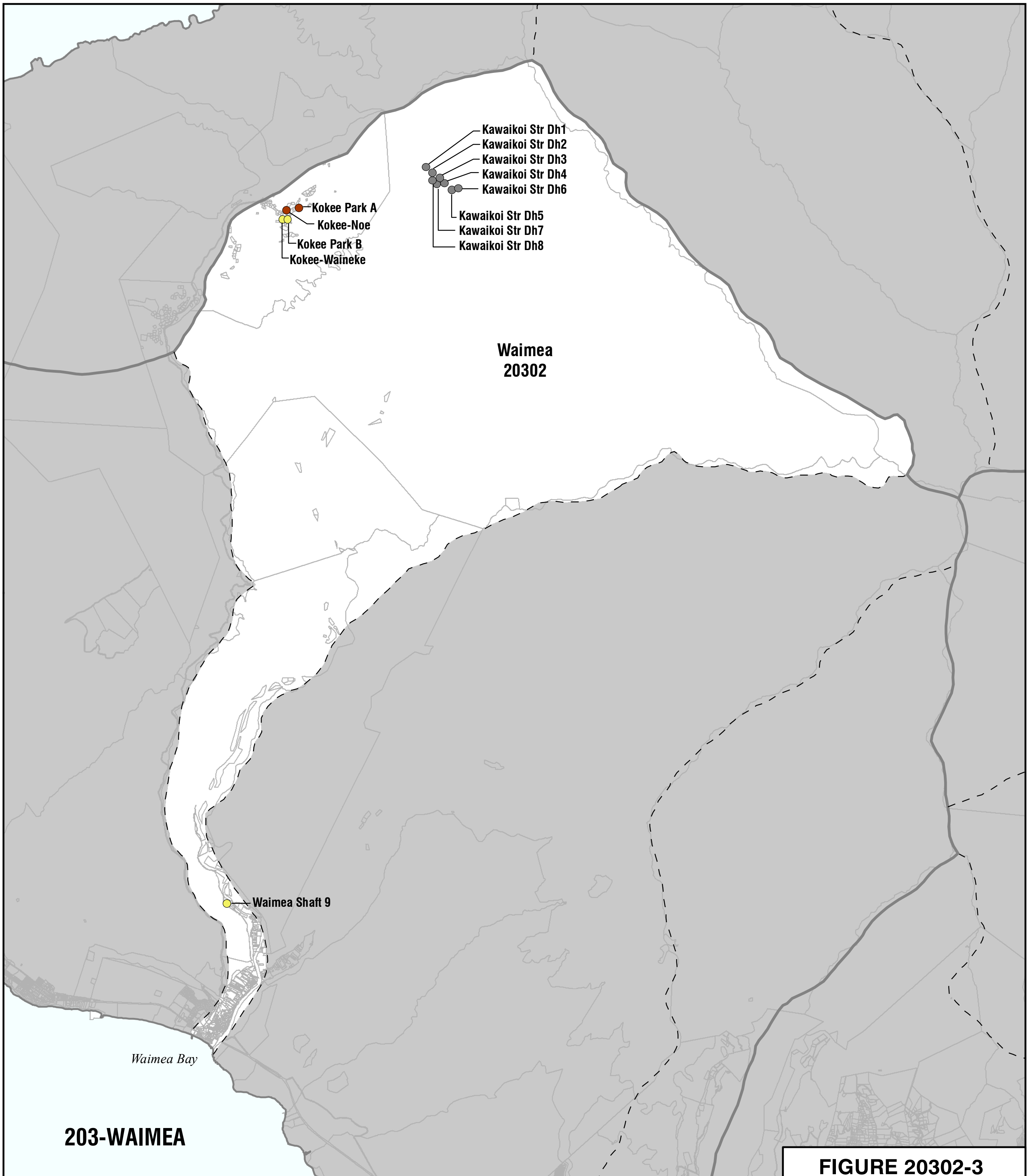
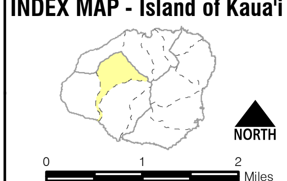


FIGURE 20302-3



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- TMK

Well Use Types

- Abandoned
- Agriculture
- Domestic
- Industrial
- Irrigation
- Military
- Municipal
- Observation
- Other
- Unused

WELL LOCATION

Aquifer Sector: WAIMEA - 203
Aquifer System:
WAIMEA - 20302

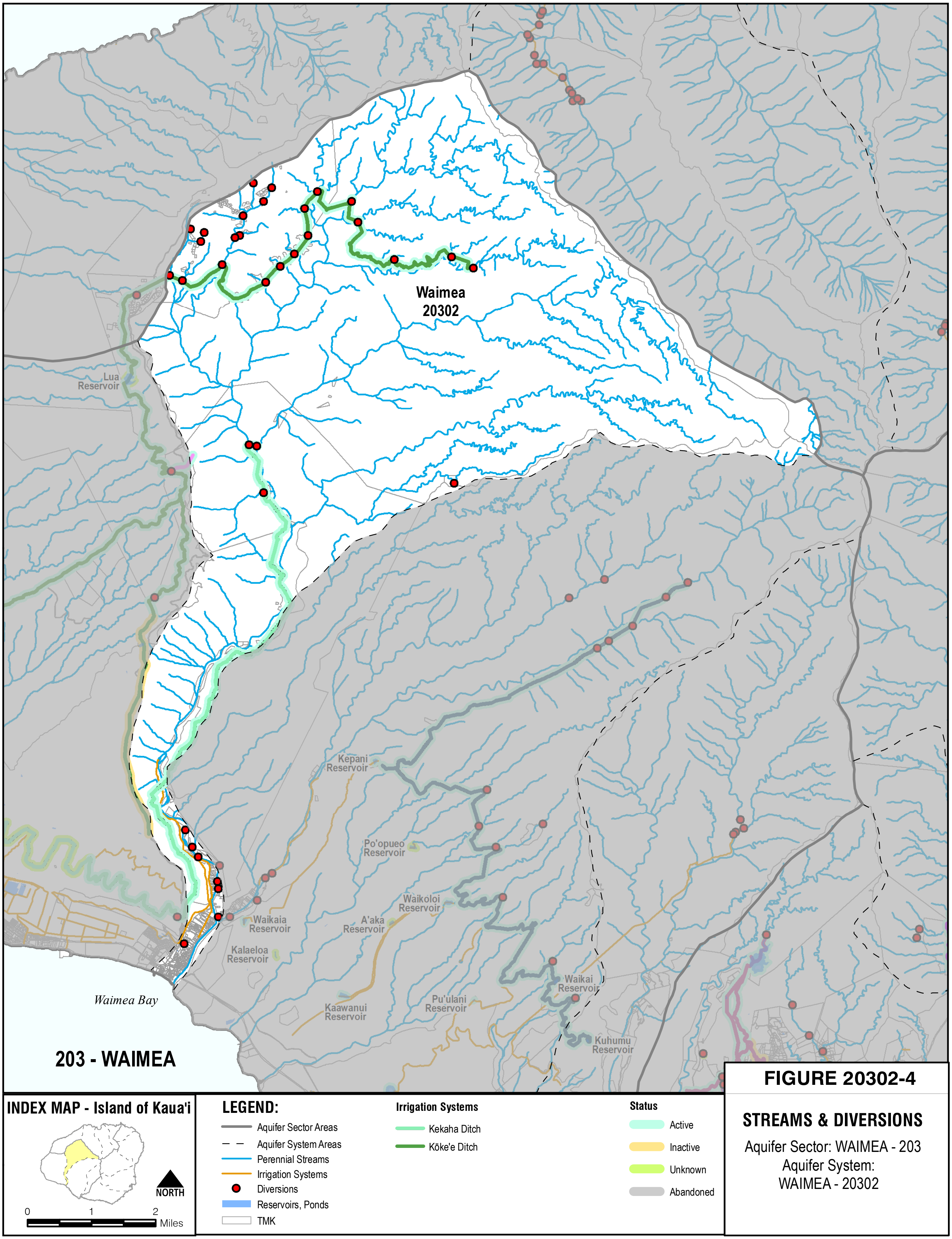
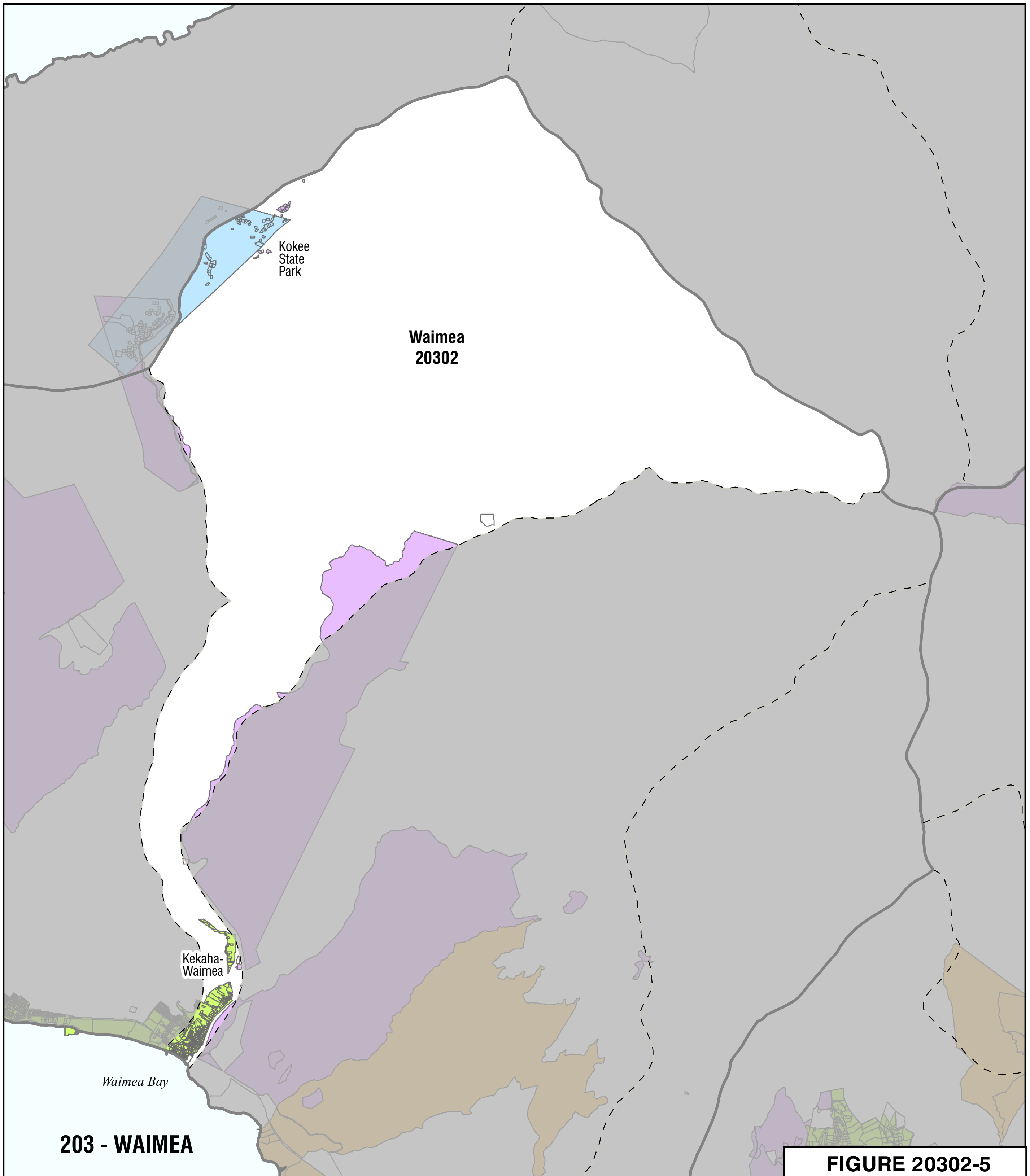


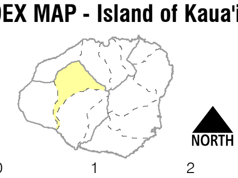
FIGURE 20302-4

STREAMS & DIVERSIONS

Aquifer Sector: WAIMEA - 203
Aquifer System:
WAIMEA - 20302



INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- DOW Service Area
- Private Water System
- State Water System
- Federal Water System
- Possible Catchment Area (Building Value > $20,000)

FIGURE 20302-5

WATER SYSTEM & SERVICE AREA

Aquifer Sector: WAIMEA - 203

Aquifer System: WAIMEA - 20302

20302-3 EXISTING WATER USE

20302-3.1 General

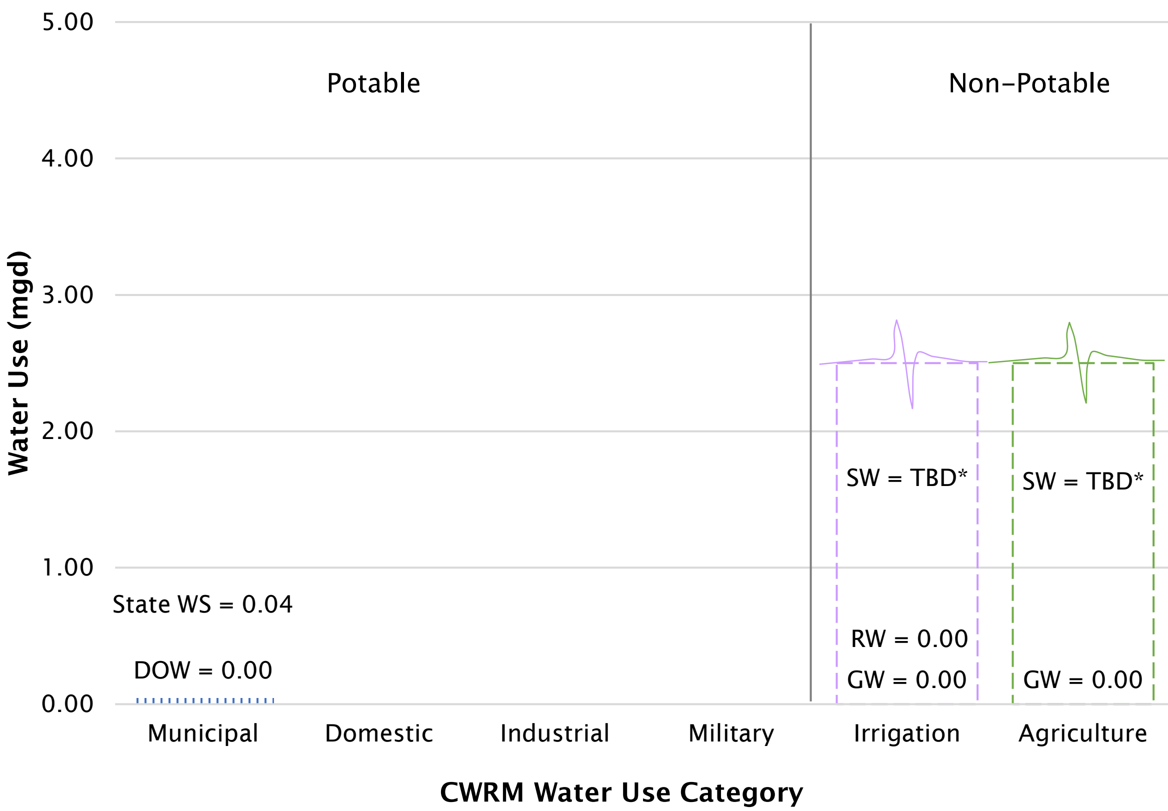
The following section presents the total estimated average water use within the Waimea ASYA. The total estimated average water use was based on data from CWRM (well pumpage) and DOH (Sanitary Surveys for Public Water Systems and estimated recycled water usage) for the year of 2014. **Table 20302-5** and **Figure 20302-6** summarize the water use in accordance with CWRM categories.

Table 20302-5: Existing Water Use by Category – Waimea ASYA

CWRM Category	Ground Water (mgd)	Other Sources (mgd)	Total (mgd)	Percent of Total
Domestic			0.00	0.0
Industrial			0.00	0.0
Irrigation			0.00	0.0
Agriculture		TBD[1]	0.00	0.0
Military			0.00	0.0
Municipal				
DOW System			0.00	0.0
State WS	0.04		0.04	100.0
Private-Public WS			0.00	0.0
TOTAL	**0.04**		**0.04**	**100.0**

[1] Surface Water – TBD from AWUDP

Figure 20302-6: Existing Water Use by Category – Waimea ASYA



*Values to be determined by other components of the Hawai'i Water Plan

20302-3.2 Domestic Use

There is are no wells classified as "Domestic" in the Waimea ASYA.

20302-3.3 Industrial Use

There are no wells classified as "Industrial" in the 2014 CWRM database.

The Waimea Mauka Hydropower Plant is owned and operated by the State Department of Agriculture's Agribusiness Development Corporations (ADC). Originally built in 1952 by the Sugar Plantation, the Waimea Mauka Hydropower plant is located along the Kekaha Ditch Irrigation System. Water comes from the Waihulu and Koai'e Intakes.

20302-3.4 Irrigation Use

Irrigation use has been divided into ground water, recycled water, and surface water.

20302-3.4.1 Ground Water

There are no wells classified as "Irrigation" in the Waimea ASYA.

20302-3.4.2 Recycled Water

There is no recycled water use in the Waimea ASYA.

20302-3.4.3 Surface Water

Information on surface water use for irrigation is to be determined by the AWUDP. However, typically, due to the location of parks and other landscaped areas within communities, it is assumed that it is unlikely for landscaping to be irrigated with surface water.

20302-3.5 Agricultural Use

Agricultural irrigation use has been divided into ground water, recycled water, and surface water.

20302-3.5.1 Ground Water

There are no wells classified as "Agriculture" in the Waimea ASYA.

20302-3.5.2 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP.

20302-3.6 Military Use

There is no military water use in the Waimea ASYA.

20302-3.7 Municipal Use

There are 2 wells in the CWRM database classified as MUNST – Municipal State. Municipal can be subcategorized into the other water use categories: Domestic, Industrial, Agricultural, Military, and Municipal.

20302-3.7.1 County Water Systems

Kekaha-Waimea Water System

The DOW has one major water system that serves the Waimea ASYA. The Kekaha-Waimea water system is DOH Public Water System (PWS) No. 406 and services areas in both the Kekaha ASYA and Waimea ASYA. The majority of the water system serves the Kekaha ASYA and therefore was discussed in **Section 20301**.

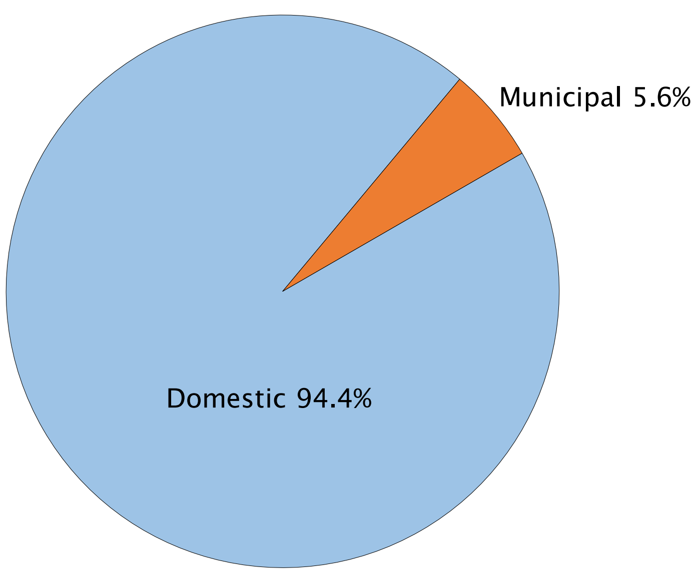
DOW Water Use by Category

DOW water use is subcategorized in **Table 20302-6** to the extent possible based on available meter data and is depicted in **Figure 20302-7**.

Table 20302-6: DOW Existing Water Use by Category – Waimea ASYA

CWRM Water Use Category	DOW Metered Water Use (mgd)	Percent of Total
Agricultural	0.000	0.0
Domestic	0.136	94.4
Industrial	0.000	0.0
Military	0.000	0.0
Municipal	0.008	5.6
Total	**0.144**	**100.0**

Figure 20302-7: DOW Existing Water Use by Category – Waimea ASYA



20302-3.7.2 State Water Systems

The Kōkeʻe State Park Water System (PWS 425) is a non-transient, non-community water system and is the only State water system in the Waimea ASYA regulated by the DOH. The water system is owned by the State Department of Land and Natural Resources (DLNR) State Parks Division. The water system serves 2,000 people through 93 service connections per the 2011 DOH Sanitary Survey. Water is provided to the Kōkeʻe State Park's museum, lodge restaurant, rental cabins, park ranger office, park pavilions, private vacation residences, and NASA facility. In addition, the water system provides wholesale treated water to the Navy's PMRF water system (PWS 430). Water for this system is supplied by two wells, with reported pumpage of 0.04 mgd.

20302-3.7.3 Federal Water Systems

There are no Federal water systems in the Waimea ASYA regulated by the DOH.

20302-3.7.4 Private-Public Water Systems

There are no private-public water systems in the Waimea ASYA regulated by the DOH.

20302-3.7.5 Per Capita Use

The per capita existing water use consumption based on domestic DOW metered water use and private-public water system use is presented in **Table 20302-7**. The per capita use in the Waimea ASYA is approximately 34.8% lower than the overall County of Kaua'i per capita use.

Table 20302-7: Per Capita Use – Waimea ASYA

	DOW Metered Water Use – Domestic (mgd)	Private-Public Water System (mgd)	90% of 2015 Population	Per Capita Use (gpd)
Waimea ASYA	0.136	0	1,195	126
County of Kaua'i	**9.360**	**2.951**	**63,462**	**194**

20302-3.8 Existing Water Use by Resource

20302-3.8.1 Ground Water

Table 20302-8 summarizes the current production, sustainable yield (SY), and percentage of SY for the current production. Current production is represented by the 2014 average yield calculated from the actual pumping data.

Table 20302-8: Pumpage – Waimea ASYA

Pumpage (mgd)	SY (mgd)	Pumpage Portion of SY
0.04	37	0.1%

Based on available information from the CWRM database, the current ground water use is 0.1 percent of the sustainable yield.

20302-3.8.2 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP.

20302-3.8.3 Water Conservation

Water conservation, including water loss management, may reduce water use. See **Section 20302-2.3** for existing conservation efforts.

20302-3.8.4 Rainwater Catchment

Developed parcels that are not supplied by ground water or surface water are assumed to be supplied by rainwater catchment.

20302-3.8.5 Recycled Water

There is no recycled water use in the Waimea ASYA.

20302-4 FUTURE WATER USE

20302-4.1 Full Build-Out Water Demand Projections

The full build-out water demand projections based on the General Plan and County Zoning for the Waimea ASYA is listed in **Tables 20302-9** and **20302-10**, respectively. Each land use class is associated with the most appropriate CWRM water use category.

Table 20302-9: General Plan Full Build-Out Water Demand Projection – Waimea ASYA

GP Category	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	0.00
Open	Domestic	0.00
Military	Military	0.00
Park	Irrigation	0.03
Residential	Domestic/Municipal	0.28
Resort	Domestic/Irrigation/Municipal	0.00
Transportation	Municipal	0.00
Urban Center	Domestic/Industrial/Municipal	0.00
DHHL	Domestic	0.00
	TOTAL	**0.32**

Table 20302-10: Zoning Full Build-Out Water Demand Projection – Waimea ASYA

Zoning Class	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	0.00
Commercial	Municipal	0.06
Industrial	Industrial/Municipal	0.00
Open	Domestic	0.00
Residential	Domestic/Municipal	0.26
Resort	Domestic/Irrigation/Municipal	0.00
DHHL	Domestic	0.00
	TOTAL	**0.32**

20302-4.1.1 Refined Land Use Based Water Projection

State Water Projects Plan

Table 20302-11 lists future State water projects reported in the 2021 SWPP update. The total projected demand to the year 2034 for the two State water projects within the Waimea ASYA is 0.002 mgd, both using potable sources.

Table 20302-11: Future State Water Projects – Waimea ASYA

Project Name	State of Hawai'i Department	Primary Use	Water Development Strategy	2034 Demand (mgd)
Waimea High School New Library	DOE	Potable	REMAIN	0.0009
Waimea High School – Renovate Buildings C & H	DOE	Potable	REMAIN	0.0006
			TOTAL REMAIN	0.0015
			TOTAL WAIMEA ASYA SWPP 2034 DEMAND	0.0015

As mentioned in **Section 2.2.2.5.1**, State water projects with the water development strategy of REMAIN are located within the service areas of County water systems which need to be coordinated with the respective County water departments. Both of the State projects within the Waimea ASYA were assigned the REMAIN water development strategy and results in a total 2034 demand of 0.0015 mgd. This accounts for 0.004 percent of the 37 mgd sustainable yield for the Waimea ASYA.

State Department of Hawaiian Home Lands

There are no DHHL tracts in the Waimea ASYA.

Agricultural Water Use and Development Plan

The AWUDP dated 2003 (revised 2004) was limited in scope. More recent, comprehensive information on agricultural lands is available in the County of Kaua'i Important Agricultural Lands (IAL) Study.

In 2019, a public review draft of the AWUDP was released and it is anticipated that the next phase of the AWUDP will provide agricultural water demand projections in greater detail and will supersede information in the KWUDP when it becomes available.

County of Kaua'i Important Agricultural Lands Study

34 acres of agricultural lands within the Waimea ASYA received a score of 28 or better in the County of Kaua'i IAL Study. Lands that receive a score of 28 or better were determined to have met all eight IAL criteria to some degree. Only a subset of lands with a score of 28 or better is expected to be designated as IALs. **Table 20302-12** compares these lands that received a score of 28 or better to the declared surface water use from diversions and to the diversified water use rate of 3,400 gallons per acre per day (gpad) estimated in the 2004 AWUDP.

Table 20302-12: Irrigation of Agricultural Lands

(1) Declared Surface Water Use from Diversions (mgd)	0.28
(2) Agricultural Lands with a Score ≥ 28 (Acres)	34
- How many acres can be sustained by **(1)** at a water rate of 3,400 gpad? (Acres)	82
- What percent of **(2)** can be sustained with a water rate of 3,400 gpad?	241
- If all of **(2)** were to be irrigated, what is the water unit rate? (gpad)	8,267

20302-4.1.2 Water Use Rates

Water use unit rates are based on the *Water System Standards* (WSS), as discussed in Chapter 2.

The General Plan provides only broad density guidelines for residential and resort designations. For these designations, under the assumption that most residents would like their communities, including the development density, to remain similar in the future, the average number of dwelling units as allowed by zoning was used as the density (i.e., 3.24 dwelling units per acre for residential designation).

20302-4.2 Water Demand Projections to the Year 2035

The following section presents water demand projections to the year 2035 for the Waimea ASYA. The projected low, medium, and high growth rates are listed in **Table 20302-13** and are graphed in **Figure 20302-8**. Potable (domestic, industrial, municipal, and military water uses) and non-potable (irrigation) water demands are also differentiated.

Table 20302-13: Water Demand Projection – Waimea ASYA

Water Use Category	Water Demand by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
GROWTH RATE C (HIGH)									
TOTAL	**0.04**	**0.04**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**
Potable	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GROWTH RATE B (MEDIUM)									
TOTAL	**0.04**	**0.04**	**0.04**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**
Potable	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GROWTH RATE A (LOW)									
TOTAL	**0.04**	**0.04**	**0.04**	**0.04**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**
Potable	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figure 20302-8: Water Demand Projection Summary – Waimea ASYA

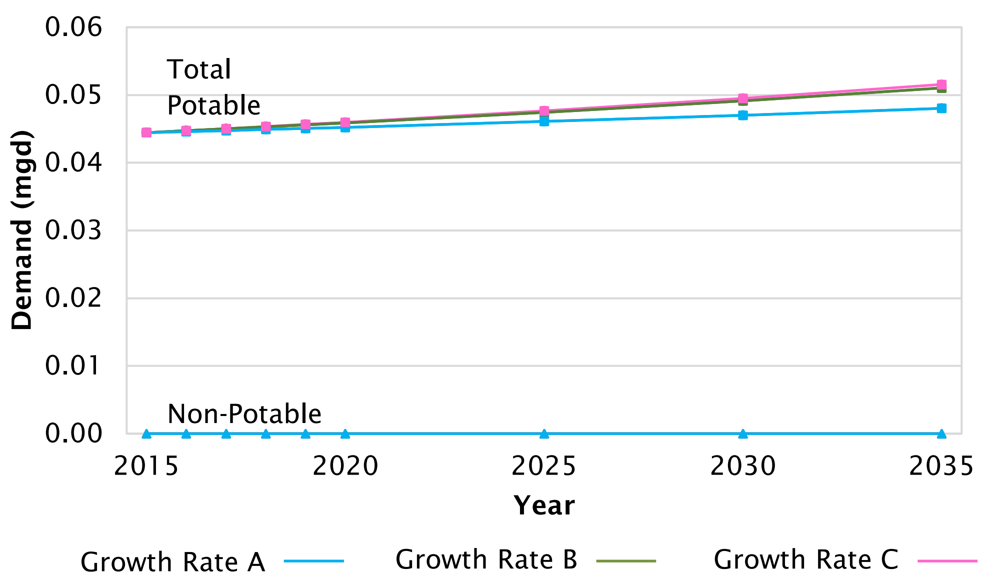


Figure 20302-9 shows the breakdown of water demand projections for a medium growth rate by CWRM categories through the year 2035. **Table 20302-14** summarizes this figure.

Figure 20302-9: Medium Growth Rate B Water Demand Projection by Category – Waimea ASYA

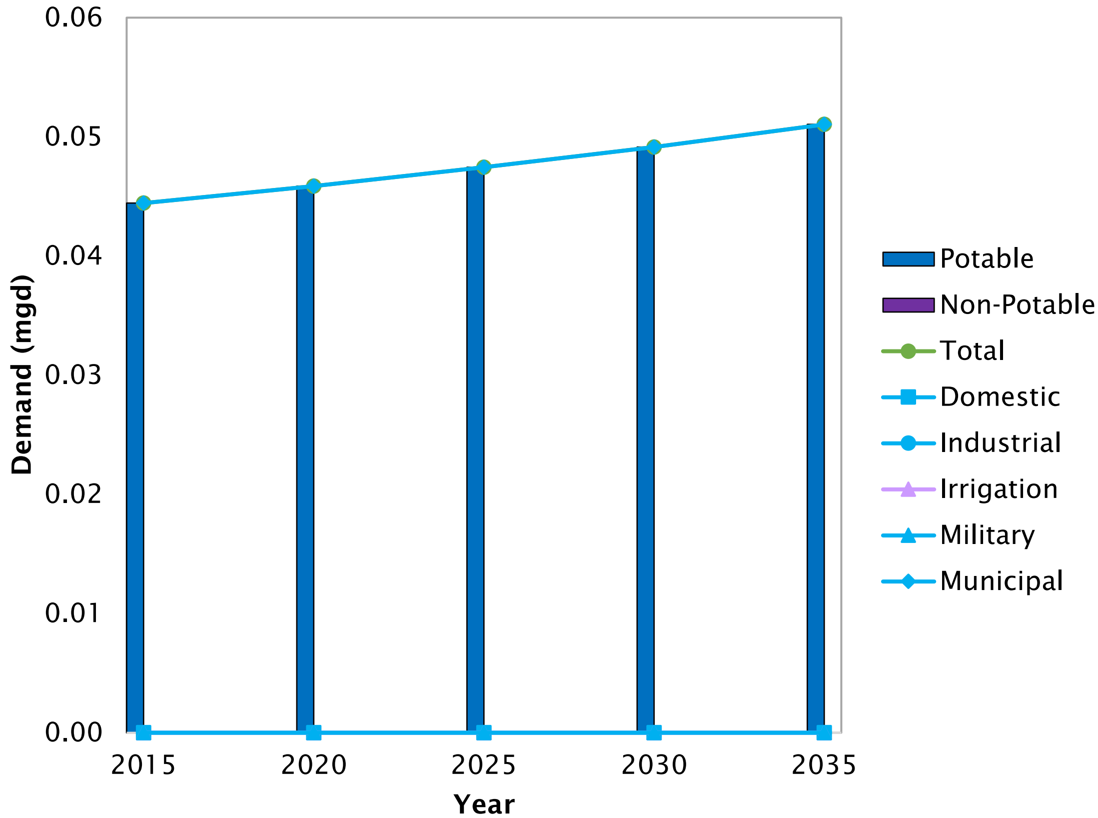


Table 20302-14: Medium Growth Rate B Water Demand Projection by Category – Waimea ASYA

Water Use Category	Water Use by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
Total	**0.04**	**0.04**	**0.04**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**
Potable	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Domestic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Irrigation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Military	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Municipal	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05
DOW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

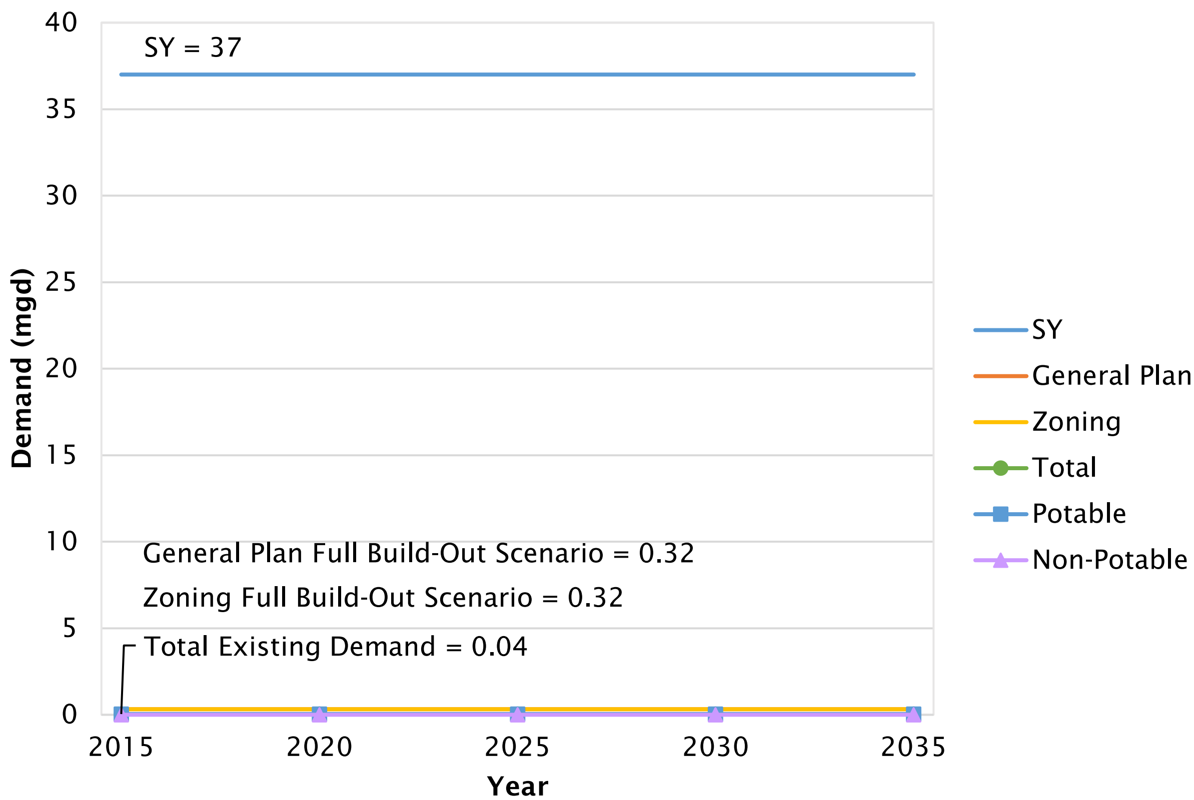
20302-4.3 Summary

Figure 20302-10 illustrates the magnitude of the sustainable yield, both General Plan and Zoning full build-out water use projections, and water use projection through the year 2035 focusing on Medium Growth Rate B. **Table 20302-15** summarizes the General Plan, Zoning, and 20-year water demand projection scenarios for the Waimea ASYA. The sustainable yield is presented to draw comparisons. All demands are in mgd.

Table 20302-15: Summary of Demand Projections

SY (mgd)	FBO (mgd)		Medium Growth Rate Demand by Year (mgd)								
	GP	Zoning	2015	2016	2017	2018	2019	2020	2025	2030	2035
37	0.32	0.32	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05

Figure 20302-10: Medium Growth Rate B Water Demand Projections and Full Build-Out – Waimea ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use. For future agricultural water use analysis, please see Section 20302-4.1.1 County of Kaua'i Important Agricultural Lands Study.

20302-5 RESOURCE AND FACILITY RECOMMENDATIONS

20302-5.1 Water Source Adequacy

20302-5.1.1 Full Build-Out

Development to the highest extent allowed by the General Plan and County Zoning within the Waimea ASYA is sustainable, with General Plan and County Zoning full build-out water demands both requiring 0.9 percent of the 37 mgd sustainable yield.

20302-5.1.2 Twenty-Year Projection

The 2035 water demand projection for the Waimea ASYA is sustainable and is only 0.1 percent of the 37 mgd sustainable yield.

20302-5.2 Source Development Requirements

20302-5.2.1 Supply-Side Management

Supply-side management, including conventional water resource measures, water conservation, and alternative water resource measures, were evaluated to meet projected water demands.

Conventional Water Resource Measures

Ground Water

The 2035 water demand projection for the Waimea ASYA is only 0.1 percent of the 37 mgd sustainable yield. This indicates that theoretically, more water could be pumped from the aquifer without impairing the utility or quality of the water resource if wells are optimally placed and the proper due diligence with regard to traditional and customary rights and impacts has been completed. However, it is noted that sustainable yield does not consider the feasibility of developing the ground water resources, and that the safe yield of an individual production well may be limited by localized ground water behavior near the well as a result of pumpage. Water supply reliability and quality, feasibility, environmental and cultural impacts, and water rights shall be considered as projects and programs develop. More detailed and site-specific evaluation of these impacts shall be required and accomplished through the environmental review process (HRS Chapter 343) for source development projects and programs utilizing public funding, and CWRM could consider requiring compliance with the environmental review process for private source development projects and programs also. **Section 1.5.3.1** provides additional information regarding the protection of traditional and customary rights.

Development within the Waimea ASYA includes Waimea, which is served by DOW's Kekaha-Waimea water system. Currently all of the water system's sources are in the Kekaha ASYA.

Surface Water

There are 34 declared diversions in the Waimea ASYA. Many of these diversions are for the Kekaha Ditch Irrigation System (KEDIS) and the Kōkeʻe Ditch Irrigation System (KODIS). Both irrigation systems have their intakes in the Waimea ASYA and deliver the water to their service area in the Kekaha ASYA.

In 2017, interim instream flow standards (IIFS) related to these irrigation systems were established through the Waimea Watershed Agreement to take steps to restore flows in streams. The agreement notes that diversions must be justified with no more water taken than is needed for other beneficial uses. Beneficial uses include agriculture and renewable energy, and the irrigation systems should continue to be maintained to allow for present and future uses. For the Waimea ASYA, the agreement identifies that provision of water for kalo farmers along the Menehune Ditch are to be maintained.

Water Transfer

As mentioned above, the intakes for the KEDIS and KODIS are located in the Waimea ASYA, and irrigation water from these systems is transferred to service areas in the Kekaha ASYA.

Water can also be transferred between ASYAs through public water systems. The DOW's Kekaha-Waimea water system services areas in the Kekaha ASYA and in the Waimea ASYA, with all of its water sources located in the Kekaha ASYA. The Waimea Booster Station has the capability to transfer water from Kekaha to Waimea. The system does not currently have the capability to transfer water in the reverse direction from Waimea to Kekaha. Similarly, the Kōkeʻe State Park water system service area is in the Nāpali and Waimea ASYA and is fed by water sources located in the Waimea ASYA.

Water Conservation

The per capita use in the Waimea ASYA is approximately 34.8% lower than the overall County of Kauaʻi per capita use. There are no ASYA-specific conservation measures in place at this time; however, there are general water conservation programs that are described in **Section 1.5.7**. Water conservation, including water loss management, can increase the amount of water available and help to ensure the long-term viability of water resources.

Alternative Water Resource Measures

Rainwater Catchment

Rainwater can be utilized as a water resource in several ways.

Rainwater can be harvested in rainwater catchment systems which can be utilized to supply domestic potable water needs. These systems are viable in areas that receive abundant rainfall and are a suitable source of potable water for individual domestic users in areas outside the limits of municipal water systems. Generally, these are remote areas and are not expected to expand significantly because most development is anticipated to be concentrated within existing urban areas. Therefore, use of rainwater catchment systems is not anticipated to increase significantly.

Rainwater can also be used to supplement or satisfy agricultural non-potable water needs through ambient rainfall.

See the Storm Water Reuse section below to see how rainwater as storm water runoff can be reclaimed and reused.

Storm Water Reuse

Rainfall can turn into storm water runoff. Storm water runoff from impervious surfaces in urban areas can be significant. This water could be captured, treated, and used as a source of non-potable water (e.g., irrigation), integrated with recycled water, or even as potable and/or non-potable ground water recharge. However, due to the lack of storm water reuse standards, the high initial infrastructure costs, and the treatment requirements, storm water reclamation and reuse on a small or large scale may not be feasible and requires further assessment as noted in the Water Resource Protection Plan. The U.S. Department of the Interior, Bureau of Reclamation published An Appraisal of Stormwater Reclamation and Reuse Opportunities in Hawai'i (Storm Water Report) in 2008 but did not identify any storm water reclamation and reuse opportunities in the Waimea ASYA.

Recycled Water

Recycled water is a valuable resource; an increase in its use may lower the dependence on potable sources. However, there are no wastewater reclamation facilities (WWRFs) in the Waimea ASYA.

Desalination

Desalination of brackish ground water is a potential alternative; however, due to its high capital and operational costs, it likely would not be considered when other potable water sources are available.

20302-5.2.2 Demand-Side Management

Development Density Control

The full build-out demand for the Waimea ASYA based on County Zoning is 0.32 mgd which is 0.9 percent of the sustainable yield. This indicates that there are adequate water resources to sustain the level of development that is allowed by law. In the Waimea ASYA, the average number of dwelling units allowed by County Zoning is 3.24 dwelling units per acre in residential districts.

The full build-out demand for the Waimea ASYA based on the General Plan is 0.32 mgd which is 0.9 percent of sustainable yield. Therefore, development density control likely may not be necessary. However, the County Planning Department could consider development density control for areas where there is the flexibility to do so, such as areas that are not yet zoned as residential or resort, and promote sustainable development. Further, it is noted that the full build-out scenario is unlikely to occur since it assumes all land is developed to the maximum extent.

20302-5.3 Recommended Alternatives

To optimize appropriate use of water resources, the quality of the water source should be matched to the quality of water required. The highest quality of water shall be reserved for the most valuable end use. Potable water is considered the highest quality water, and the sustenance of life is the most valuable end use. Recycled water, brackish water, untreated surface water, and other lower quality water sources should be used for landscaping and agriculture when available, thereby reserving potable water for human consumption. If there is a practical alternative water source available, that alternative source should be used in lieu of ground water or surface water. With this in mind, the following recommendations are made for the Waimea ASYA:

<u>Alternative Water Resources</u>

Use of alternative water sources can reduce demands on both ground and surface water resources and conserve water resources as a whole. However, aside from rainwater, there are no available alternative water sources in the area. Alternative water sources are unlikely to be developed when other water resources are readily available.

<u>Conservation</u>

Water resources are a finite resource that should be managed and used wisely. It should be conserved and not wasted. Implementation of conservation measures should continue to be encouraged.

<u>Ground Water</u>

Meeting future demands at a reasonable cost is a planning objective, and conventional sources, such as ground water, are typically the most cost-effective means for meeting projected water demands. Projected potable water needs are within the sustainable yield for this area. Therefore, ground water resources could continue to be used and developed to meet potable water needs now and into the future. However, as noted above, development of conventional water resource measures can have challenges, and water supply reliability and quality, feasibility, environmental and cultural impacts, and water rights shall be considered as projects and programs develop.

Development of ground water resources is the primary strategy to serve future potable demands in the Waimea ASYA.

<u>Surface Water</u>

Surface water, where available, should be used to meet non-potable demands if alternative water resources are not available. As discussed in the Waimea Watershed Agreement, diversions must be justified with no more water being taken than is needed for beneficial uses, such as for agriculture and renewable energy, and the established interim instream flow standards (IIFS) shall be met. In addition, it is critical that the KODIS and KEDIS continue to be maintained to allow for present and future uses. Utilization of surface waters for non-potable water demands has the potential to minimize future dependence on the use of ground water.

Demand-Side Management

Full build-out demand based on the General Plan is 0.9 percent of sustainable yield. At this projection, implementation of development density control by the County Planning Department is not needed in this area. Although the projection is sustainable, the County Planning Department will need to consider potential impacts on available water resources when considering any future zoning modifications. Modifications that may result in increased development density within the area will increase demands on water resources.

Chapter 20303

Makaweli Aquifer System Area

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FIGURES

TABLES

20303 MAKAWELI AQUIFER SYSTEM AREA

20303-1 SYSTEM AREA PROFILE

20303-1.1 General

The Makaweli [20303] Aquifer System Area (ASYA)is roughly bound on the west and north side along the ridge above the Mokuone Stream and up to the peak of Mount Waiʻaleʻale, along the south and east along the ridge above the Kōʻula River to Port Allen, and the Pacific Ocean on the southwest from Port Allen to Waimea Town.

Rural residential areas are located along the makai shore side of the AYSA in proximity to Kaumualiʻi Highway. A large portion of lands in this AYSA are currently in use as pasture lands and for cultivation of seed crops.

Average annual rainfall ranges from 35 inches per year along the coast to 300 inches in the mountains. The sustainable yield is 26 mgd.

20303-1.2 Economy and Population

20303-1.2.1 Economy

Land within the Makaweli ASYA is mainly used for agricultural activities – pastures and cultivation of seed crops. Small commercial areas, including Port Allen airstrip, and salt ponds are located along the shore area in proximity to Port Allen and Kaumualiʻi Highway.

20303-1.2.2 Population

The population contributing to the demand within the Makaweli ASYA is primarily concentrated in rural subdivisions located along Kaumualiʻi Highway. Historical population data for the Makaweli ASYA is summarized in **Table 20303-1**. Population projections through the year 2035 are summarized in **Table 20303-2a**. As summarized in **Table 20303-2b**, it is estimated that the area will experience growth rates between 2 to 7 percent per decade.

Table 20303-1: Historical Population – Makaweli ASYA

	Year		
	1990	**2000**	**2010**
Population	1,900	2,159	2,916
Percent Change		13.7	35.0

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report.
Data redistributed and evaluated for Makaweli ASYA.

Table 20303-2a: Population Projection – Makaweli ASYA

Growth Rate	Population by Year								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
A – Low	2,961	2,968	2,976	2,984	2,992	3,000	3,043	3,092	3,146
B – Med.	2,983	2,998	3,014	3,031	3,047	3,064	3,155	3,256	3,368
C – High	2,986	3,003	3,021	3,038	3,057	3,075	3,174	3,284	3,407

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report. Data redistributed and evaluated for Makaweli ASYA.

Table 20303-2b: Population Projection – Percent Change – Makaweli ASYA

Growth Rate	2015-2025 % Change	2025-2035 % Change
A – Low	2.8	3.4
B – Medium	5.8	6.8
C – High	6.3	7.3

20303-1.3 Land Use

20303-1.3.1 2000 Kaua‘i General Plan

The 2000 Kaua‘i County General Plan Land Use Designation Map for the Makaweli ASYA is shown on **Figure 20303-1**. The estimated land use allocation acreage for each land use designation within the system area is listed in **Table 20303-3**.

Table 20303-3: General Plan Estimated Land Use Allocation Acreage – Makaweli ASYA

General Plan Land Use Designation	Acreage	Percent of Total
Agricultural	9,243	21.2
Military	0	0.0
Open	33,685	77.2
Park	23	0.1
Residential Community	147	0.3
Resort	171	0.4
Transportation	0	0.0
Urban Center	0	0.0
DHHL	343	0.8
TOTAL	**43,612**	**100.0**

20303-1.3.2 Kaua‘i Zoning

Kaua‘i County Zoning Map for the Makaweli ASYA is shown on **Figure 20303-2**. The estimated land use allocation acreage for each zoning district within the system area is listed in **Table 20303-4**.

Table 20303-4: County Zoning Estimated District Allocation Acreage – Makaweli ASYA

Zoning District	Acreage	Percent of Total
Agriculture	17,463	39.4
Commercial – General	0	0.0
Commercial - Neighborhood	0	0.0
Conservation	17,524	39.6
Industrial – General	0	0.0
Industrial - Limited	0	0.0
Open	8,656	19.6
Residential	96	0.2
Resort	134	0.3
Project Development	0	0.0
Special Planning Area	0	0.0
Special Treatment	11	0.0
No Zoning	33	0.1
DHHL	353	0.8
TOTAL	**44,270**	**100.0**

The number of dwelling units allowed in residential and resort districts varies by the type of residential or resort district. The average number of dwelling units allowed in residential districts in the Makaweli ASYA is 5.74 dwelling units per acre. The average number of dwelling units allowed in resort districts in the Makaweli ASYA is 1.00 dwelling units per acre.

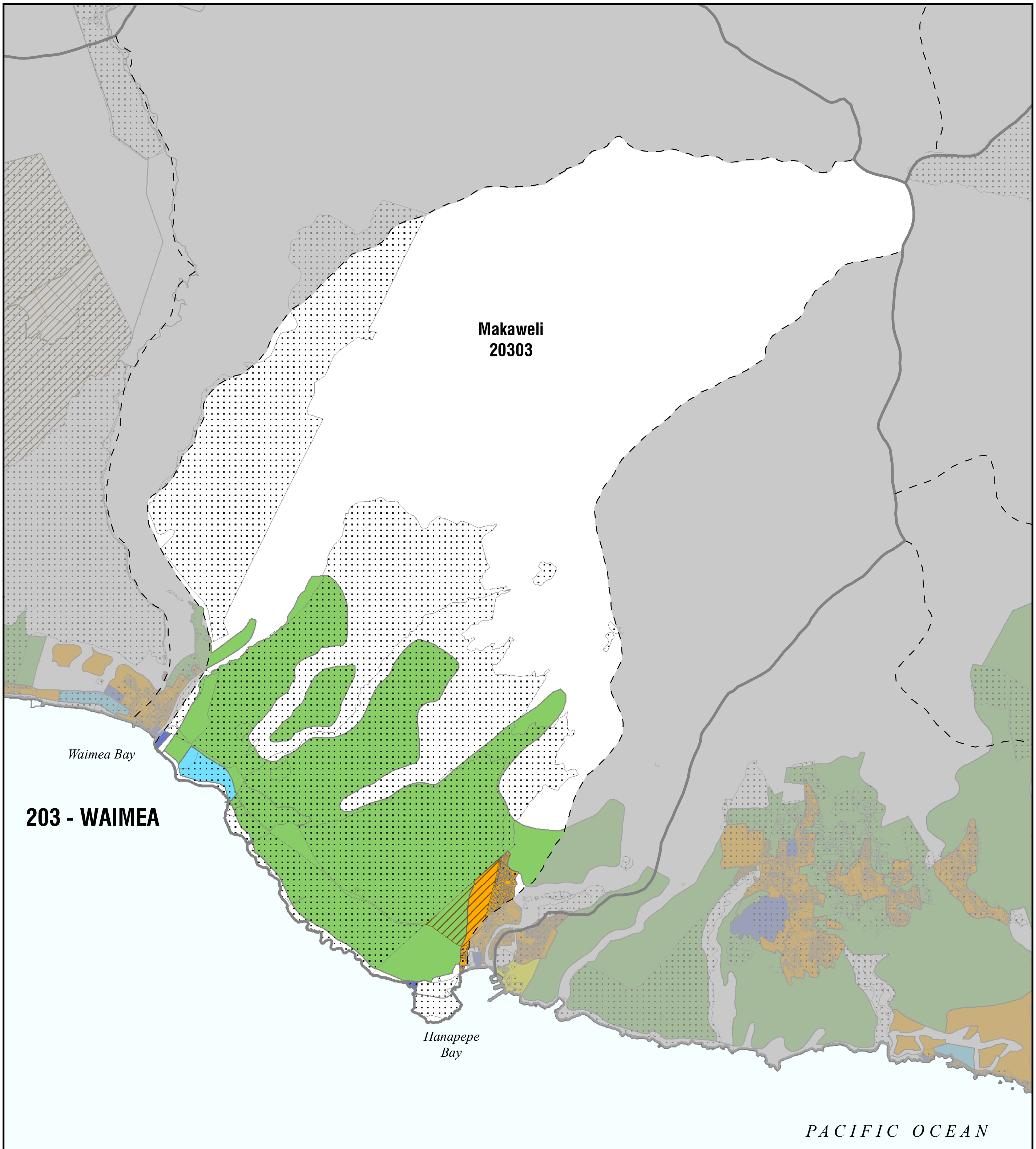
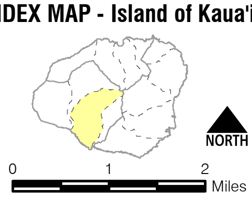


FIGURE 20303-1

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- Hawaiian Home Lands
- Developed Properties

Land Use Allocation Guide

- Agricultural
- Open
- Park
- Military
- Residential Community
- Resort
- Transportation
- Urban Center

GENERAL PLAN
LAND USE MAP
Aquifer Sector: WAIMEA - 203
Aquifer System:
MAKAWELI - 20303

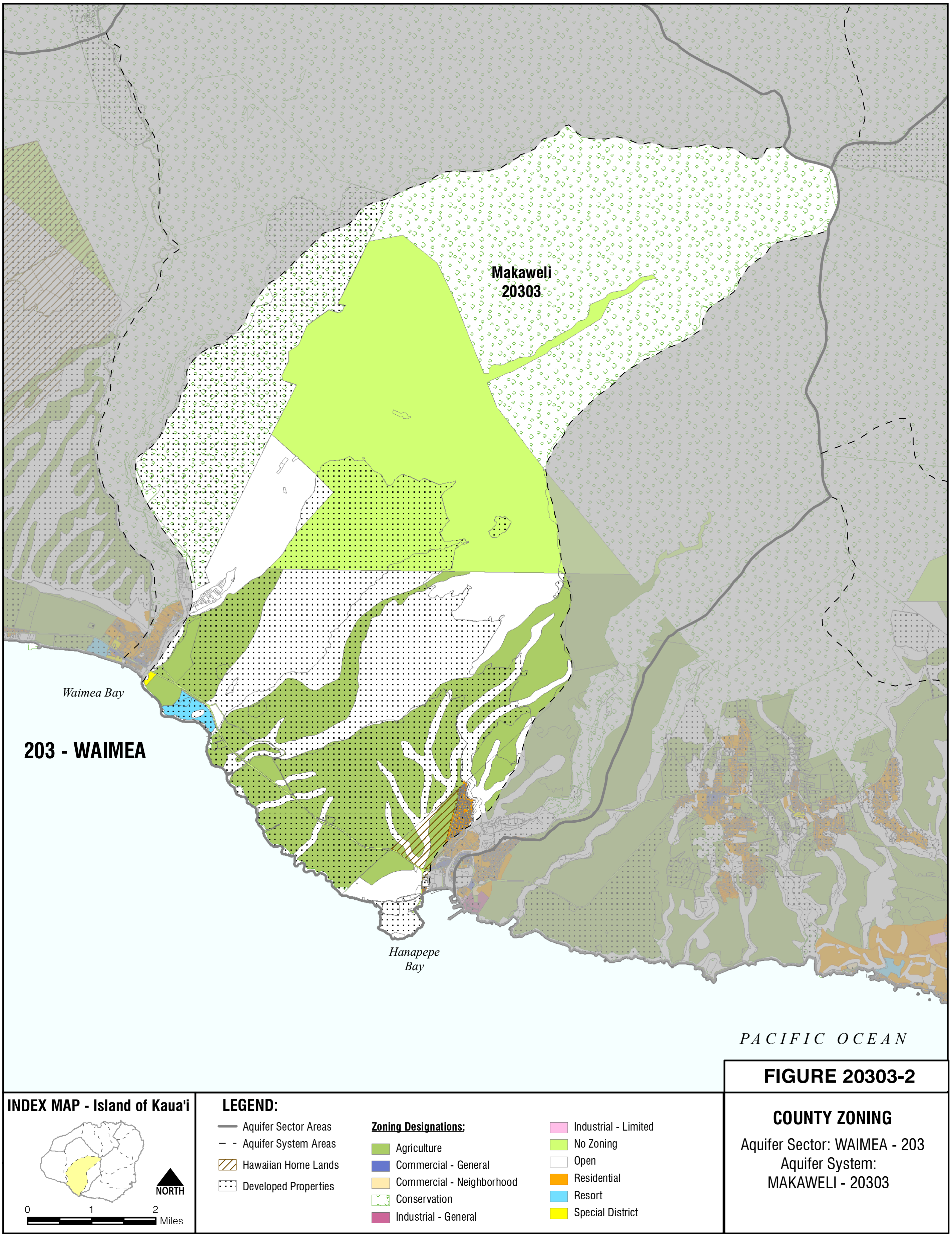


FIGURE 20303-2

COUNTY ZONING

Aquifer Sector: WAIMEA - 203
Aquifer System:
MAKAWELI - 20303

20303-2 EXISTING WATER RESOURCES

20303-2.1 Ground Water

The Makaweli ASYA has a sustainable yield of 26 mgd. According to the 2014 CWRM database, there are 4 production wells, 1 agriculture, 1 domestic, and 2 municipal wells. There are also 2 wells drilled and categorized as "unused." Refer to **Appendix A** for this database. **Figure 20303-3** shows the well locations.

20303-2.2 Surface Water

There are 4 streams classified as perennial in the Makaweli ASYA, of which 3 are considered continuous and 1 is considered intermittent. Mahinauli Stream, Waipao Stream, and Waimea Stream are classified as continuous streams, and A'akukui Stream is classified as an intermittent stream. The USGS has 5 active surface water gauges in the system area. The gauges are located on Waialae Stream, Waimea River, Makaweli River, and Kawaikōī Stream, which were previously listed in **Table 1-19**.

In accordance with the Code, the CWRM must establish and administer instream flow standards (IFS) on a stream-by-stream basis as necessary to protect public interests. IFS is defined as "a quantity or flow of water or depth of water which is required to be present at a specific location in a stream system at certain specified times of the year to protect fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses." Considerably more research and study need to be completed to accumulate the data and perspective necessary to conduct a thorough and meaningful assessment of IFS. Until permanent IFS are established, interim IFS have been adopted. The interim IFS are defined as the amount of water flowing in each stream at the time the administrative rules governing them were adopted in 1988 and 1989. In order to assess surface water sustainability, this KWUDP assumes that no additional diversions will be allowed from any stream without amendment of the interim IFS.

There are 19 declared stream diversions in the CWRM database shown on **Figure 20303-4**, which accounts for 7 percent of the 292 declared stream diversions on the island. The declared stream diversions are listed in **Appendix B**. The total declared flow for the Makaweli ASYA is 18.13 mgd. In addition, some existing irrigation systems have the capability to transfer surface water to adjacent ASYAs. 5.06 mgd of declared flow from diversions in the Hanapēpē ASYA appear to be associated with irrigation lines that have service area in the Makaweli ASYA.

The Olokele Ditch Irrigation System was formerly owned by the Hawaiian Sugar Company to irrigate sugarcane fields. It is still active and is now operated and maintained by Gay and Robinson to irrigate their fields.

20303-2.3 Water Conservation

Water conservation increases the amount of water available and helps to ensure the long-term viability of water resources. Water conservation measures for this ASYA are described in **Section 1.5.7** of this report. There are no ASYA specific special conservation measures in place at this time.

20303-2.4 Rainwater Catchment

Rainwater catchment is a viable resource for areas that are not served by ground water or surface water. **Figure 20303-5** shows the possible catchment areas, or parcels with a building value greater than $20,000 and assumed to be developed but without a ground water or surface water source.

20303-2.5 Recycled Water

There are no wastewater reclamation facilities in the Makaweli ASYA.

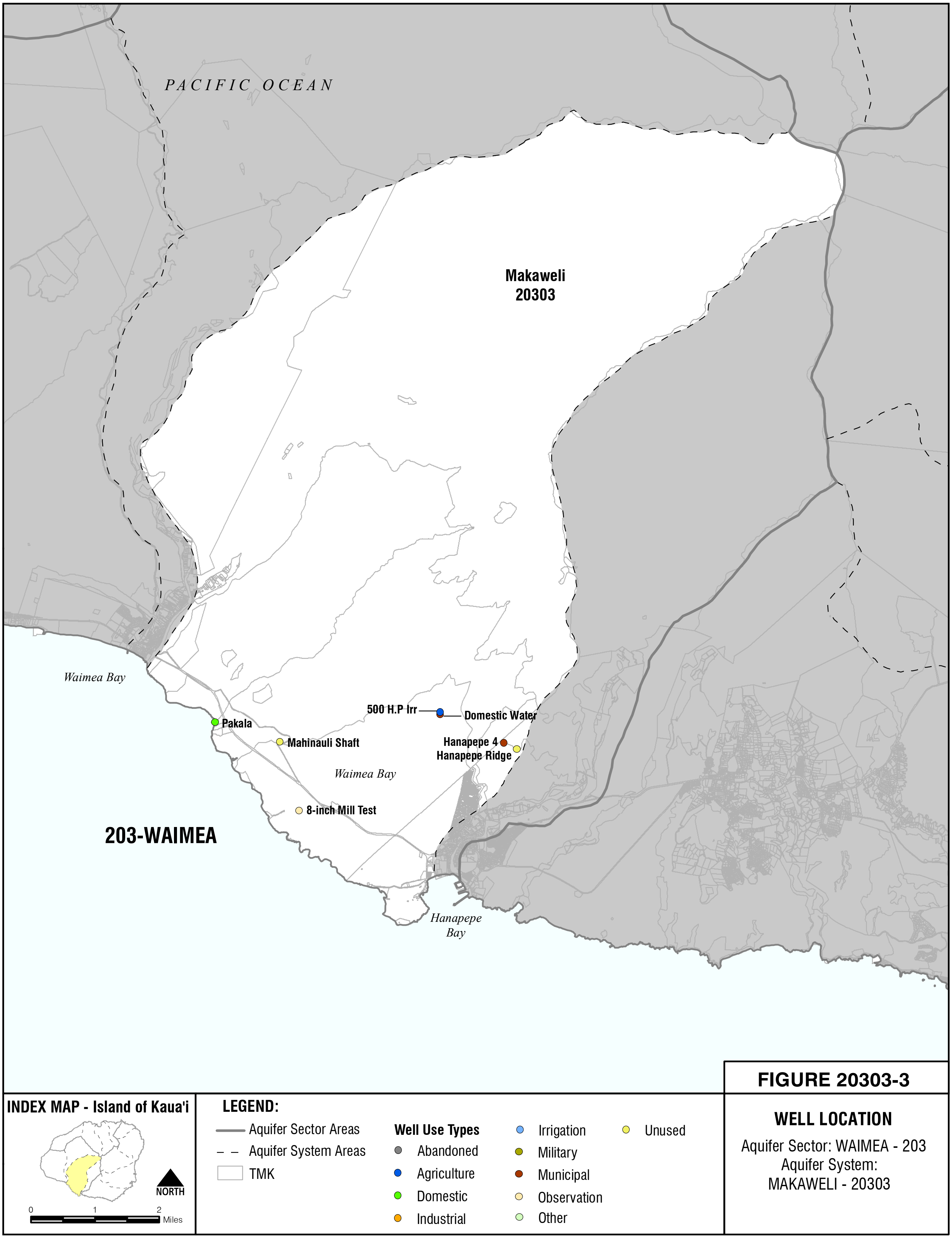


FIGURE 20303-3

WELL LOCATION

Aquifer Sector: WAIMEA - 203
Aquifer System:
MAKAWELI - 20303

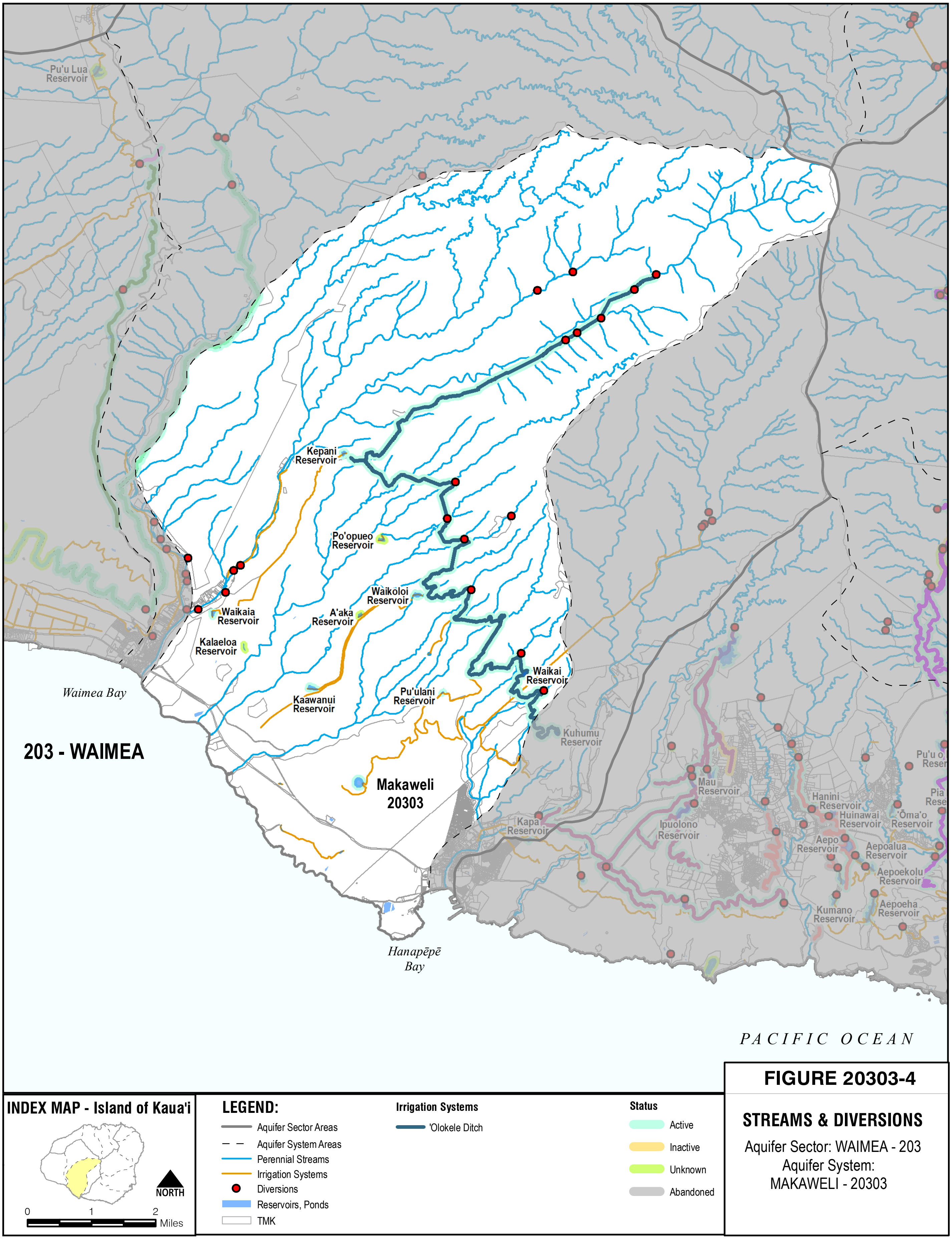


FIGURE 20303-4

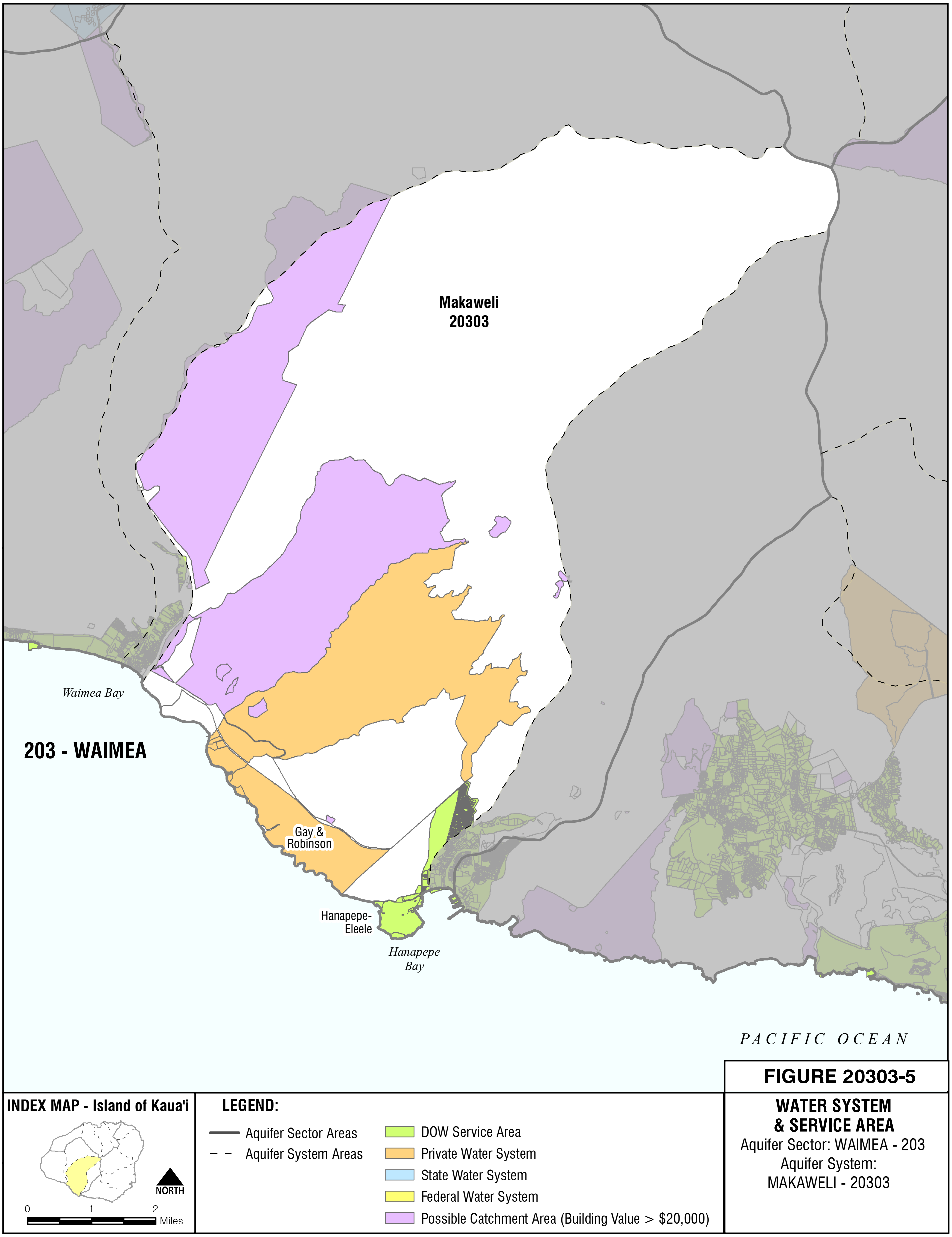
STREAMS & DIVERSIONS

Aquifer Sector: WAIMEA - 203
Aquifer System: MAKAWELI - 20303

Fukunaga & Associates, Inc.
Consulting Engineers

Kaua'i County - Department of Water

KAUA'I WATER USE AND DEVELOPMENT PLAN UPDATE



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Kaua'i County - Department of Water

KAUA'I WATER USE AND DEVELOPMENT PLAN UPDATE

20303-3 EXISTING WATER USE

20303-3.1 General

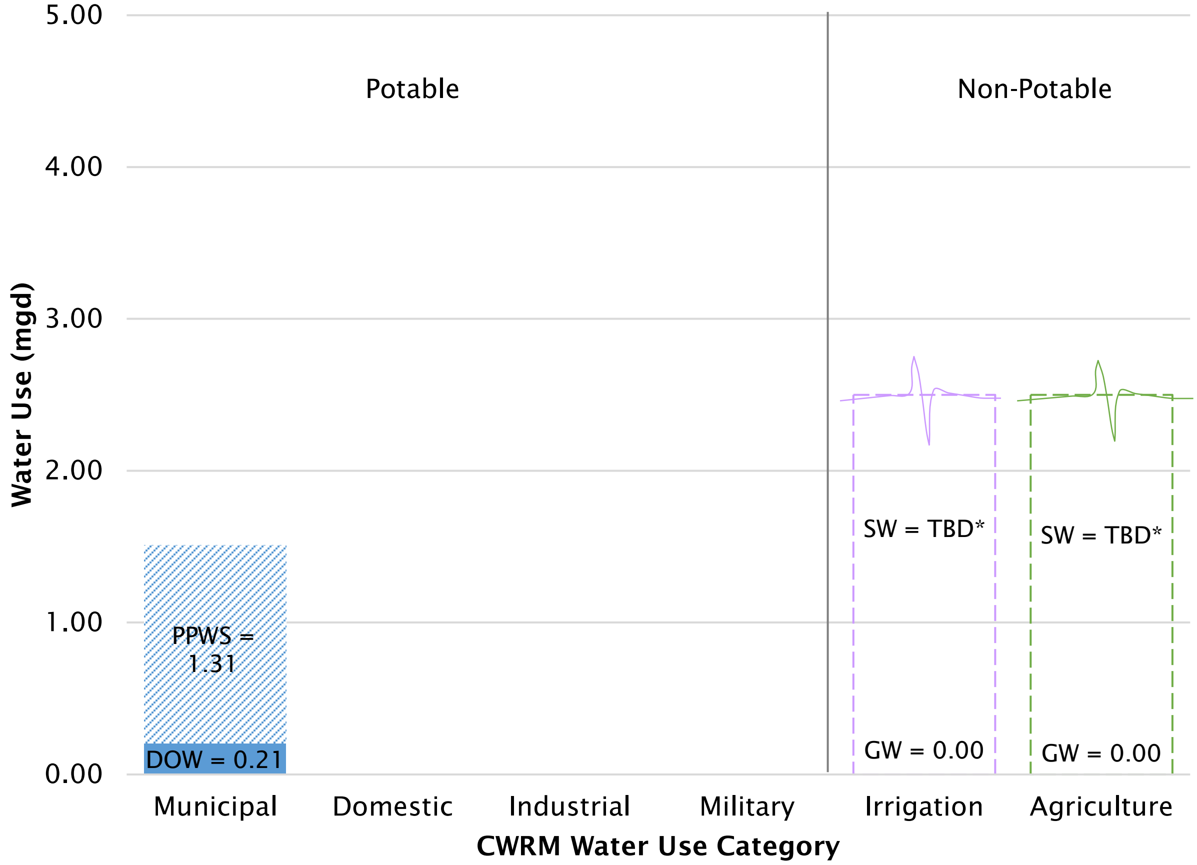
The following section presents the total estimated average water use within the Makaweli ASYA. The total estimated average water use was based on data from CWRM (well pumpage) and DOH (Sanitary Surveys for Public Water Systems and estimated recycled water usage) for the year 2014. **Table 20303-5** and **Figure 20303-6** summarize the water use in accordance with CWRM categories.

Table 20303-5: Existing Water Use by Category – Makaweli ASYA

CWRM Category	Ground Water (mgd)	Other Sources (mgd)	Total (mgd)	Percent of Total
Domestic	0.00		0.00	0.0
Industrial			0.00	0.0
Irrigation			0.00	0.0
Agriculture	0.00	TBD[1]	0.00	0.0
Military			0.00	0.0
Municipal				
DOW System	0.21		0.21	13.8
Private-Public WS	1.31		1.31	86.2
TOTAL	**1.52**		**1.52**	**100.0**

[1] Surface Water – TBD from AWUDP

Figure 20303-6: Existing Water Use by Category – Makaweli ASYA



*Values to be determined by other components of the Hawai‘i Water Plan

20303-3.2 Domestic Use

There is one well classified as "Domestic" in the 2014 CWRM database owned by Richland Mortgage Corporation; however, it has not reported pumpage.

20303-3.3 Industrial Use

There are no wells classified as "Industrial" in the Makaweli ASYA.

The Kaumakani-Makaweli Hydropower and Olokele Hydro Expansion power plant are located on Olokele ditch. The Kaumakani-Makaweli Hydropower plant was built in the 1920s to supply power to the Hawaiian Sugar Company's plantation. The Olokele Hydro Expansion power plant was built in 2019. Both plants are owned, operated, and maintained by Gay and Robinson and can produce up to 7.3 MW of power that is sold to the Kaua‘i Island Utility Cooperative (KIUC). Water is diverted from Olokele Ditch.

20303-3.4 Irrigation Use

Irrigation use has been divided into ground water, recycled water, and surface water.

20303-3.4.1 Ground Water

There are no wells classified as "Irrigation" in the Makaweli ASYA.

20303-3.4.2 Recycled Water

There is no recycled water use in the Makaweli ASYA.

20303-3.4.3 Surface Water

Information on surface water use for irrigation is to be determined by the AWUDP. However, typically, due to the location of parks and other landscaped areas within communities, it is assumed that it is unlikely for landscaping to be irrigated with surface water.

20303-3.5 Agricultural Use

Agricultural use has been divided into ground water, recycled water, and surface water.

20303-3.5.1 Ground Water

There is 1 well classified as AGRCP – Crops and Processing Agriculture owned by Gay and Robinson, Inc. It serves the Gay & Robinson Water System (PWS 417) and is discussed in **Section 20303-3.7**.

20303-3.5.2 Recycled Water

There is no recycled water use in the Makaweli ASYA.

20303-3.5.3 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP.

20,888 acres of Important Agricultural Lands (IAL), owned by Robinson Family Partners, are located in the Makaweli ASYA. Approximately 18,700 acres of IAL is used for cattle ranching and is leased to Gay & Robinson, who operates the ranch under the tradename Makaweli Ranch. The remaining 2,188 acres of IAL is used for seed production and is leased to Agrigenetics Inc. and DuPont Pioneer. Both the Kōʻula Ditch System and the Olokele Ditch System serve the IAL. The existing surface water use is unknown.

20303-3.6 Military Use

There is no military water use in the Makaweli ASYA.

20303-3.7 Municipal Use

There is 1 well in the CWRM database classified as "Municipal" (MUNCO – Municipal County) and 1 well classified as MUNPR – Municipal Private. Municipal can be subcategorized into the other water use categories: Domestic, Industrial, Agricultural, Military, and Municipal.

20303-3.7.1 County Water Systems

Hanapēpē-ʻEleʻele Water System

The DOW has one major water system that serves the Makaweli ASYA. The Hanapēpē-ʻEleʻele water system is DOH Public Water System (PWS) No. 404 and services areas in the Makaweli, Hanapēpē, and Kōloa ASYA. Majority of the water system serves the Hanapēpē ASYA and therefore will be discussed in **Section 20304**.

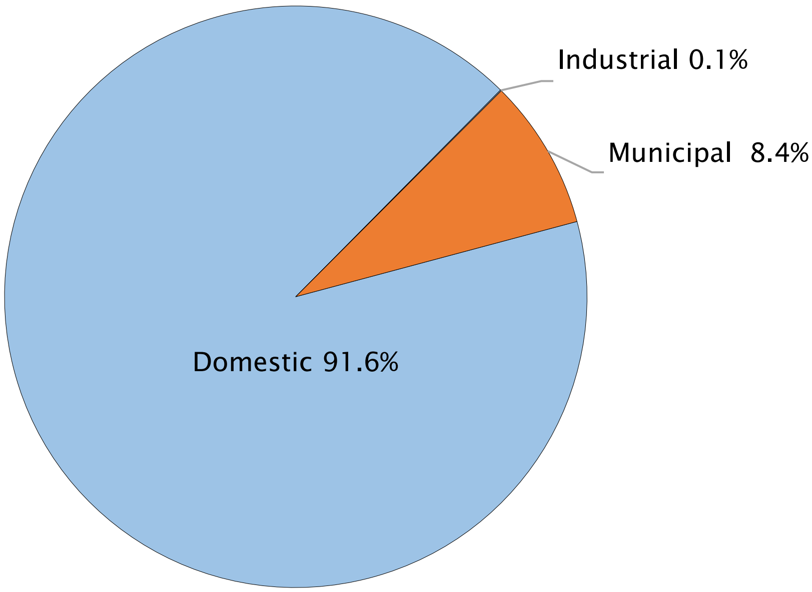
DOW Water Use by Category

DOW water use is subcategorized in **Table 20303-6** to the extent possible based on available meter data and is depicted in **Figure 20303-7**.

Table 20303-6: DOW Existing Water Use by Category – Makaweli ASYA

CWRM Water Use Category	DOW Metered Water Use (MGD)	Percent of Total
Agricultural	0.0000	0.0
Domestic	0.1440	91.6
Industrial	0.0001	0.1
Military	0.0000	0.0
Municipal	0.0130	8.3
Total	**0.1581**	**100.0**

Figure 20303-7: DOW Existing Water Use by Category – Makaweli ASYA



20303-3.7.2 State Water Systems

There are no State water systems in the Makaweli ASYA regulated by the DOH.

20303-3.7.3 Federal Water Systems

There are no Federal water systems in the Makaweli ASYA regulated by the DOH.

20303-3.7.4 Private-Public Water Systems

The Gay & Robinson Water System (PWS 417) is the only private-public water system in the Makaweli ASYA regulated by the DOH. The water system is owned by Gay & Robinson, Inc. and provides water to customers living in plantation housing in Pākala, Kaumakani Village, and Camp-6. Prior to 2009, the water system also provided water to the sugar mill. Water for the system is provided by a well and a shaft, with reported pumpage of 1.31 mgd. The well and shaft also provide water for the plantation's irrigation system by pumping water through the pump-to-waste line uphill to an irrigation ditch. An air gap between the pump-to-waste discharge and the irrigation system separates the potable water system from the irrigation system.

20303-3.7.5 Per Capita Use

The per capita existing water use consumption based on domestic DOW metered water use and private-public water system use is presented in **Table 20303-7**. The per capita use in the Makaweli ASYA is approximately 178.2% lower than the overall County of Kaua'i per capita use largely due to the high PPWS use. However, it is noted that the Gay & Robinson water system is used for both domestic and irrigation purposes.

Table 20303-7: Per Capita Use – Makaweli ASYA

	DOW Metered Water Use – Domestic (mgd)	Private-Public Water System (mgd)	90% of 2015 Population	Per Capita Use (gpd)
Makaweli ASYA	0.144	0	2,685	540
County of Kauaʻi	**9.360**	**2.951**	**63,462**	**194**

20303-3.8 Existing Water Use by Resource

20303-3.8.1 Ground Water

Table 20303-8 summarizes the current production, sustainable yield (SY), and percentage of SY for the current production. Current production is represented by the 2014 average yield calculated from the actual pumping data.

Table 20303-8: Pumpage – Makaweli ASYA

Pumpage (mgd)	SY (mgd)	Pumpage Portion of SY
1.52	26	5.8%

Based on available information from the CWRM database, the current ground water use is 5.8 percent of the sustainable yield.

20303-3.8.2 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP. However, some limited information is available in the AWUDP dated 2003 (revised 2004) and in IAL designation documents.

The Olokele Ditch Irrigation System and Koʻula Ditch System provides water to 20,888 acres of IAL for cattle ranching (Makaweli Ranch) and seed production owned by Robinson Family Partners. Existing surface water use is unknown.

20303-3.8.3 Water Conservation

Water conservation, including water loss management, may reduce water use. See **Section 20303-2.3** for discussion of existing conservation efforts.

20303-3.8.4 Rainwater Catchment

Developed parcels that are not supplied by ground water or surface water are assumed to be supplied by rainwater catchment.

20303-3.8.5 Recycled Water

There is no recycled water use in the Makaweli ASYA.

20303-4 FUTURE WATER USE

20303-4.1 Full Build-Out Water Demand Projections

The full build-out water demand projections based on the General Plan and County Zoning for the Makaweli ASYA is listed in **Tables 20303-9** and **20303-10**, respectively. Each land use class is associated with the most appropriate CWRM water use category.

Table 20303-9: General Plan Full Build-Out Water Demand Projection – Makaweli ASYA

GP Category	CWRM Category	Water Demand (MGD)
Agriculture	Agriculture/Domestic	0.37
Open	Domestic	0.05
Military	Military	0
Park	Irrigation	0.09
Residential	Domestic/Municipal	0.42
Resort	Domestic/Irrigation/Municipal	0.12
Transportation	Municipal	0
Urban Center	Domestic/Industrial/Municipal	0
DHHL	Domestic	0.40
	TOTAL	**1.45**

Table 20303-10: Zoning Full Build-Out Water Demand Projection – Makaweli ASYA

Zoning Class	CWRM Category	Water Demand (MGD)
Agriculture	Agriculture/Domestic	0.37
Commercial	Municipal	0
Industrial	Industrial/Municipal	0
Open	Domestic	0.05
Residential	Domestic/Municipal	0.27
Resort	Domestic/Irrigation/Municipal	0.09
DHHL	Domestic	0.40
	TOTAL	**1.18**

20303-4.1.1 Refined Land Use Based Water Projection

State Water Projects Plan

Table 20303-11 lists future State water projects reported in the 2021 SWPP update. The total projected demand to the year 2034 for the four State water projects within the Makaweli ASYA is 0.982 mgd using potable, 0.292 mgd using non-potable, and 0.245 mgd non-potable using potable sources.

Table 20303-11: Future State Water Projects – Makaweli ASYA

Project Name	State of Hawaiʻi Department	Primary Use	Water Development Strategy	2034 Demand (mgd)
Hanepēpē	DHHL	Potable	NEWSWS	0.4045
Hanepēpē (Non-Potable)	DHHL	Non-potable	NONE-AMBIENT MOISTURE	0.2924
Hanepēpē (Non-Potable using Potable)	DHHL	Non-potable using Potable	NEWSWS	0.2448
DLNR West Kauaʻi Field Operations Facility	DLNR	Potable	REMAIN	0.0400
			TOTAL REMAIN	0.0400
			TOTAL MAKAWELI ASYA SWPP 2034 DEMAND	0.9817

As mentioned in **Section 2.2.2.5.1**, State water projects with the water development strategy of REMAIN are located within the service areas of County water systems which need to be coordinated with the respective County water departments. One of the four State projects within the Makaweli ASYA was assigned the REMAIN water development strategy and results in a total 2034 demand of 0.0400 mgd. This accounts for 0.15 percent of the 26 mgd sustainable yield for the Makaweli ASYA. See the following paragraph for more information on the DHHL projects within the Makaweli ASYA.

State Department of Hawaiian Home Lands

The Hanapēpē Tract is the DHHL tract located within the Makaweli ASYA. The State Water Projects Plan – DHHL Update (SWPP), dated May 2017, discusses the projected water demands for DHHL and the proposed water development strategies to meet these water demands. The DHHL demands have also been incorporated into the SWPP Update, dated May 2021. See **Table 20303-11** for a breakdown of the demands. The projected potable water demands for the Hanapēpē tract is 0.405 mgd. The 2017 SWPP suggests that this demand be met by a new State water system in the Makaweli ASYA.

The 2017 SWPP also discussed non-potable demands. It projects that non-potable demand for the Hanapēpē Tract will be 0.537 mgd, and that the need can be met by ambient moisture.

Agricultural Water Use and Development Plan

The AWUDP dated 2003 (revised 2004) was limited in scope. More recent, comprehensive information on agricultural lands is available in the County of Kauaʻi Important Agricultural Lands Study.

In 2019, a public review draft of the AWUDP was released and it is anticipated that the next phase of the AWUDP will provide agricultural water demand projections in greater detail and will supersede information in the KWUDP when it becomes available.

County of Kauaʻi Important Agricultural Lands Study

7,620 acres of agricultural lands within the Makaweli ASYA received a score of 28 or better in the County of Kauaʻi Important Agricultural Lands (IAL) Study. Lands that receive a score of 28 or better were determined to have met all eight IAL criteria to some degree. Only a subset of lands with a score of 28 or better is expected to be designated as IALs. A total of 20,888 acres of agricultural lands have been designated as IAL in the Makaweli ASYA thus far. **Table 20303-12** compares these lands that received a score of 28 or better to the declared surface water use from diversions and to the diversified water use rate of 3,400 gallons per acre per day (gpad) estimated in the 2004 AWUDP.

Table 20303-12: Irrigation of Agricultural Lands

(1) Declared Surface Water Use from Diversions (mgd)	23.19
(2) Agricultural Lands with a Score ≥ 28 (Acres)	7,620
- How many acres can be sustained by **(1)** at a water rate of 3,400 gpad? (Acres)	6,821
- What percent of **(2)** can be sustained with a water rate of 3,400 gpad?	90
- If all of **(2)** were to be irrigated, what is the water unit rate? (gpad)	3,043

20303-4.1.2 Water Use Unit Rates

Water use unit rates are based on the *Water System Standards* (WSS), as discussed in Chapter 2.

The General Plan provides only broad density guidelines for residential and resort designations. For these designations, under the assumption that most residents would like their communities, including the development density, to remain similar in the future, the average number of dwelling units as allowed by zoning was used as the density (i.e., 5.74 dwelling units per acre for residential designation and 1.00 dwelling units per acre for resort designation).

20303-4.2 Water Demand Projections to the Year 2035

The following section presents water demand projections to the year 2035 for the Makaweli ASYA. The projected low, medium, and high growth rates are listed in **Table 20303-13** and are graphed in **Figure 20303-8**. Potable (domestic, industrial, municipal, and military water uses) and non-potable (irrigation) water demands are also differentiated.

Table 20303-13: Water Demand Projection – Makaweli ASYA

Water Use Category	Water Demand by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
GROWTH RATE C (HIGH)									
TOTAL	**1.52**	**1.52**	**1.53**	**1.54**	**1.55**	**1.56**	**1.61**	**1.66**	**1.72**
Potable	1.52	1.52	1.53	1.54	1.55	1.56	1.61	1.66	1.72
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GROWTH RATE B (MEDIUM)									
TOTAL	**1.52**	**1.52**	**1.53**	**1.54**	**1.54**	**1.55**	**1.60**	**1.65**	**1.71**
Potable	1.52	1.52	1.53	1.54	1.54	1.55	1.60	1.65	1.71
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GROWTH RATE A (LOW)									
TOTAL	**1.52**	**1.52**	**1.52**	**1.52**	**1.53**	**1.53**	**1.55**	**1.58**	**1.61**
Potable	1.52	1.52	1.52	1.52	1.53	1.53	1.55	1.58	1.61
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figure 20303-8: Water Demand Projection Summary – Makaweli ASYA

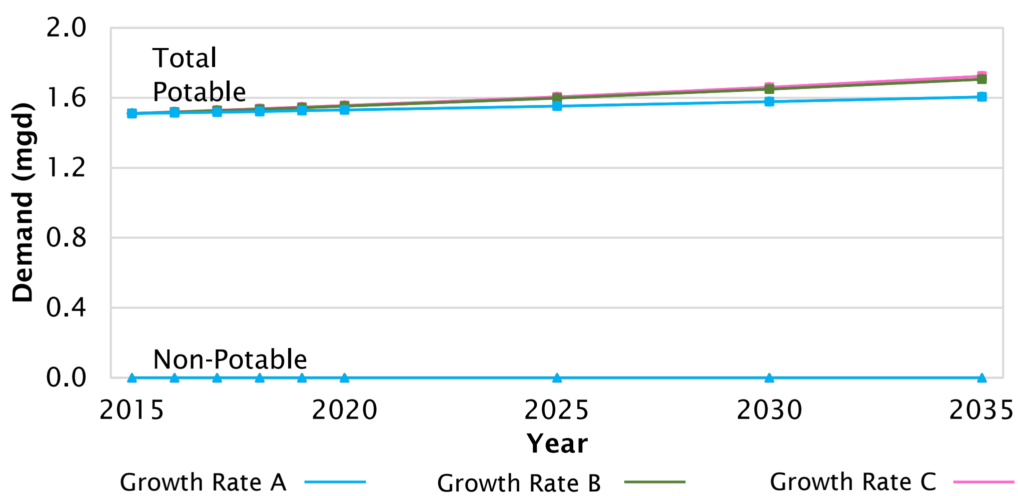


Figure 20303-9 shows the breakdown of water demand projections for a medium growth rate by CWRM categories through the year 2035. **Table 20303-14** summarizes this figure.

Figure 20303-9: Medium Growth Rate B Water Demand Projection by Category – Makaweli ASYA

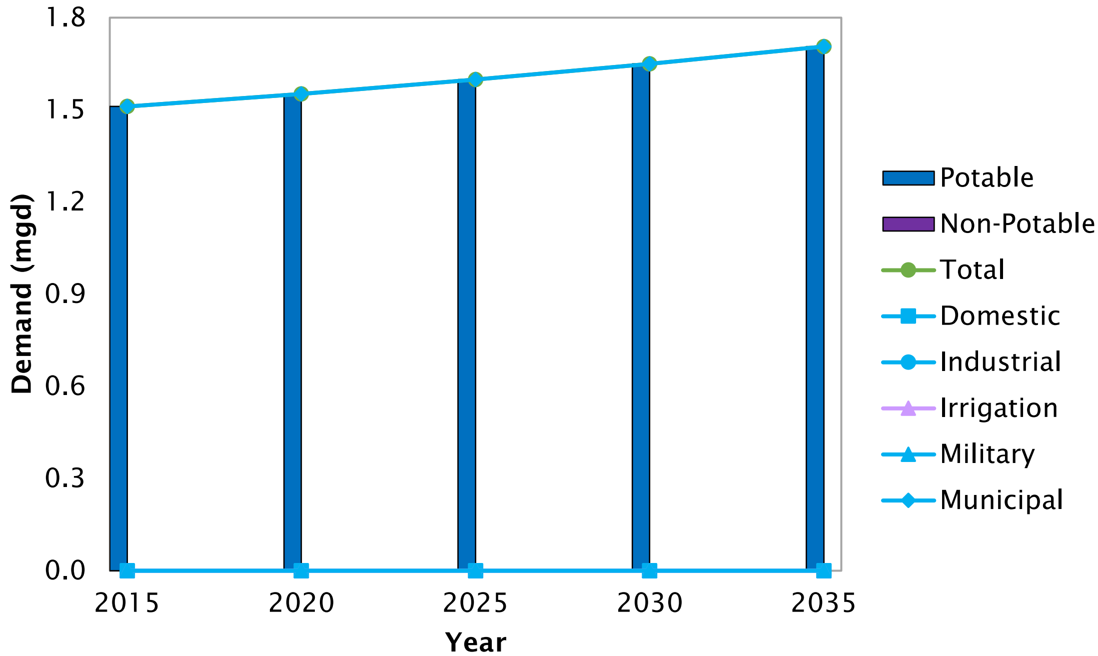


Table 20303-14: Medium Growth Rate B Water Demand Projection by Category – Makaweli ASYA

Water Use Category	Water Use by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
Total	**1.52**	**1.52**	**1.53**	**1.54**	**1.54**	**1.55**	**1.60**	**1.65**	**1.71**
Potable	1.52	1.52	1.53	1.54	1.54	1.55	1.60	1.65	1.71
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Domestic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Irrigation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Military	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Municipal	1.52	1.52	1.53	1.54	1.54	1.55	1.60	1.65	1.71
DOW	0.21	0.21	0.21	0.21	0.21	0.21	0.22	0.22	0.23

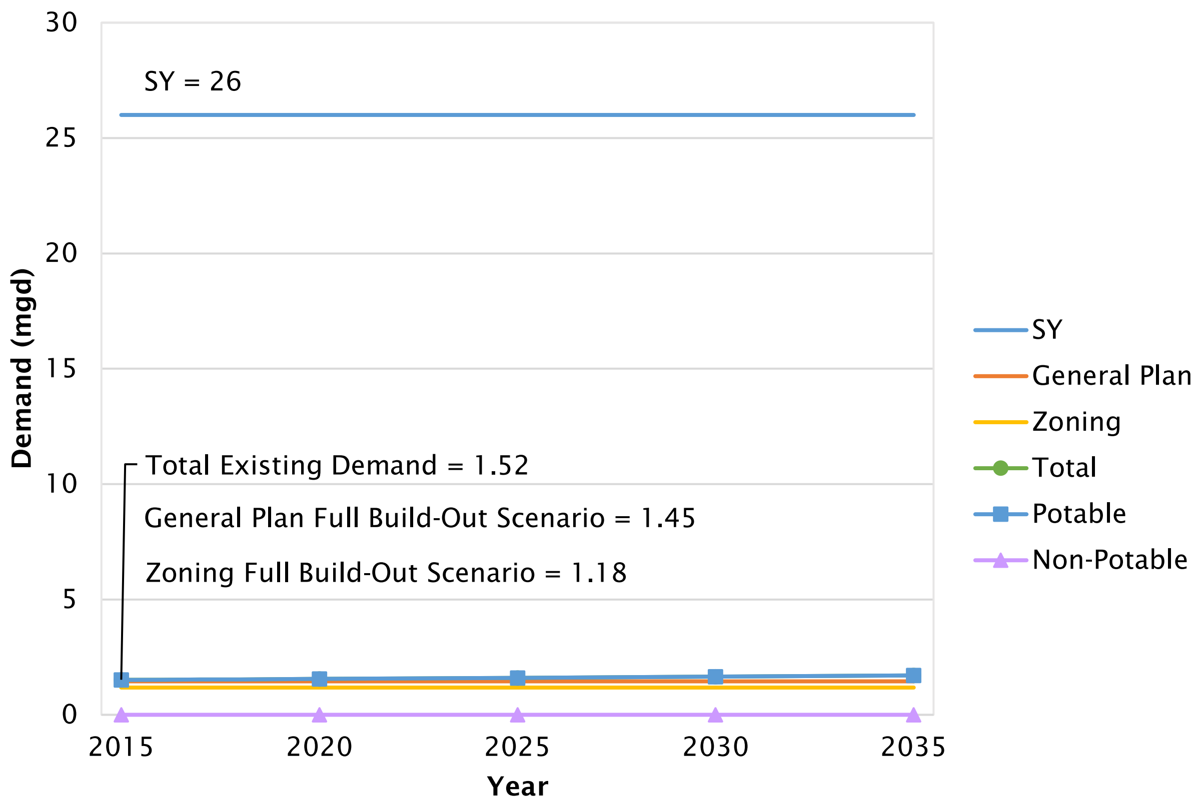
20303-4.3 Summary

Figure 20303-10 illustrates the magnitude of the sustainable yield, both General Plan and Zoning full build-out water use projections, and water use projection through the year 2035 focusing on Medium Growth Rate B. **Table 20303-15** summarizes the General Plan, Zoning, and 20-year water demand projection scenarios for the Makaweli ASYA. The sustainable yield is presented to draw comparisons. All demands are in mgd.

Table 20303-15: Summary of Demand Projections

SY (mgd)	FBO (mgd)		Medium Growth Rate Demand by Year (mgd)								
	GP	Zoning	2015	2016	2017	2018	2019	2020	2025	2030	2035
26	1.45	1.18	1.52	1.52	1.53	1.54	1.54	1.55	1.60	1.65	1.71

Figure 20303-10: Medium Growth Rate B Water Demand Projections and Full Build-Out – Makaweli ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use. For future agricultural water use analysis, please see Section 20303-4.1.1 County of Kaua 'i Important Agricultural Lands Study.

20303-5 RESOURCE AND FACILITY RECOMMENDATIONS

20303-5.1 Water Source Adequacy

20303-5.1.1 Full Build-Out

Development to the highest extent allowed by the General Plan and County Zoning within the Makaweli ASYA is sustainable, with General Plan and County Zoning full build-out water demands requiring 6 and 5 percent of the 26 mgd sustainable yield, respectively.

20303-5.1.2 Twenty-Year Projection

The 2035 water demand projection for the Makaweli ASYA is sustainable and is only 6 percent of the 26 mgd sustainable yield.

20303-5.2 Source Development Requirements

20303-5.2.1 Supply-Side Management

Supply-side management, including conventional water resource measures, water conservation, and alternative water resource measures, were evaluated to meet projected water demands.

Conventional Water Resource Measures

Ground Water

The Makaweli ASYA contains basal and perched ground water. All reported pumpage is from the perched zone.

The 2035 water demand projection for the Makaweli ASYA is only 6 percent of the 26 mgd sustainable yield. This indicates that theoretically, more water could be pumped from the aquifer without impairing the utility or quality of the water resource if wells are optimally placed and the proper due diligence with regard to traditional and customary rights and impacts has been completed. However, it is noted that sustainable yield does not consider the feasibility of developing the ground water resources, and that the safe yield of an individual production well may be limited by localized ground water behavior near the well as a result of pumpage. Water supply reliability and quality, feasibility, environmental and cultural impacts, and water rights shall be considered as projects and programs develop. More detailed and site-specific evaluation of these impacts shall be required and accomplished through the environmental review process (HRS Chapter 343) for source development projects and programs utilizing public funding, and CWRM could consider requiring compliance with the environmental review process for private source development projects and programs also. **Section 1.5.3.1** provides additional information regarding the protection of traditional and customary rights.

There are two public water systems in the Makaweli ASYA: the Gay & Robinson water system and DOW's Hanapēpē-ʻEleʻele water system.

The Gay & Robinson water system serves customers living in plantation housing in Pākala, Kaumakani Village, and Camp-6.

The DOW's Hanapēpē-'Ele'ele water system serves Hanapēpē, Hanapēpē Heights, 'Ele'ele Nani, and Port Allen and services areas in the Makaweli ASYA and Hanapēpē ASYA. One of the system's water sources is in the Makaweli ASYA. The DOW's Water Plan 2020 did not identify any additional new ground water sources to meet its projected demands.

The 2017 SWPP proposed a new state water system in the Makaweli ASYA to meet the projected potable demands of DHHL's Hanapēpē tract.

Further development of ground water to meet future demands should be viable.

Surface Water

There are 19 declared diversions in the Makaweli ASYA. Until permanent instream flow standards are established, interim instream flow standards have been adopted. According to Section 13-169-46, Hawai'i Administrative Rules, "Interim Instream Flow Standard for all streams on Hawai'i, as adopted by the commission on water resource management on June 15, 1988, shall be that amount of water flowing in each stream on the effective date of this standard, and as that flow may naturally vary throughout the year and from year to year without further amounts of water being diverted off-stream through new or expanded diversions, and under the stream conditions existing on the effective date of the standard, except as may be modified [by the commission]." Therefore, for the purposes of assessing surface water availability, it is assumed that no additional diversions will be allowed without amendment of the interim IFS.

The existing declared diversions have the potential to meet additional demands. However, a challenge with developing surface water is transmission of these resources from source to location of need. Farmers generally grow what is feasible for the area; therefore, it is anticipated that agricultural water use will follow the availability of irrigation water. Increase in the availability of surface water would likely promote additional usage and could thereby minimize ground water being used for irrigation.

The Olokele Ditch Irrigation System is operated and maintained by Gay and Robinson. The Agricultural Water Use and Development Plan (AWUDP) should provide an inventory of large irrigation systems and provide information on their rehabilitation and maintenance needs. The AWUDP should also include a more detailed assessment of agricultural water demand projections that will supersede information in the KWUDP when it becomes available.

Water Transfer

Some existing irrigation systems have the capability to transfer surface water to adjacent ASYAs. The AWUDP should study irrigation system services areas and provide information on irrigation systems' water transfer.

Water can also be transferred between ASYAs through public water systems. The service area of DOW's Hanapēpē-'Ele'ele water system falls in the Makaweli ASYA, Hanapēpē ASYA, and Kōloa

ASYA. Its wells are located in the Makaweli ASYA and Hanapēpē ASYA, and water must be transferred to ʻEleʻele via booster pump stations.

Water Conservation

The per capita use in the Makaweli ASYA is approximately 178.2% lower than the overall County of Kauaʻi per capita use largely due to the high PPWS use. However, it is noted that the Gay & Robinson water system is used for both domestic and irrigation purposes. There are no ASYA-specific conservation measures in place at this time; however, there are general water conservation programs that are described in **Section 1.5.7**. Water conservation, including water loss management, can increase the amount of water available and help to ensure the long-term viability of water resources.

In the DOW's Water Plan 2020, instituting water conservation measures in the Hanapēpē-ʻEleʻele water system service area was proposed to avoid a slight supply and storage deficit.

Alternative Water Resource Measures

Rainwater Catchment

Rainwater can be utilized as a water resource in several ways.

Rainwater can be harvested in rainwater catchment systems which can be utilized to supply domestic potable water needs. These systems are viable in areas that receive abundant rainfall and are a suitable source of potable water for individual domestic users in areas outside the limits of municipal water systems. Generally, these are remote areas and are not expected to expand significantly because most development is anticipated to be concentrated within existing urban areas. Therefore, use of rainwater catchment systems is not anticipated to increase significantly.

Rainwater can also be used to supplement or satisfy agricultural non-potable water needs through ambient rainfall.

See the Storm Water Reuse section below to see how rainwater as storm water runoff can be reclaimed and reused.

Storm Water Reuse

Rainfall can turn into storm water runoff. Storm water runoff from impervious surfaces in urban areas can be significant. This water could be captured, treated, and used as a source of non-potable water (e.g., irrigation), integrated with recycled water, or even as potable and/or non-potable ground water recharge. However, due to the lack of storm water reuse standards, the high initial infrastructure costs, and the treatment requirements, storm water reclamation and reuse on a small or large scale may not be feasible and requires further assessment as noted in the Water Resource Protection Plan. The U.S. Department of the Interior, Bureau of Reclamation published An Appraisal of Stormwater Reclamation and Reuse Opportunities in Hawaiʻi (Storm Water Report) in 2008 but did not identify any storm water reclamation and reuse opportunities in the Makaweli ASYA.

Recycled Water

Recycled water is a valuable resource; an increase in its use may lower the dependence on potable sources. However, there are no wastewater reclamation facilities (WWRFs) in the Makaweli ASYA.

Desalination

Desalination of brackish ground water is a potential alternative; however, due to its high capital and operational costs, it likely would not be considered when other potable water sources are available.

20303-5.2.2 Demand-Side Management

Development Density Control

The full build-out demand for the Makaweli ASYA based on County Zoning is 1.18 mgd which is 5 percent of the sustainable yield. This indicates that there are adequate water resources to sustain the level of development that is allowed by law. In the Makaweli ASYA, the average number of dwelling units allowed by County Zoning is 5.74 dwelling units per acre in residential districts and 1.00 dwelling units per acre in resort districts.

The full build-out demand for the Makaweli ASYA based on the General Plan is 1.45 mgd which is 6 percent of sustainable yield. Therefore, development density control may not be necessary. However, the County Planning Department could consider development density control for areas where there is the flexibility to do so, such as areas that are not yet zoned as residential or resort, and promote sustainable development. Further, it is noted that the full build-out scenario is unlikely to occur since it assumes all land is developed to the maximum extent.

20303-5.3 Recommended Alternatives

To optimize appropriate use of water resources, the quality of the water source should be matched to the quality of water required. The highest quality of water shall be reserved for the most valuable end use. Potable water is considered the highest quality water, and the sustenance of life is the most valuable end use. Recycled water, brackish water, untreated surface water, and other lower quality water sources should be used for landscaping and agriculture when available, thereby reserving potable water for human consumption. If there is a practical alternative water source available, that alternative source should be used in lieu of ground water or surface water. With this in mind, the following recommendations are made for the Makaweli ASYA:

Alternative Water Resources

Use of alternative water sources can reduce demands on both ground and surface water resources and conserve water resources as a whole. However, aside from rainwater, there are no available alternative water sources in the area. Alternative water sources are unlikely to be developed when other water resources are readily available.

Conservation

Water resources are a finite resource that should be managed and used wisely. It should be conserved and not wasted. Implementation of conservation measures should continue to be encouraged.

Ground Water

Meeting future demands at a reasonable cost is a planning objective, and conventional sources, such as ground water, are typically the most cost-effective means for meeting projected water demands. Projected potable water needs are within the sustainable yield for this area. Therefore, ground water resources could continue to be used and developed to meet potable water needs now and into the future. However, as noted above, development of conventional water resource measures can have challenges, and water supply reliability and quality, feasibility, environmental and cultural impacts, and water rights shall be considered as projects and programs develop.

Development of ground water resources is the primary strategy to serve future potable demands in the Makaweli ASYA.

Surface Water

Surface water, where available, should be used to meet non-potable demands if alternative water resources are not available. To achieve this, it will be critical to maintain and improve existing irrigation systems. Making surface waters more readily available to meet non-potable water demands has the potential to minimize future dependence on the use of ground water. It is therefore recommended that the AWUDP provide information on the rehabilitation and maintenance needs of large irrigation systems.

Demand-Side Management

Full build-out demand based on the General Plan is 6 percent of sustainable yield. At this projection, implementation of development density control by the County Planning Department is not needed in this area. Although the projection is sustainable, the County Planning Department will need to consider potential impacts on available water resources when considering any future zoning modifications. Modifications that may result in increased development density within the area will increase demands on water resources.

Chapter 20304

Hanapēpē Aquifer System Area

CHAPTER 20304 - TABLE OF CONTENTS

FIGURES

TABLES

20304 HANAPĒPĒ AQUIFER SYSTEM

20304-1 SYSTEM AREA PROFILE

20304-1.1 General

The Hanapēpē [20304] Aquifer System Area (ASYA) is roughly equivalent to the Hanapēpē drainage basin, encompassing a drainage area of about 26 square miles[1]. The Hanapēpē drainage basin is relatively long and narrow, approximately 11.5 miles long by about 2.5 miles wide and drains the southwest summit slopes of Mount Waialeale. The upper reach of the drainage basin is located through agricultural lands and extends through urbanized lands in its lower reaches.

Average annual rainfall in the Hanapēpē ASYA is approximately 127 inches. The sustainable yield for the Hanapēpē ASYA is 22 mgd.

20304-1.2 Economy and Population

20304-1.2.1 Economy

The largest industry/employment component in Hanapēpē is related to accommodations and food service making up about 20 percent of the jobs in the area.

20304-1.2.2 Population

Historical population data for the Hanapēpē AYSA is summarized in **Table 20304-1**. Population projections through the year 2035 are summarized in **Table 20304-2a**. As summarized in **Table 20304-2b**, it is estimated that the area will experience growth rates between 2 to 6 percent per decade.

Table 20304-1: Historical Population – Hanapēpē ASYA

	Year		
	1990	**2000**	**2010**
Population	683	769	1,085
Percent Change		12.6	41.1

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report. Data redistributed and evaluated for Hanapēpē ASYA.

[1] https://waterdata.usgs.gov/hi/nwis/inventory/?site_no=16052000&agency_cd=USGS

Table 20304-2a: Population Projection – Hanapēpē ASYA

Growth Rate	Population by Year								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
A – Low	1,101	1,104	1,107	1,109	1,112	1,115	1,131	1,148	1,168
B – Med.	1,109	1,115	1,121	1,127	1,133	1,139	1,173	1,209	1,251
C – High	1,111	1,117	1,123	1,130	1,136	1,143	1,180	1,220	1,265

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report. Data redistributed and evaluated for Hanapēpē ASYA.

Table 20304-2b: Population Projection – Percent Change – Hanapēpē ASYA

Growth Rate	2015-2025 % Change	2025-2035 % Change
A – Low	2.7	3.3
B – Medium	5.8	6.7
C – High	6.2	7.2

20304-1.3 Land Use

20304-1.3.1 2000 Kaua'i General Plan

The 2000 Kaua'i County General Plan Land Use Designation Map for the Hanapēpē ASYA is shown on **Figure 20304-1**. The estimated land use allocation acreage for each land use designation is listed in **Table 20304-3**.

Table 20304-3: General Plan Estimated Land Use Allocation Acreage – Hanapēpē ASYA

General Plan Land Use Designation	Acreage	Percent of Total
Agricultural	638	4.5
Military	0	0.0
Open	13,512	94.1
Park	13	0.1
Residential Community	178	1.2
Resort	0	0.0
Transportation	1	0.0
Urban Center	1	0.0
DHHL	9	0.1
TOTAL	**14,352**	**100.0**

20304-1.3.2 Kaua'i Zoning

Kaua'i County Zoning Map for the Hanapēpē ASYA is shown on **Figure 20304-2**. The estimated land use allocation acreage for each zoning district within the system area is listed in **Table 20304-4**.

Table 20304-4: County Zoning Estimated District Allocation Acreage – Hanapēpē ASYA

Zoning District	Acreage	Percent of Total
Agriculture	2,582	17.9
Commercial – General	26	0.2
Commercial - Neighborhood	0	0.0
Conservation	10,999	76.2
Industrial – General	0	0.0
Industrial - Limited	0	0.0
Open	718	5.0
Residential	92	0.6
Resort	0	0.0
Project Development	0	0.0
Special Planning Area	0	0.0
Special Treatment	0	0.0
No Zoning	19	0.1
DHHL	1	0.0
TOTAL	**14,437**	**100.0**

The number of dwelling units allowed in residential and resort districts varies by the type of residential or resort district. The average number of dwelling units allowed in residential districts in the Hanapēpē ASYA is 3.58 dwelling units per acre.

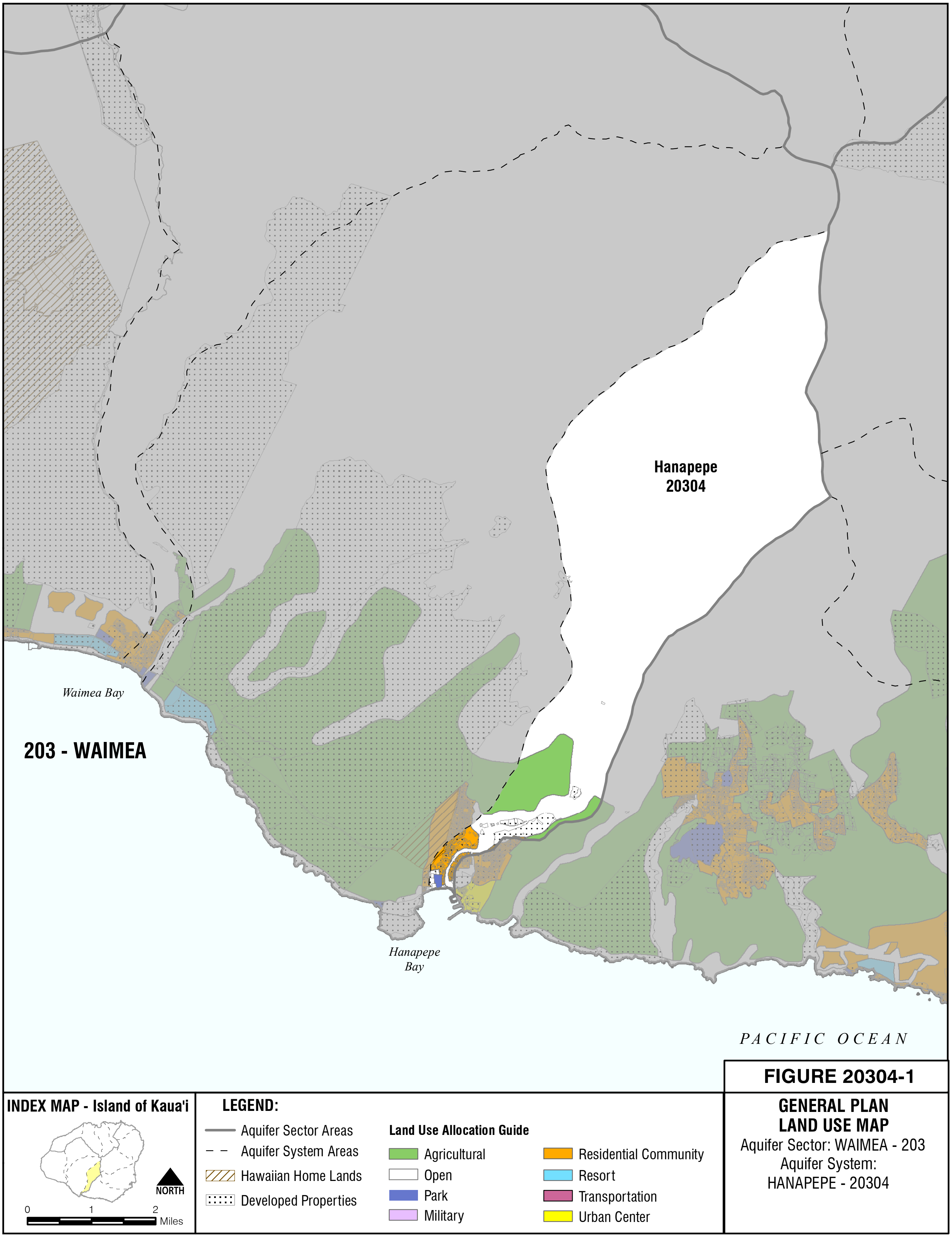


FIGURE 20304-1

GENERAL PLAN
LAND USE MAP
Aquifer Sector: WAIMEA - 203
Aquifer System:
HANAPEPE - 20304

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Consulting Engineers

Kaua'i County - Department of Water

KAUA'I WATER USE AND DEVELOPMENT PLAN UPDATE

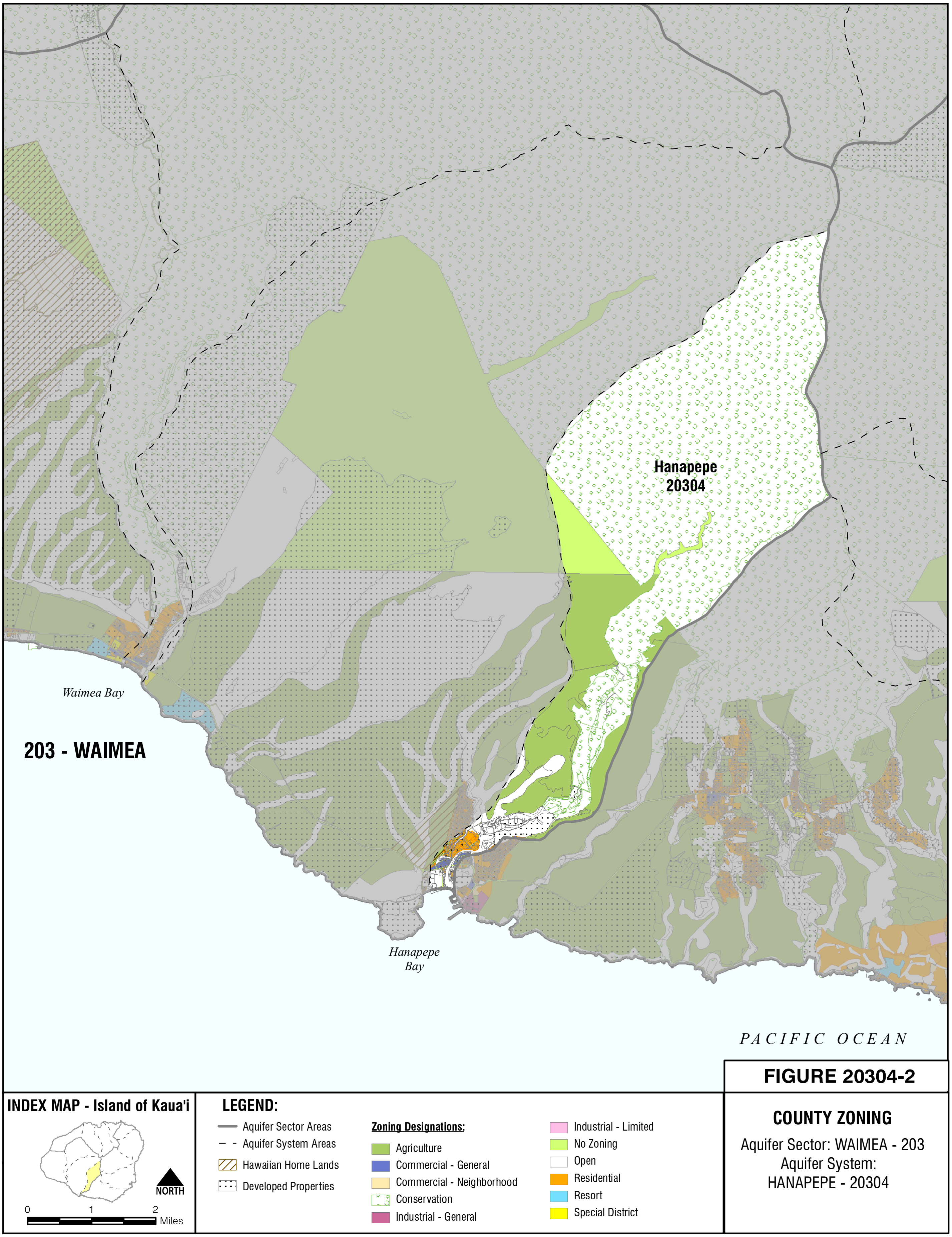

FIGURE 20304-2

COUNTY ZONING

Aquifer Sector: WAIMEA - 203
Aquifer System:
HANAPEPE - 20304

20304-2 EXISTING WATER RESOURCES

20304-2.1 Ground Water

The Hanapēpē ASYA has a sustainable yield of 22 mgd. According to the 2014 CWRM database, there are 4 production wells, 1 agriculture and 3 municipal wells. There are also 2 wells drilled and categorized as “unused”. Refer to **Appendix A** for this database. **Figure 20304-3** shows the well locations.

20304-2.2 Surface Water

The Hanapēpē stream is classified as a continuous, perennial stream and is the only perennial stream in the Hanapēpē ASYA. The USGS has 1 active surface water gauge in the system area. The gauge is located on Hanapēpē River, below Manuahi Stream, which was previously listed in **Table 1-19**.

In accordance with the Code, the CWRM must establish and administer instream flow standards (IFS) on a stream-by-stream basis as necessary to protect public interests. IFS is defined as “a quantity or flow of water or depth of water which is required to be present at a specific location in a stream system at certain specified times of the year to protect fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses.” Considerably more research and study need to be completed to accumulate the data and perspective necessary to conduct a thorough and meaningful assessment of IFS. Until permanent IFS are established, interim IFS have been adopted. The interim IFS are defined as the amount of water flowing in each stream at the time the administrative rules governing them were adopted in 1988 and 1989. In order to assess surface water sustainability, this KWUDP assumes that no additional diversions will be allowed from any stream without amendment of the interim IFS.

There are 7 declared stream diversions in the CWRM database shown on **Figure 20304-4**, which accounts for 2 percent of the 292 declared stream diversions on the island. The declared stream diversions are listed in **Appendix B**. The total declared flow for the Hanapēpē ASYA is 19.32 mgd. In addition, some existing irrigation systems have the capability to transfer surface water to adjacent ASYAs. 16.32 mgd of declared flow from diversions in the Hanapēpē ASYA appear to be associated with irrigation lines that transfer water out of the Hanapēpē ASYA.

20304-2.3 Water Conservation

Water conservation increases the amount of water available and helps to ensure the long-term viability of water resources. Water conservation measures for this ASYA are as described in **Section 1.5.7** of this report. There are no ASYA specific special conservation measures in place at this time.

20304-2.4 Rainwater Catchment

Rainwater catchment is a viable resource for areas that are not served by ground water or surface water. **Figure 20304-5** shows the possible catchment areas, or parcels with a building value greater than $20,000 and assumed to be developed but without a ground water or surface water source.

20304-2.5 Recycled Water

There are no wastewater reclamation facilities in the Hanapēpē ASYA.

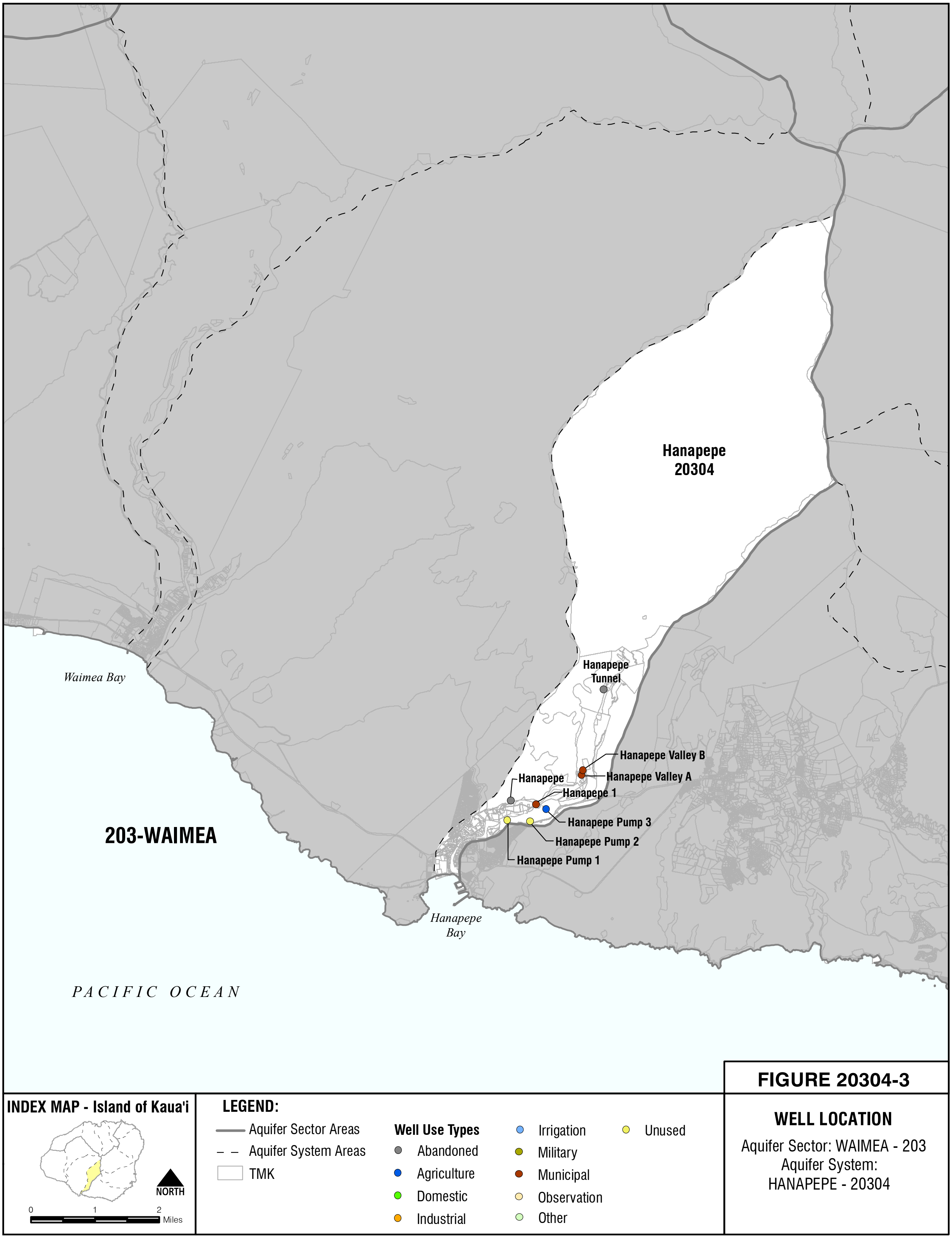

FIGURE 20304-3

WELL LOCATION

Aquifer Sector: WAIMEA - 203
Aquifer System:
HANAPEPE - 20304

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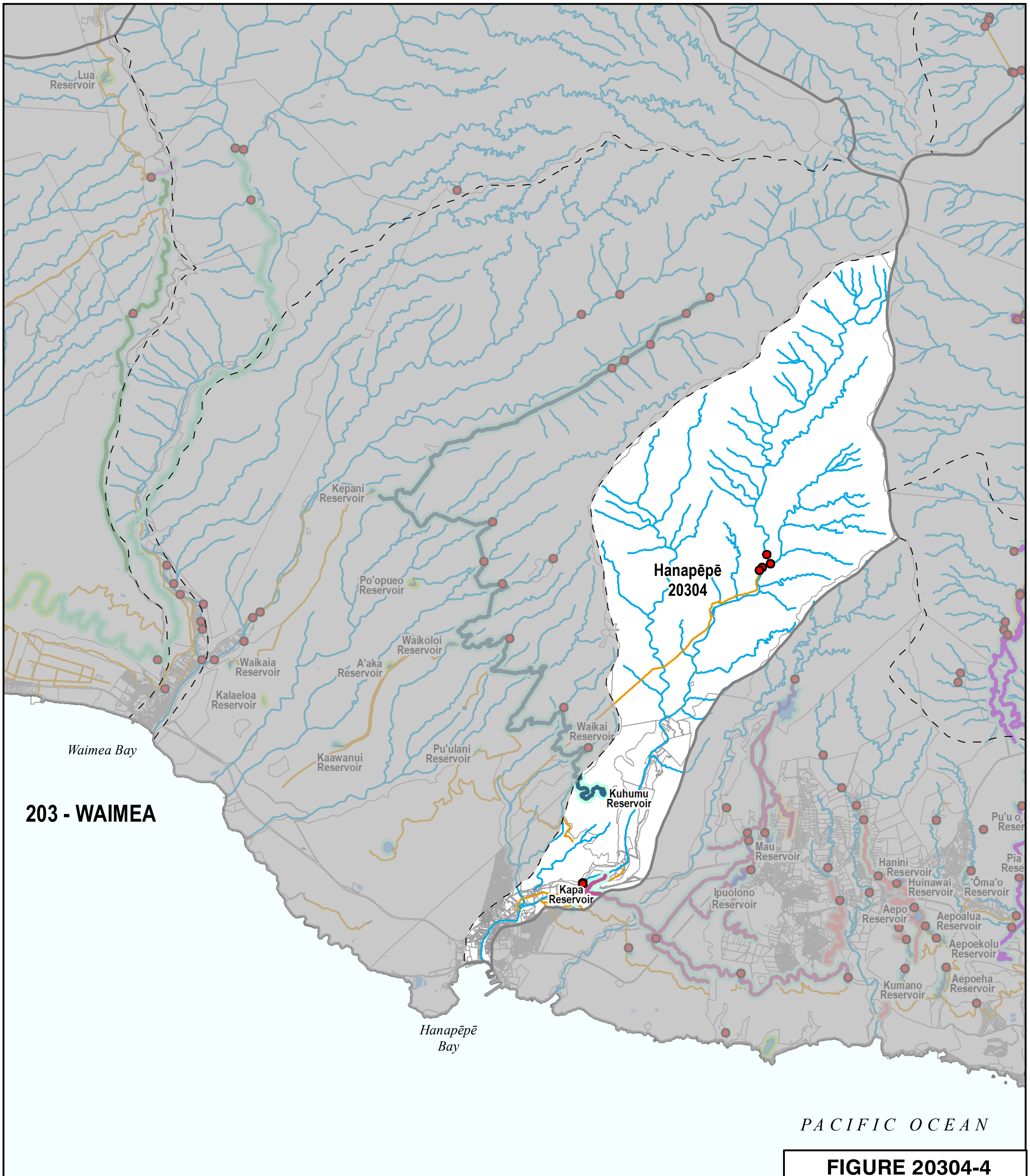
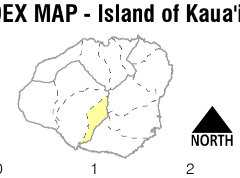
KAUA'I WATER USE AND DEVELOPMENT PLAN UPDATE



INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- Perennial Streams
- Irrigation Systems
- Diversions
- Reservoirs, Ponds
- TMK

Irrigation Systems

- Kaua'i Coffee
- 'Olokele Ditch

Status

- Active
- Inactive
- Unknown
- Abandoned

FIGURE 20304-4

STREAMS & DIVERSIONS

Aquifer Sector: WAIMEA - 203
Aquifer System:
HANAPĒPĒ - 20304

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Kaua'i County - Department of Water

KAUA'I WATER USE AND DEVELOPMENT PLAN UPDATE

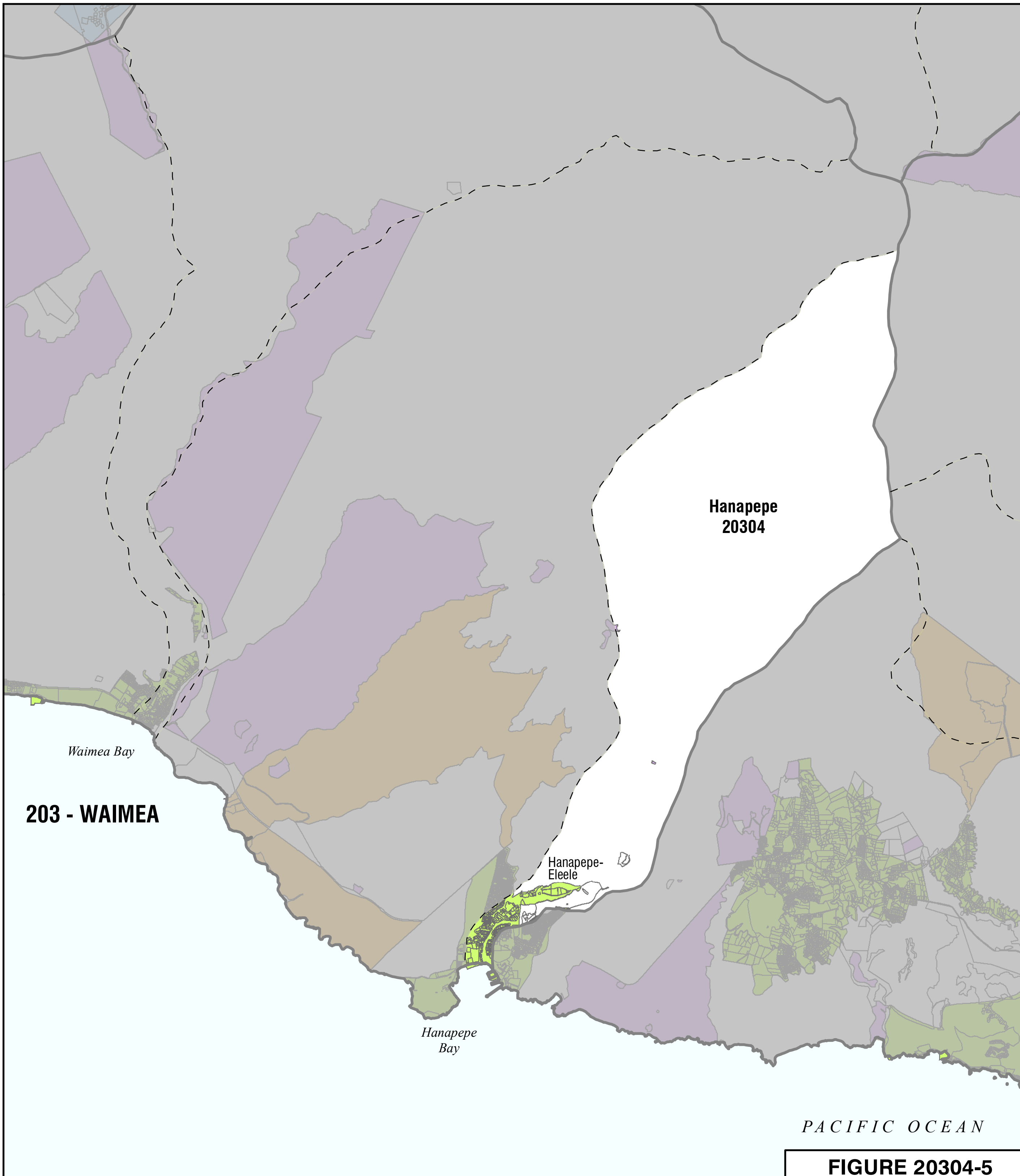


FIGURE 20304-5

INDEX MAP - Island of Kaua'i

NORTH

0 1 2 Miles

LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- DOW Service Area
- Private Water System
- State Water System
- Federal Water System
- Possible Catchment Area (Building Value > $20,000)

WATER SYSTEM & SERVICE AREA

Aquifer Sector: WAIMEA - 203

Aquifer System: HANAPEPE - 20304

20304-3 EXISTING WATER USE

20304-3.1 General

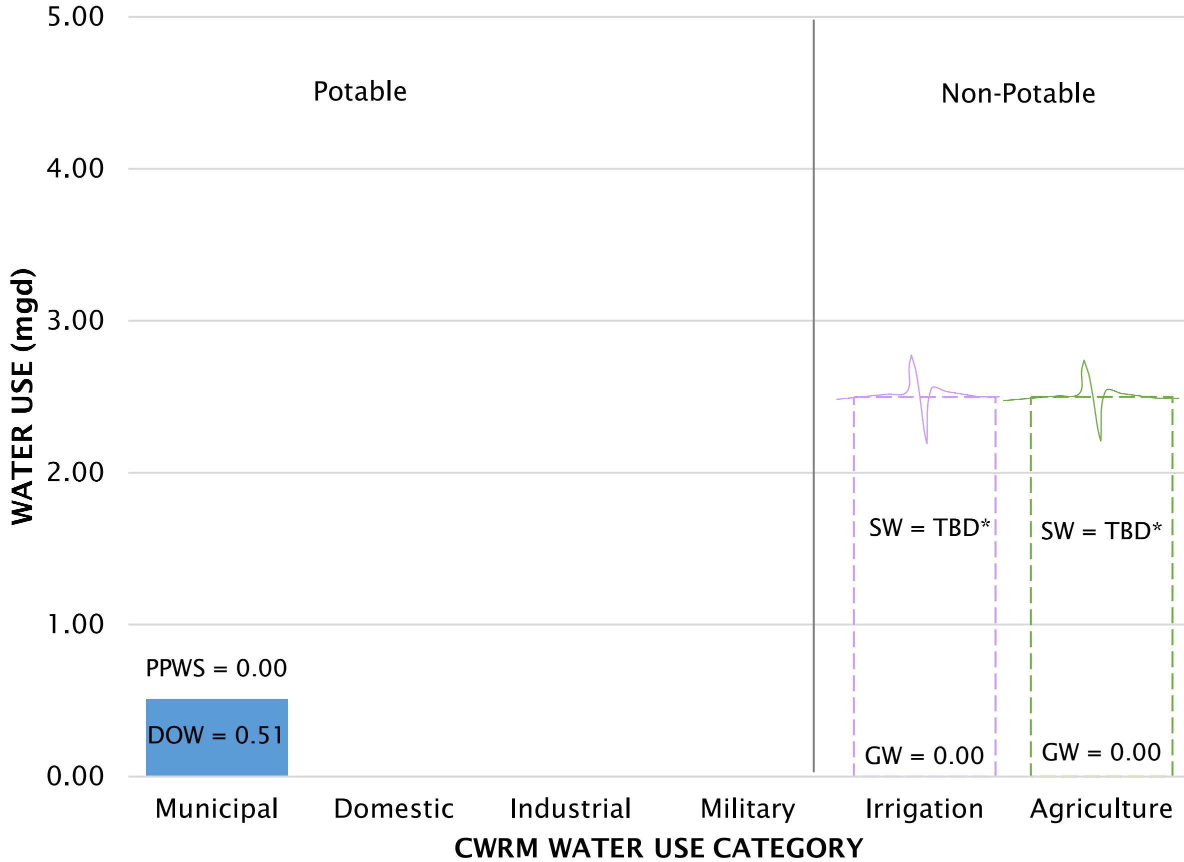
The following section presents the total estimated average water use within the Hanapēpē ASYA. The total estimated average water use was based on data from CWRM (well pumpage) and DOH (Sanitary Surveys for Public Water Systems and estimated recycled water usage) for the year of 2014. **Table 20304-5** and **Figure 20304-6** summarize the water use in accordance with CWRM categories.

Table 20304-5: Existing Water Use by Category – Hanapēpē ASYA

CWRM Category	Ground Water (mgd)	Other Sources (mgd)	Total (mgd)	Percent of Total
Domestic			0.00	0.0
Industrial			0.00	0.0
Irrigation			0.00	0.0
Agriculture	0	TBD[1]	0.00	0.0
Military			0.00	0.0
Municipal				
DOW System	0.51		0.51	100.0
Private-Public WS			0.00	0.0
TOTAL	**0.51**		**0.51**	**100.0**

[1] Surface Water – TBD from AWUDP

Figure 20304-6: Existing Water Use by Category – Hanapēpē ASYA



*Values to be determined by other components of the Hawai'i Water Plan

20304-3.2 Domestic Use

There are no wells classified as "Domestic" in the Hanapēpē ASYA.

20304-3.3 Industrial Use

There are no wells classified as "Industrial" in the Hanapēpē ASYA.

20304-3.4 Irrigation Use

Irrigation use has been divided into ground water, recycled water, and surface water.

20304-3.4.1 Ground Water

There are no wells classified as "Irrigation" in the Hanapēpē ASYA.

20304-3.4.2 Recycled Water

There is no recycled water use in the Hanapēpē ASYA.

20304-3.4.3 Surface Water

Information on surface water use for irrigation is to be determined by the AWUDP. However, typically, due to the location of parks and other landscaped areas within communities, it is assumed that it is unlikely for landscaping to be irrigated with surface water.

20304-3.5 Agricultural Use

Agricultural use has been divided into ground water, recycled water, and surface water.

20304-3.5.1 Ground Water

There is 1 well classified as "Agriculture" (AGRCP - crops and processing), owned by McBryde Sugar Company, Ltd. The well has not reported any pumpage.

20304-3.5.2 Recycled Water

There is no recycled water use in the Hanapēpē ASYA.

20304-3.5.3 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP.

20304-3.6 Military Use

There is no military water use in the Hanapēpē ASYA.

20304-3.7 Municipal Use

There are 3 wells in the CWRM database classified as "Municipal" (MUNCO – Municipal County). Municipal can be subcategorized into the other water use categories: Domestic, Industrial, Agricultural, Military, and Municipal.

20304-3.7.1 County Water Systems

Hanapēpē-ʻEleʻele Water System

The DOW has one major water system that serves the Hanapēpē ASYA. The Hanapēpē-ʻEleʻele water system is DOH Public Water System (PWS) No. 404 and services areas in the Makaweli, Hanapēpē, and Koloa ASYA. The water system service area includes Hanapēpē, Hanapēpē Heights, and ʻEleʻele Nani. It also includes the Port Allen Harbor facilities and nearby industrial support areas. This water system serves 4,430 people through 1,710 service connections. Water for this system is supplied by 3 wells. **Table 20304-6** lists the water sources, well numbers, pumping capacities, pressure zones, and pumpage amount.

Table 20304-6: DOW Hanapēpē-ʻEleʻele Water System Water Sources

WELL NAME	WELL NUMBER	PUMPING CAPACITY (gpm)	PRESSURE ZONE (ft)	PUMPAGE (mgd)
Hanapēpē Valley Well A	2-5533-001	470	212' & 340' Hanapēpē	0.22
Hanapēpē Valley Well B	2-5533-002	800	212' & 340' Hanapēpē	0.29
Hanapēpē 4*	2-5634-002	700	212' & 402' Hanapēpē	0.21

* Well located in Makaweli ASYA

There are four primary pressure zones (212', 340', 402' Hanapēpē, 402' ʻEleʻele) and five storage tanks in the Hanapēpē-ʻEleʻele Water System. Water is delivered to ʻEleʻele via booster pump stations since all of the water sources are located on the Hanapēpē side of the service area.

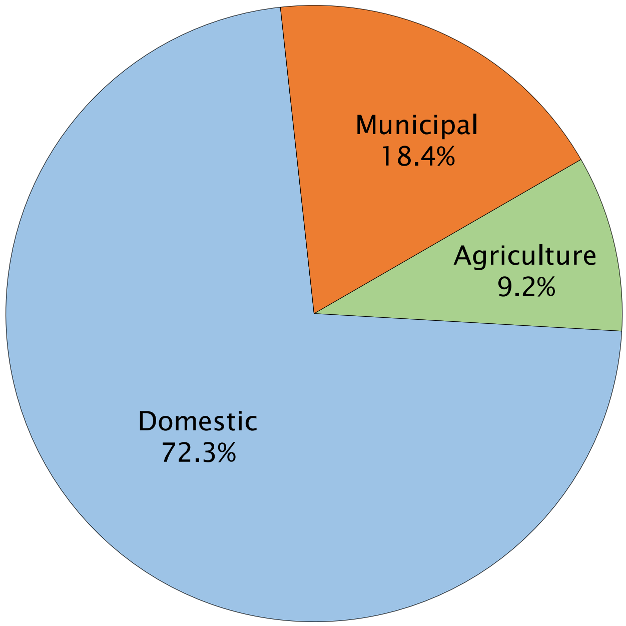
DOW Water Use by Category

DOW water use is subcategorized in **Table 20304-7** to the extent possible based on available meter data and is depicted in **Figure 20304-7**.

Table 20304-7: DOW Existing Water Use by Category – Hanapēpē ASYA

CWRM Water Use Category	DOW Metered Water Use (mgd)	Percent of Total
Agricultural	0.014	9.2
Domestic	0.110	72.3
Industrial	0.000	0.0
Military	0.000	0.0
Municipal	0.028	18.4
Total	**0.152**	**100.0**

Figure 20304-7: DOW Existing Water Use by Category – Hanapēpē ASYA



20304-3.7.2 State Water Systems

There are no State water systems in the Hanapēpē ASYA regulated by the DOH.

20304-3.7.3 Federal Water Systems

There are no Federal water systems in the Hanapēpē ASYA regulated by the DOH.

20304-3.7.4 Private-Public Water Systems

There are no private-public water systems in the Hanapēpē ASYA regulated by the DOH.

20304-3.7.5 Per Capita Use

The per capita existing water use consumption based on domestic DOW metered water use and private-public water system use is presented in **Table 20304-8**. The per capita use in the Hanapēpē ASYA is approximately 43.2% lower than the overall County of Kauaʻi per capita use.

Table 20304-8: Per Capita Use – Hanapēpē ASYA

	DOW Metered Water Use – Domestic (mgd)	Private-Public Water System (mgd)	90% of 2015 Population	Per Capita Use (gpd)
Hanapēpē ASYA	0.110	0	998	110
County of Kaua'i	**9.360**	**2.951**	**63,462**	**194**

20304-3.8 Existing Water Use by Resource

20304-3.8.1 Ground Water

Table 20304-9 summarizes the current production, sustainable yield (SY), and percentage of SY for the current production. Current production is represented by the 2014 average yield calculated from the actual pumping data.

Table 20304-9: Pumpage – Hanapēpē ASYA

Pumpage (mgd)	SY (mgd)	Pumpage Portion of SY
0.51	22	2.3%

Based on available information from the CWRM database, the current ground water use is 2.3 percent of the sustainable yield.

20304-3.8.2 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP.

20304-3.8.3 Water Conservation

Water conservation, including water loss management, may reduce water use. See **Section 20304-2.3** for existing conservation efforts.

20304-3.8.4 Rainwater Catchment

Developed parcels that are not supplied by ground water or surface water are assumed to be supplied by rainwater catchment.

20304-3.8.5 Recycled Water

There is no recycled water use in the Hanapēpē ASYA.

20304-4 FUTURE WATER USE

20304-4.1 Full Build-Out Water Demand Projections

The full build-out water demand projections based on the General Plan and County Zoning for the Hanapēpē ASYA is listed in **Tables 20304-10** and **20304-11**, respectively. Each land use class is associated with the most appropriate CWRM water use category.

Table 20304-10: General Plan Full Build-Out Water Demand Projection – Hanapēpē ASYA

General Plan Category	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	0.12
Open	Domestic	0.02
Military	Military	0.00
Park	Irrigation	0.05
Residential	Domestic/Municipal	0.32
Resort	Domestic/Irrigation/Municipal	0.00
Transportation	Municipal	0.00
Urban Center	Domestic/Industrial/Municipal	0.01
DHHL	Domestic	0.00
	TOTAL	**0.52**

Table 20304-11: Zoning Full Build-Out Water Demand Projection – Hanapēpē ASYA

Zoning Class	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	0.12
Commercial	Municipal	0.13
Industrial	Industrial/Municipal	0.00
Open	Domestic	0.02
Residential	Domestic/Municipal	0.16
Resort	Domestic/Irrigation/Municipal	0.00
DHHL	Domestic	0.00
	TOTAL	**0.43**

20304-4.1.1 Refined Land Use Based Water Projection

State Water Projects Plan

There are no future State water projects through the year 2034 within the Hanapēpē ASYA according to the 2021 SWPP Update.

State Department of Hawaiian Home Lands

There are no DHHL tracts in the Hanapēpē ASYA.

Agricultural Water Use and Development Plan

The AWUDP dated 2003 (revised 2004) was limited in scope. More recent, comprehensive information on agricultural lands is available in the County of Kaua‘i Important Agricultural Lands (IAL) Study.

In 2019, a public review draft of the AWUDP was released and it is anticipated that the next phase of the AWUDP will provide agricultural water demand projections in greater detail and will supersede information in the KWUDP when it becomes available.

County of Kaua‘i Important Agricultural Lands Study

904 acres of agricultural lands within the Hanapēpē ASYA received a score of 28 or better in the County of Kaua‘i Important Agricultural Lands (IAL) Study. Lands that receive a score of 28 or better were determined to have met all eight IAL criteria to some degree. Only a subset of lands with a score of 28 or better is expected to be designated as IALs. **Table 20304-12** compares these lands that received a score of 28 or better to the declared surface water use from diversions and to the diversified water use rate of 3,400 gallons per acre per day (gpad) estimated in the 2004 AWUDP.

Table 20304-12: Irrigation of Agricultural Lands

(1) Declared Surface Water Use from Diversions (mgd)	3.00
(2) Agricultural Lands with a Score ≥ 28 (acres)	904
- How many acres can be sustained by **(1)** at a water rate of 3,400 gpad? (Acres)	882
- What percent of **(2)** can be sustained with a water rate of 3,400 gpad?	98%
- If all of **(2)** were to be irrigated, what is the water unit rate? (gpad)	3,319

20304-4.1.2 Water Use Unit Rates

Water use unit rates are based on the *Water System Standards* (WSS), as discussed in Chapter 2.

The General Plan provides only broad density guidelines for residential and resort designations. For these designations, under the assumption that most residents would like their communities, including the development density, to remain similar in the future, the average number of dwelling units as allowed by zoning was used as the density (i.e., 3.58 dwelling units per acre for residential designation).

20304-4.2 Water Demand Projections to the Year 2035

The following section presents water demand projections to the year 2035 for the Hanapēpē ASYA. The projected low, medium, and high growth rates are listed in **Table 20304-13** and are graphed in **Figure 20304-8**. Potable (domestic, industrial, municipal, and military water uses) and non-potable (irrigation) water demands are also differentiated.

Table 20304-13: Water Demand Projection – Hanapēpē ASYA

Water Use Category	Water Demand by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
GROWTH RATE C (HIGH)									
TOTAL	**0.51**	**0.51**	**0.51**	**0.52**	**0.52**	**0.52**	**0.54**	**0.56**	**0.58**
Potable	0.51	0.51	0.51	0.52	0.52	0.52	0.54	0.56	0.58
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GROWTH RATE B (MEDIUM)									
TOTAL	**0.51**	**0.51**	**0.51**	**0.52**	**0.52**	**0.52**	**0.54**	**0.56**	**0.57**
Potable	0.51	0.51	0.51	0.52	0.52	0.52	0.54	0.56	0.57
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GROWTH RATE A (LOW)									
TOTAL	**0.51**	**0.51**	**0.51**	**0.51**	**0.51**	**0.52**	**0.52**	**0.53**	**0.54**
Potable	0.51	0.51	0.51	0.51	0.51	0.52	0.52	0.53	0.54
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figure 20304-8: Water Demand Projection Summary – Hanapēpē ASYA

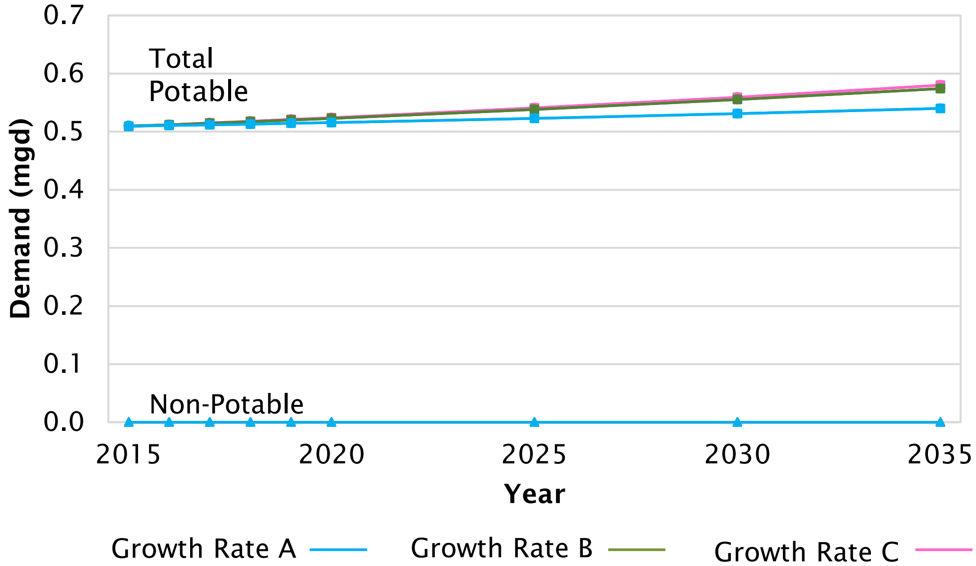


Figure 20304-9 shows the breakdown of water demand projections for a medium growth rate by CWRM categories through the year 2035. **Table 20304-14** summarizes this figure.

Figure 20304-9: Medium Growth Rate B Water Demand Projection by Category – Hanapēpē ASYA

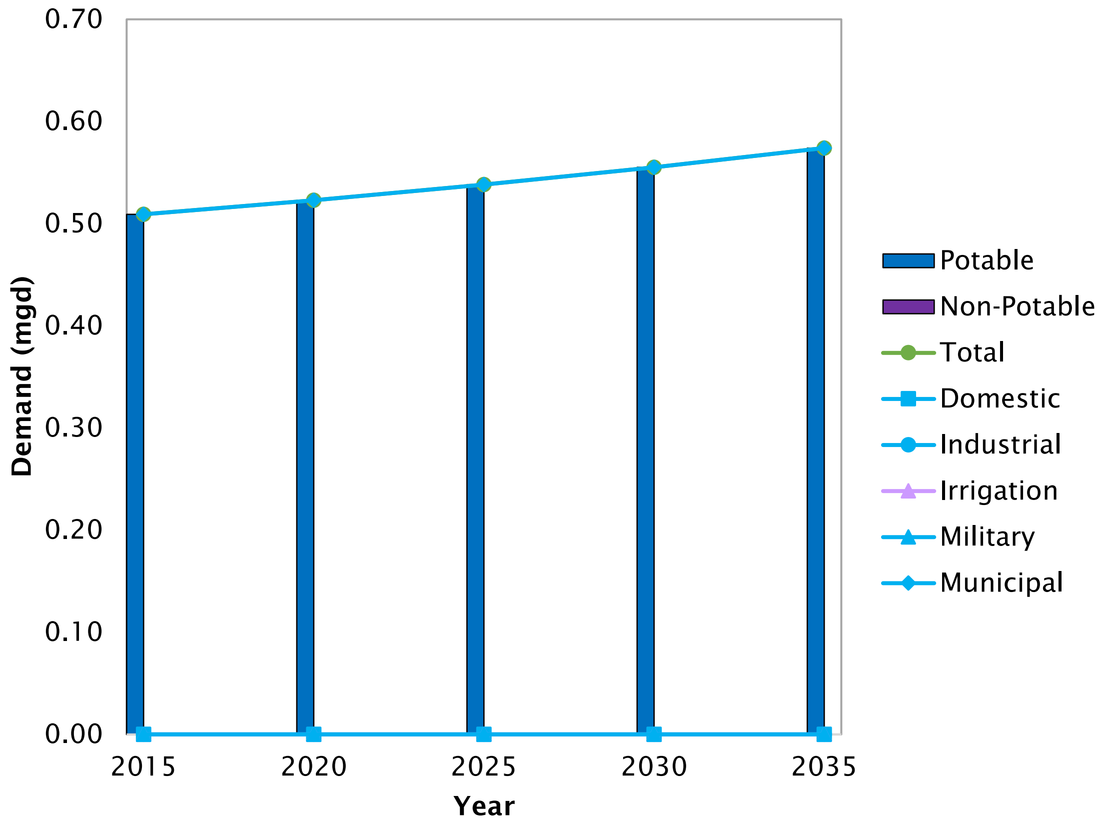


Table 20304-14: Medium Growth Rate B Water Demand Projection by Category – Hanapēpē ASYA

Water Use Category	Water Use by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
Total	**0.51**	**0.51**	**0.51**	**0.52**	**0.52**	**0.52**	**0.54**	**0.56**	**0.57**
Potable	0.51	0.51	0.51	0.52	0.52	0.52	0.54	0.56	0.57
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Domestic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Irrigation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Military	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Municipal	0.51	0.51	0.51	0.52	0.52	0.52	0.54	0.56	0.57
DOW	0.51	0.51	0.51	0.52	0.52	0.52	0.54	0.56	0.57

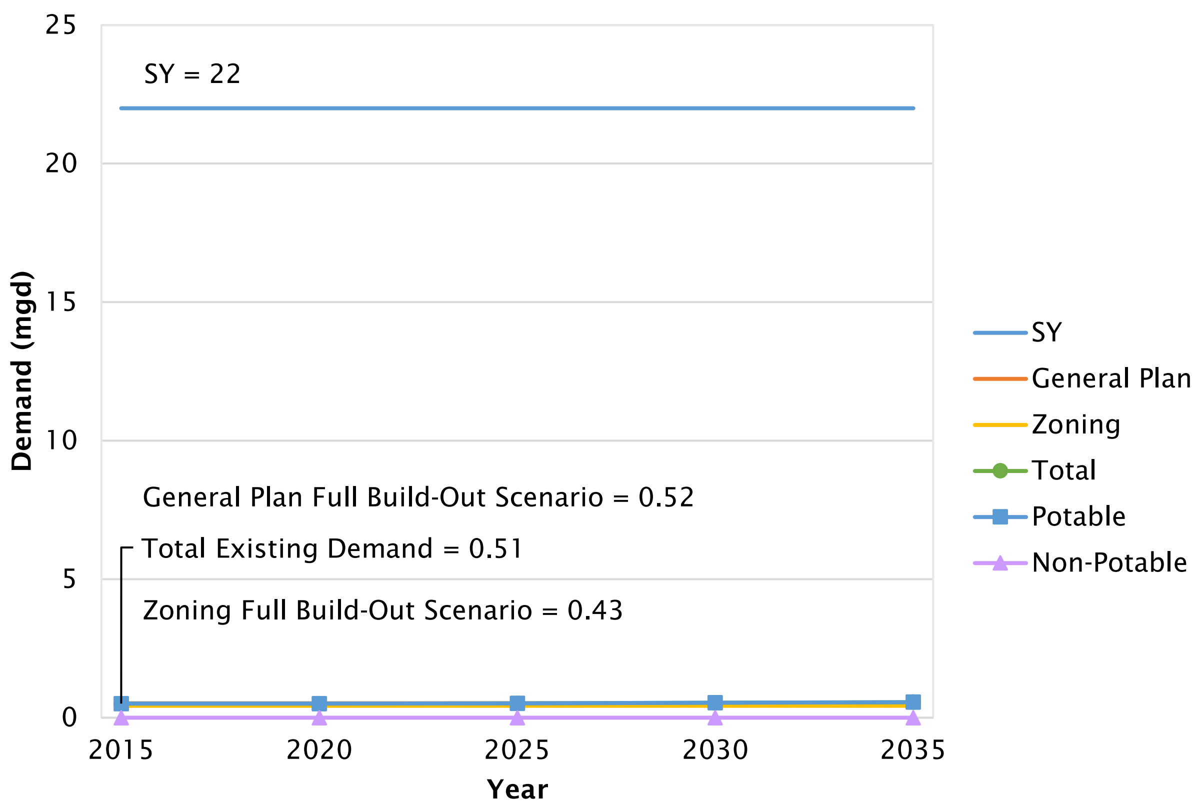
20304-4.3 Summary

Figure 20304-10 illustrates the magnitude of the sustainable yield, both General Plan and Zoning full build-out water use projections, and water use projection through the year 2035 focusing on Medium Growth Rate B. **Table 20304-15** summarizes the General Plan, Zoning, and 20-year water demand projection scenarios for the Hanapēpē ASYA. The sustainable yield is presented to draw comparisons. All demands are in mgd.

Table 20304-15: Summary of Demand Projections

SY (mgd)	FBO (mgd)		Medium Growth Rate Demand by Year (mgd)								
	GP	Zoning	2015	2016	2017	2018	2019	2020	2025	2030	2035
22	0.52	0.43	0.51	0.51	0.51	0.52	0.52	0.52	0.54	0.56	0.57

Figure 20304-10: Medium Growth Rate B Water Demand Projections and Full Build-Out – Hanapēpē ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use. For future agricultural water use analysis, please see Section 20304-4.1.1 County of Kaua'i Important Agricultural Lands Study.

20304-5 RESOURCE AND FACILITY RECOMMENDATIONS

20304-5.1 Water Source Adequacy

20304-5.1.1 Full Build-Out

Development to the highest extent allowed by the General Plan and County Zoning within the Hanapēpē ASYA is sustainable, with General Plan and County Zoning full build-out water demands requiring 2.4 and 2.0 percent of the 22 mgd sustainable yield, respectively.

20304-5.1.2 Twenty-Year Projection

The 2035 water demand projection for the Hanapēpē ASYA is sustainable and is only 2.6 percent of the 22 mgd sustainable yield.

20304-5.2 Source Development Requirements

20304-5.2.1 Supply-Side Management

Supply-side management, including conventional water resource measures, water conservation, and alternative water resource measures, were evaluated to meet projected water demands.

Conventional Water Resource Measures

Ground Water

The Hanapēpē ASYA contains basal and perched ground water. There is likely also high-level water but it currently isn't utilized. Most reported pumpage is from the basal zone.

The 2035 water demand projection for the Hanapēpē ASYA is only 2.6 percent of the 22 mgd sustainable yield. This indicates that theoretically, more water could be pumped from the aquifer without impairing the utility or quality of the water resource if wells are optimally placed and the proper due diligence with regard to traditional and customary rights and impacts has been completed. However, it is noted that sustainable yield does not consider the feasibility of developing the ground water resources, and that the safe yield of an individual production well may be limited by localized ground water behavior near the well as a result of pumpage. Water supply reliability and quality, feasibility, environmental and cultural impacts, and water rights shall be considered as projects and programs develop. More detailed and site-specific evaluation of these impacts shall be required and accomplished through the environmental review process (HRS Chapter 343) for source development projects and programs utilizing public funding, and CWRM could consider requiring compliance with the environmental review process for private source development projects and programs also. **Section 1.5.3.1** provides additional information regarding the protection of traditional and customary rights.

The DOW's Hanapēpē-'Ele'ele water system serves Hanapēpē, Hanapēpē Heights, 'Ele'ele Nani, and Port Allen and services ares in the Makaweli ASYA and Hanapēpē ASYA. Two of the three water sources for the system are in the Hanapēpē ASYA. The DOW's Water Plan 2020 did not propose development of any additional ground water sources to meet projected demands. The

DOW's Water Plan 2020 did, however, identify potential storage and distribution system upgrades, including the rehabilitation of the Hanapēpē Heights tank and replacement of a water main in Hanapēpē Road.

Surface Water

The Hanapēpē ASYA has 7 declared diversions. Until permanent instream flow standards are established, interim instream flow standards have been adopted. According to Section 13-169-46, Hawai'i Administrative Rules, "Interim Instream Flow Standard for all streams on Hawai'i, as adopted by the commission on water resource management on June 15, 1988, shall be that amount of water flowing in each stream on the effective date of this standard, and as that flow may naturally vary throughout the year and from year to year without further amounts of water being diverted off-stream through new or expanded diversions, and under the stream conditions existing on the effective date of the standard, except as may be modified [by the commission]." Therefore, for the purposes of assessing surface water availability, it is assumed that no additional diversions will be allowed without amendment of the interim IFS.

The existing declared diversions have the potential to meet additional demands. However, a challenge with developing surface water is transmission of these resources from source to location of need. Farmers generally grow what is feasible for the area; therefore, it is anticipated that agricultural water use will follow the availability of irrigation water. Increase in the availability of surface water would likely promote additional usage and could thereby minimize ground water being used for irrigation.

There are only a couple of small existing irrigation lines in the Hanapēpē ASYA, as shown on **Figure 20304-4,** but there are no major irrigation systems.

Water Transfer

Some existing irrigation systems have the capability to transfer surface water to adjacent ASYAs. The AWUDP should study irrigation system service areas and provide information on irrigation systems' water transfer.

Water can also be transferred between ASYAs through public water systems. The DOW's Hanapēpē-'Ele'ele water system extends through the Makaweli ASYA, Hanapēpē ASYA, and Koloa ASYA. Source wells are located in the Makaweli ASYA and Hanapēpē ASYA. Water is transferred to 'Ele'ele via booster pump stations.

Water Conservation

The per capita use in the Hanapēpē ASYA is approximately 43.2% lower than the overall County of Kaua'i per capita use. There are no ASYA-specific conservation measures in place at this time; however, there are general water conservation programs that are described in **Section 1.5.7**. Water conservation, including water loss management, can increase the amount of water available and help to ensure the long-term viability of water resources.

In the DOW's Water Plan 2020, instituting water conservation measures in the Hanapēpē-'Ele'ele water system service area was proposed to avoid a slight supply and storage deficit.

Alternative Water Resource Measures

Rainwater Catchment

Rainwater can be utilized as a water resource in several ways.

Rainwater can be hrvested in rainwater catchment systems which can be utilized to supply domestic potable water needs. These systems are viable in areas that receive abundant rainfall and are a suitable source of potable water for individual domestic users in areas outside the limits of municipal water systems. Generally, these are remote areas and are not expected to expand significantly because most development is anticipated to be concentrated within existing urban areas. Therefore, use of rainwater catchment systems is not anticipated to increase significantly.

Rainwater can also be used to supplement or satisfy agricultural non-potable water needs through ambient rainfall.

See the Storm Water Reuse section below to see how rainwater as storm water runoff can be reclaimed and reused.

Storm Water Reuse

Rainfall can turn into storm water runoff. Storm water runoff from impervious surfaces in urban areas can be significant. This water could be captured, treated, and used as a source of non-potable water (e.g., irrigation), integrated with recycled water, or even as potable and/or non-potable ground water recharge. However, due to the lack of storm water reuse standards, the high initial infrastructure costs, and the treatment requirements, storm water reclamation and reuse on a small or large scale may not be feasible and requires further assessment as noted in the Water Resource Protection Plan. The U.S. Department of the Interior, Bureau of Reclamation published An Appraisal of Stormwater Reclamation and Reuse Opportunities in Hawai‘i (Storm Water Report) in 2008 but did not identify any storm water reclamation and reuse opportunities in the Hanapēpē ASYA.

Recycled Water

Recycled water is a valuable resource, and increase on its use may lower the dependence on potable sources. However, there are no wastewater reclamation facilities (WWRFs) in the Hanapēpē ASYA.

Desalination

Desalination of brackish ground water is a potential alternative; however, due to its high capital and operational costs, it likely would not be considered when other potable water sources are available.

20304-5.2.2 Demand-Side Management

Development Density Control

The full build-out demand for the Hanapēpē ASYA based on County Zoning is 0.43 mgd which is 2 percent of the sustainable yield. This indicates that there are adequate water resources to sustain the level of development that is allowed by law. In the Hanapēpē ASYA, the average number of dwelling units allowed by County Zoning is 3.58 dwelling units per acre in residential districts.

The full build-out demand for the Hanapēpē ASYA based on the General Plan is 0.52 mgd which is 2.4 percent of sustainable yield. Therefore, development density control likely may not be necessary. However, the County Planning Department could consider development density control for areas where there is the flexibility to do so, such as areas that are not yet zoned as residential or resort, and promote sustainable development. Further, it is noted that the full build-out scenario is unlikely to occur since it assumes all land is developed to the maximum extent.

20304-5.3 Recommended Alternatives

To optimize appropriate use of water resources, the quality of the water source should be matched to the quality of water required. The highest quality of water shall be reserved for the most valuable end use. Potable water is considered the highest quality water, and the sustenance of life is the most valuable end use. Recycled water, brackish water, untreated surface water, and other lower quality water sources should be used for landscaping and agriculture when available, thereby reserving potable water for human consumption. If there is a practical alternative water source available, that alternative source should be used in lieu of ground water or surface water. With this in mind, the following recommendations are made for the Hanapēpē ASYA:

Alternative Water Resources

Use of alternative water sources can reduce demands on both ground and surface water resources and conserve water resources as a whole. However, aside from rainwater, there are no available alternative water sources in the area. Alternative water sources are unlikely to be developed when other water resources are readily available.

Conservation

Water resources are a finite resource that should be managed and used wisely. It should be conserved and not wasted. Implementation of conservation measures should continue to be encouraged.

Ground Water

Meeting future demands at a reasonable cost is a planning objective, and conventional sources, such as ground water, are typically the most cost-effective means for meeting projected water demands. Projected potable water needs are within the sustainable yield for this area. Therefore, ground water resources could continue to be used and developed to meet potable water needs now and into the future. However, as noted above, development of conventional water resource measures can have challenges, and water supply reliability and quality, feasibility, environmental and cultural impacts, and water rights shall be considered as projects and programs develop.

Development of ground water resources is the primary strategy to serve future potable demands in the Hanapēpē ASYA.

Surface Water

Surface water, where available, should be used to meet non-potable demands if alternative water resources are not available. To achieve this, it will be critical to maintain and improve existing irrigation systems. Making surface waters more readily available to meet non-potable water demands has the potential to minimize future dependence on the use of ground water. It is therefore recommended that the AWUDP provide information on the rehabilitation and maintenance needs of large irrigation systems.

Demand-Side Management

Full build-out demand based on the General Plan is 2.4 percent of sustainable yield. At this projection, implementation of development density control by the County Planning Department is not needed in this area.

Although the projection is sustainable, the County Planning Department will need to consider potential impacts on available water resources when considering any future zoning modifications. Modifications that may result in increased development density within the area will increase demands on water resources.

Chapter 3

Summary of Conclusions and General Recommendations

3 SUMMARY OF CONCLUSIONS AND GENERAL RECOMMENDATIONS

The primary objective of the Kaua'i Water Use and Development Plan (WUDP) Update is to set forth the allocation of water to land use to guide the county in its planning, management, and development of land use and water resource strategies and policies for sustainable development. For all aquifer system areas (ASYA), development to the highest extent allowed by the General Plan and County Zoning are sustainable. Specific recommendations were presented for each ASYA in the ASYA chapters; however, the WUDP Update promotes several common key themes which are applicable island-wide.

1) Reserve the Highest Quality of Water for the Most Valued End Use

The highest quality water should be reserved for the most valued end use, thus the "need" for water is emphasized. Potable water is considered the highest quality water; and the sustenance of life is considered the most valuable end use. Landscaping is viewed as a luxury, not a necessity for life; hence, usage of potable water for landscaping is considered unessential and is discouraged. Lower quality non-potable water, such as recycled water, brackish ground water and untreated surface water, should be utilized for landscaping and agriculture where feasible, thereby reserving potable water for human consumption.

If there is a practical alternative water source available, such as recycled water, that alternative source should be used in lieu of ground water or surface water. Use of alternative water sources can be promoted by installing alternative water systems in the proximity of concentrated development. It is noted that installation of alternative water infrastructure can be costly and take years to implement. Proper community planning and development is necessary to ensure the success of this process.

2) Promote Water Conservation

Water resources are a finite resource that should be managed and used wisely. It should be conserved and not wasted. Incorporating conservation measures into planning for future water system improvements helps to ensure the long-term viability of Hawai'i's water resources. End users and water purveyors should work together to conserve water. End users can follow the demand-side conservation practices described in **Section 1.5.7.2** to reserve potable water only for the sustenance of life, and water purveyors can follow the supply-side conservation measures described in **Section 1.5.7.1**. Water audits by a utility are an important tool to determine and pursue opportunities for water conservation and efficiency improvements. Other conservation measures could consider requirement of neighborhood development and new construction to be Leadership in Energy and Environmental Design (LEED) certified.

Chapter 4

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APPENDIX A

Inventory of Wells

Aquifer System	Well No.	Well Name	Owner/User	Well Type	Use	Year Drilled
20101	2-5226-001	Po'ipū-Hyatt	Hyatt Regency	PER	IRRHOT	1988
20101	2-5226-002	Secondary Source	Hyatt Regency		UNU	
20101	2-5227-001	Po'ipū	Kiahuna Plantation	PER	IRRHOT	1969
20101	2-5227-002	Wai'ohai	Marriott Ownership Resorts, Inc.	ROT	IRRHOT	2004
20101	2-5327-001	EAKT 1	Stacey Wong (Eric A. Knudsen Trust)	ROT	UNU	2005
20101	2-5328-001	Kukui'ula 1	Tom Shigemoto (Kukuiula Development Company (Hawai'i) LLC)	ROT	UNU	2002
20101	2-5330-001	Lāwai Shaft 3 Pump 6	Scott Sloan (National Tropical Botanical Garden)	TUN	AGRON	1899
20101	2-5425-011	Māhā'ulepū 11	McBryde Sugar Co. Ltd.	PER	IRR	1927
20101	2-5425-012	Māhā'ulepū 12A	McBryde Sugar Co. Ltd.	PER	IRR	1927
20101	2-5425-013	Māhā'ulepū 13	McBryde Sugar Co. Ltd.	PER	IRR	1927
20101	2-5425-014	Māhā'ulepū 14	McBryde Sugar Co. Ltd.	PER	UNU	1928
20101	2-5425-015	Kōloa F	Department of Water Kaua'i, KDOW	PER	MUNCO	1998
20101	2-5426-003	Kōloa	McBryde Sugar Co. Ltd.	PER	IRR	1953
20101	2-5426-004	Kōloa C	Department of Water Kaua'i, KDOW	PER	MUNCO	1977
20101	2-5426-005	Kōloa D	Department of Water Kaua'i, KDOW	PER	MUNCO	1981
20101	2-5427-001	Kōloa A	Department of Water Kaua'i, KDOW	PER	MUNCO	1953
20101	2-5427-002	Kōloa B	Department of Water Kaua'i, KDOW	ROT	MUNCO	1964
20101	2-5427-003	Kōloa E	Department of Water Kaua'i, KDOW	PER	MUNCO	1989
20101	2-5427-004	The Shops at Kōloa Town	Kōloa Marketplace, LLC		UNU	2009
20101	2-5428-001	Kukui'ula-A & B	Astoria International Inc.	PER	UNU	1993
20101	2-5428-003	Honuhonu	Honuhonu Ranch	ROT	IRROTH	2010
20101	2-5430-002	Waha Water	Twin Pines Farm	ROT	DOM	2013
20101	2-5435-001	Port Allen 1	Citizens Utilities Co.	PER	INDEL	1968
20101	2-5435-002	Port Allen 2	Citizens Utilities Co.	PER	INDEL	1968
20101	2-5435-003	Port Allen 3	Citizens Utilities Co.	PER	INDEL	1968
20101	2-5435-004	Hanapēpē	County of Kaua'i	ROT	OTH	1973
20101	2-5435-005	Port Allen 4	Citizens Utilities Co.	PER	INDEL	1990
20101	2-5523-001	Kīpū Kai	J. Waterhouse	PER	DOM	1950
20101	2-5523-002	Kīpū Kai	J. Waterhouse	PER	DOM	1960
20101	2-5526-001	Kaluahonu	Grove Farm Company, Inc.		AGRCP	1966
20101	2-5527-001	Kahoano	Neil Tagawa (Grove Farm Company, Inc.)		AGRCP	1966
20101	2-5529-001	Poelele	McBryde Sugar Co. Ltd.	ROT	AGR	1950

Aquifer System	Well No.	Well Name	Owner/User	Well Type	Use	Year Drilled
20101	2-5529-003	Lāwai A	McBryde Sugar Co. Ltd.	PER	AGRCP	1954
20101	2-5530-001	Lāwai Cannery	McBryde Sugar Co. Ltd.	ROT	UNU	1950
20101	2-5530-002	Lāwai Cannery	McBryde Sugar Co. Ltd.	PER	IND	1951
20101	2-5530-003	Lāwai 1	Department of Water Kaua'i, KDOW	ROT	MUNCO	1962
20101	2-5530-004	Lāwai 2	Department of Water Kaua'i, KDOW	PER	MUNCO	1986
20101	2-5531-001	Kalāheo	Department of Water Kaua'i, KDOW	PER	UNU	1963
20101	2-5628-001	Kōloa 610 K-55	McBryde Sugar Co. Ltd.		IRR	1967
20101	2-5629-001	Piwai 2	Department of Water Kaua'i, KDOW	ROT	MUNCO	2003
20101	2-5629-002	Piwai 3	Department of Water Kaua'i, KDOW	ROT	MUNCO	2004
20101	2-5630-001	Lāwai TH 2	McBryde Sugar Co. Ltd.	ROT	UNU	1950
20101	2-5631-001	Kalāheo A	Department of Water Kaua'i, KDOW	PER	MUNCO	1974
20101	2-5631-002	Kalāheo B	Department of Water Kaua'i, KDOW	PER	MUNCO	1985
20101	2-5631-003	Brydeswood 1	A&B Properties, Inc., A&B		UNU	2012
20102	2-0020-001	Hanamā'ulu Shaft	LPC Corporation	SHF	UNU	
20102	2-0020-002	Lagoon Supply	Aqua Kaua'i Beach Resort	PER	IRRHOT	1981
20102	2-0020-003	EWM 1	EWM Kaua'i LLC	ROT	AGRLI	2001
20102	2-0021-001	Kālepa Ridge	Land Division O'ahu, DLNR-LD	PER	UNU	1967
20102	2-0022-001	Hanamā'ulu 1	Department of Water Kaua'i, KDOW	PER	UNU	1995
20102	2-0023-002	Pukaki	Department of Water Kaua'i, KDOW	ROT	MUNCO	1998
20102	2-0120-001	Kālepa Ridge	County of Kaua'i	PER	IRR	1899
20102	2-5625-001	Kīpū	WM. Rice	ROT	DOM	1961
20102	2-5721-001	Westin Kaua'i	Hemmeter Properties	PER	UNU	1986
20102	2-5721-002	Banyan Harbor	Lyle Otsuka (Banyan Harbor - AOAO)	ROT	IRRLA	2003
20102	2-5725-001	Kokolau Tunnel	Department of Water Kaua'i, KDOW	TUN	MUNCO	1928
20102	2-5725-002	Hule'ia No 1	Grove Farm Company, Inc.	ROT	UNU	1953
20102	2-5725-003	Hule'ia No 2	Grove Farm Company, Inc.	ROT	UNU	1953
20102	2-5725-004	Hule'ia No 3	Grove Farm Company, Inc.	ROT	UNU	1953
20102	2-5727-001	Kōloa H-34	McBryde Sugar Co. Ltd.		UNU	1968
20102	2-5727-002	Green Energy 1	Green Energy Team LLC	ROT	INDOTH	2011
20102	2-5727-004	Green Energy 3	Green Energy Team LLC		INDEL	2014
20102	2-5728-001	Kāhili Tunnel 1	Shigenobu Arakaki (Kahili Adventist School)	TUN	UNU	
20102	2-5820-001	Well 3	Hemmeter Development Co.	PER	IRRGC	1987

Aquifer System	Well No.	Well Name	Owner/User	Well Type	Use	Year Drilled
20102	2-5821-001	Līhu'e STP	County of Kaua'i	PER	UNU	1974
20102	2-5821-003	Well 1	Hemmeter Development Co.	PER	IRRGC	1987
20102	2-5821-004	Well 2	Hemmeter Development Co.	PER	IRRGC	1987
20102	2-5821-005	Well 4	Hemmeter Development Co.	PER	IRRGC	1987
20102	2-5821-006	Well 5	Hemmeter Development Co.	PER	IRRGC	1987
20102	2-5822-001	Sugar Mill	LPC Corporation	ROT	IND	1965
20102	2-5822-002	Līhu'e Gram School	Department of Water Kaua'i, KDOW	PER	MUNCO	1961
20102	2-5823-001	Garlinghouse Tunnel	Department of Water Kaua'i, KDOW	TUN	MUNCO	1935
20102	2-5824-001	Puhi 1	Department of Water Kaua'i, KDOW	ROT	MUNCO	1975
20102	2-5824-003	Puhi 2	Department of Water Kaua'i, KDOW	PER	UNU	1980
20102	2-5824-004	Kilohana J	Department of Water Kaua'i, KDOW	PER	UNU	1982
20102	2-5824-005	Puhi 3	Department of Water Kaua'i, KDOW	PER	MUNCO	1990
20102	2-5824-006	Puhi 4	Department of Water Kaua'i, KDOW	PER	MUNCO	1993
20102	2-5824-008	Puhi 5A	Department of Water Kaua'i, KDOW	ROT	MUNCO	1997
20102	2-5824-009	Puhi 5B	Department of Water Kaua'i, KDOW	ROT	MUNCO	1997
20102	2-5825-001	Ha'ikū Mauka 1	Neil Tagawa (Grove Farm Company, Inc.)	PER	UNU	1993
20102	2-5825-004	Humane Society	Humane Society	PER	DOM	1996
20102	2-5826-001	Grove Obs. 2	Neil Tagawa (Grove Farm Company, Inc.)	ROT	UNU	1994
20102	2-5921-001	Kālepa Ridge	Department of Water Kaua'i, KDOW	ROT	MUNCO	1954
20102	2-5923-001	Kilohana A	Department of Water Kaua'i, KDOW	PER	MUNCO	1974
20102	2-5923-002	Kilohana B	Department of Water Kaua'i, KDOW	PER	MUNCO	1977
20102	2-5923-003	Kilohana C	Department of Water Kaua'i, KDOW	ROT	UNU	1978
20102	2-5923-004	Kilohana F	Department of Water Kaua'i, KDOW	PER	UNU	1980
20102	2-5923-005	Kilohana G	Department of Water Kaua'i, KDOW	PER	UNU	1981
20102	2-5923-006	Kilohana H	Department of Water Kaua'i, KDOW	PER	UNU	1981
20102	2-5923-007	Kilohana I	Department of Water Kaua'i, KDOW	PER	MUNCO	1982
20102	2-5923-009	Hanamā'ulu 2	Department of Water Kaua'i, KDOW	PER	UNU	1998
20103	2-0124-002	Hanamā'ulu 3	Department of Water Kaua'i, KDOW	ROT	MUNCO	1998
20103	2-0124-003	Hanamā'ulu 4	Department of Water Kaua'i, KDOW	ROT	MUNCO	2002
20103	2-0221-001	Fern Grotto 1	Division of State Parks Oahu, DLNR-SP	PER	UNU	1986
20103	2-0221-002	Fern Grotto 2	Division of State Parks Oahu, DLNR-SP	PER	OTH	1991
20103	2-0221-005	Ōpaeka'a 2	Benjamin Garfinkle (Opaekaa Falls Land Co., LLC)	ROT	UNU	2007

Aquifer System	Well No.	Well Name	Owner/User	Well Type	Use	Year Drilled
20103	2-0222-002	Hanamā'ulu	Department of Land and Natural Resources, DLNR	ROT	UNU	2006
20103	2-0321-001	Nonou 9-1C	Department of Water Kaua'i, KDOW	PER	MUNCO	1971
20103	2-0321-002	Allen	Greg Allen	ROT	DOM	2006
20103	2-0321-003	Flow	Dwain Hill	ROT	IRR	2010
20103	2-0323-001	Wailua-Smith	Gregory Smith	ROT	UNU	1993
20103	2-0323-003	Kawaikini Estates	Eric Braun	ROT	UNU	
20103	2-0323-004	Babalou	Robert Soares	ROT	DOM	2007
20103	2-0421-001	Wailua Homesteads 1	Department of Water Kaua'i, KDOW	ROT	MUNCO	1972
20103	2-0421-002	Wailua Homesteads B	Department of Water Kaua'i, KDOW	PER	MUNCO	1985
20104	2-0320-001	Nonou 9-1A	Department of Water Kaua'i, KDOW	PER	UNU	1960
20104	2-0320-002	Wailua	Hawai'i Department of Agriculture Oahu, HDOA	PER	UNU	1952
20104	2-0320-003	Nonou 9-1B	Department of Water Kaua'i, KDOW	PER	MUNCO	1970
20104	2-0419-001	Kapa'a Cannery	Hawai'i Fruit Packers, Ltd.			1928
20104	2-0419-002	Kapa'a Shaft	LPC Corporation	SHF	UNU	1938
20104	2-0419-003	Kapa'a Wailua	County of Kaua'i	ROT	OTH	1973
20104	2-0419-004	CCK # 1	John Young (Calvary Chapel Kaua'i)	ROT	DOM	2007
20104	2-0419-005	Kapa'a Highlands 1	Greg Allen (Kapa'a Highlands LLC)	ROT	UNU	2006
20104	2-0419-009	CCK 2	Calvary Chapel Kaua'i	ROT	UNU	2012
20104	2-0518-001	Mahelona Hospital	State Dept. of Health, DOH	ROT	OTH	1973
20104	2-0518-003	Mahelona Hospital	State Dept. of Health, DOH	PER	OTH	1975
20104	2-0518-004	Mahelona Hospital	State Dept. of Health, DOH	PER	OTH	1975
20104	2-0518-005	Mahelona Hospital	State Dept. of Health, DOH	PER	OTH	1975
20104	2-0519-004	Kapa'a Homesteads 3	Department of Water Kaua'i, KDOW	ROT	MUNCO	2004
20104	2-0519-005	Lydgate 1	Lynn Ogden	ROT	DOM	2005
20104	2-0519-007	Miller 01	Robert Miller 1	ROT	DOM	2006
20104	2-0520-001	RWR	Pat Slaboch (Exodyne Electric Motors, Inc.)	ROT	DOM	1999
20104	2-0520-016	Nampara	Jerry Driscoll	ROT	DOM	2012
20104	2-0521-003	Kulana 17	Kapa'a 382 LLC	ROT	UNU	2001
20104	2-0521-009	Golden Pond	Carrie Cowan	ROT	DOM	2005
20104	2-0521-010	Dry Gulch Flats	William Lydgate (Dry Gulch Flats, LLC)	PER	DOM	2006
20104	2-0522-001	Waipouli 2004	Valley Well Drilling, LLC	ROT	DOM	2005
20104	2-0522-002	Makaleha Gardens	Makaleha Gardens LLC	ROT	DOM	2014

Aquifer System	Well No.	Well Name	Owner/User	Well Type	Use	Year Drilled
20104	2-0523-001	Wailua Homesteads 3	Department of Water Kaua'i, KDOW	ROT	UNU	2005
20104	2-0618-005	Keālia 7	Plantation Partners Kaua'i LLC	PER	UNU	1928
20104	2-0618-006	Keālia 6	Plantation Partners Kaua'i LLC	PER	UNU	1928
20104	2-0618-009	Keālia 1A	Plantation Partners Kaua'i LLC	ROT	MUNPR	2001
20104	2-0618-010	Keālia 2A	Plantation Partners Kaua'i LLC	ROT	MUNPR	2001
20104	2-0619-001	Mitchell	Norman Mitchell	ROT	DOM	2009
20104	2-0620-001	Kapa'a Cannery	Kaua'i Natural Waters, LLC	PER	INDOTH	1960
20104	2-0620-002	Keālia-Bail	Kenneth Bail		DOM	1987
20104	2-0620-003	Keālia-Nice	Cameron Nice		DOM	1995
20104	2-0620-004	Reasoner	Christopher Reasoner	ROT	DOM	2000
20104	2-0620-006	Gardner	Joe Gardner	ROT	DOM	2000
20104	2-0622-001	Akulikuli Tunnel	Department of Water Kaua'i, KDOW	TUN	MUNCO	
20104	2-0622-002	Kapa'a Homesteads 2	Department of Water Kaua'i, KDOW	PER	MUNCO	1989
20104	2-0622-003	Einrogel Farms	Einrogel Farms LLC	ROT	DOM	1999
20104	2-0622-004	Shalom-Tzion	Eve Nober	ROT	DOM	2008
20104	2-0623-001	Makaleha Tun	Department of Water Kaua'i, KDOW	TUN	MUNCO	
20104	2-0623-002	Moalepe Tunnel	Department of Water Kaua'i, KDOW	TUN	MUNCO	
20104	2-0623-003	Makaleha TH	Department of Water Kaua'i, KDOW		UNU	1981
20104	2-0623-004	Kapa'a Homesteads 1	Department of Water Kaua'i, KDOW	PER	MUNCO	1986
20104	2-0719-001	Hōmaikawa'a Str	LPC Corporation	ROT	UNU	1954
20104	2-0719-002	Hōmaikawa'a Str	LPC Corporation	ROT	UNU	1954
20104	2-0719-003	Caldwell Water	William S. Caldwell		DOM	2014
20104	2-0720-001	Mimino Ditch	LPC Corporation	ROT	UNU	1953
20104	2-0720-002	Keālia Stream	LPC Corporation	ROT	UNU	1954
20104	2-0720-003	Keālia Mauka 1	Cornerstone Hawai'i	ROT	DOM	2001
20104	2-0720-004	Keālia Mauka 2	Cornerstone Hawai'i	ROT	DOM	2003
20104	2-0818-001	Anahola 1	Department of Water Kaua'i, KDOW	PER	MUNCO	1956
20104	2-0818-002	Anahola 2	Department of Water Kaua'i, KDOW	PER	MUNCO	1957
20104	2-0818-003	Anahola 3	Department of Water Kaua'i, KDOW	PER	MUNCO	1991
20104	2-0819-001	Anahola Tunnel	Department of Hawaiian Home Lands, Kaua'i, DHHL	TUN	UNU	
20104	2-0918-001	'Aliomanu	Cynthia Lazaroff	PER	IRR	1978
20104	2-0918-002	Anahola	Chris & Lyn etal Prentiss (Passages Malibu)	ROT	DOM	2000

Aquifer System	Well No.	Well Name	Owner/User	Well Type	Use	Year Drilled
20104	2-0918-003	Aloha Mana	Ilya Hendrix	ROT	DOM	2002
20104	2-0919-001	'Aliomanu	D. Moriarty	ROT	DOM	1978
20104	2-0919-002	Anahola	Haruo Kakimoto	PER	IRRLA	1978
20104	2-0919-003	Anahola	Department of Water Kaua'i, KDOW	PER	UNU	1979
20104	2-0919-004	Anderton	Jon Anderton	PER	AGRCP	1997
20104	2-0919-005	'Aliomanu	C. Bauder	ROT	UNU	1998
20104	2-0919-006	'Āina Anahola	Jonathan Adamek (Water Group at Nani O Kalalea Ranch Condo)	ROT	DOM	1999
20104	2-0919-008	Hui Road 2	Hui Road, LLC	ROT	UNU	2005
20104	2-0919-012	Barnes	James Barnes	ROT	UNU	2009
20104	2-1018-001	Hill	Richard Hill	PER	DOM	2001
20104	2-1019-002	'Aliomanu	LPC Corporation	PER	UNU	1955
20104	2-1019-003	Pāpa'a Bay Ranch	Hawaiian Trust Co., Ltd.	ROT	IRR	1973
20104	2-1019-004	'Aliomanu	'Aliomanu Estates Community Assn.	PER	MUNPR	1992
20104	2-1019-008	Pāpa'a Bay Ranch	Mandalay Properties Hawai'i LLC	ROT	IRRLA	1999
20104	2-1019-010	Last	Kurt & Kathy Last	ROT	AGR	2014
20104	2-1020-001	Moloa'a Camp TH	LPC Corporation	ROT	UNU	1954
20104	2-1020-002	Moloa'a 1	Jeffery Lindner (Loka Development)	ROT	AGRCP	1962
20104	2-1020-003	Moloa'a 2	LPC Corporation	ROT	AGRCP	1963
20104	2-1020-004	'Aliomanu	Land Division O'ahu, DLNR-LD	PER	UNU	1974
20104	2-1020-005	Papaa-Lindner	Jeffery Lindner (Loka Development)	ROT	AGRCP	2003
20104	2-1119-002	MBLC # 2	Gene Hughes (Moloa'a Bay Land Company LLC)	ROT	DOM	2007
20104	2-1120-001	Moloa'a Tunnel	LPC Corporation	TUN	UNU	
20104	2-1120-002	Moloa'a-Martino	Phillip Martino		DOM	1988
20104	2-1120-003	Moloa'a-Lawhead	James Lawhead	PER	DOM	1989
20104	2-1120-004	Moloa'a-Altemus	Mark Altemus	PER	DOM	1989
20104	2-1120-005	Moloa'a-Yoshioka	Akitatsu Yoshioka	PER	DOM	1990
20104	2-1120-007	Moloa'a-Mattson	W. Mattson	ROT	UNU	1991
20104	2-1120-008	Moloa'a-Donna	D. Luellen Trust	ROT	DOM	1992
20104	2-1120-009	Moloa'a-Mae	D. Luellen Trust	ROT	DOM	1992
20104	2-1120-011	Moloa'a-Sparks 1	La Vorne Sparks	ROT	DOM	1992
20104	2-1120-012	Moloa'a-Ka'aumoana	David Ka'aumoana	ROT	DOM	1991
20104	2-1120-013	Moloa'a-Sparks 2	La Vorne Sparks	ROT	IRRLA	1993

Aquifer System	Well No.	Well Name	Owner/User	Well Type	Use	Year Drilled
20104	2-1120-019	Moloa'a-Thronas	Thronas-Loganbill	ROT	DOM	1999
20104	2-1120-023	Moloa'a Bay View	Scott Tucker	ROT	UNU	
20104	2-1120-024	Montgomery	Jess Montgomery	ROT	DOM	1996
20104	2-1120-025	Moloa'a-Anderson	Mark Anderson	ROT	DOM	1995
20104	2-1120-027	Ka'aka'anui	Deborah Forester	ROT	DOM	1998
20104	2-1120-028	Ka Lae Mana	P. Kuuleialoha Johnson	ROT	DOM	1997
20104	2-1120-029	Moshe	Bacon Family Trust	ROT	DOM	2000
20104	2-1120-030	Moloa'a Ranch 1	Moloa'a Bay Ranch	ROT	DOM	1999
20104	2-1120-031	Agua Por Vida	Russel Brand	ROT	AGRCP	2001
20104	2-1120-032	Larsen Beach	Ronald Russel	ROT	DOM	2001
20104	2-1120-033	Moloa'a Plntn	Andy Fitts	ROT	DOM	2001
20104	2-1120-034	Ke Ho'omaka	Craig Maas	ROT	MUNPR	2001
20104	2-1120-035	Wai Ola	Moloa'a Bay Ventures, LLC	ROT	DOM	2001
20104	2-1120-039	Kawaihau Meadows	Stephen Williams	ROT	DOM	2002
20104	2-1120-040	Waldau	Peter Waldau	ROT	DOM	2003
20104	2-1120-043	Molo Wai	John Miller (Koohio Reality Trust)	ROT	DOM	2007
20104	2-1120-046	Ka'apuna Kai	Bill Chase (Moloa'a Bay Ventures, LLC)	ROT	DOM	2005
20104	2-1120-047	Tom's	Patricia Schwartz (Moloa'a Bay Land Company, LLC)	ROT	DOM	2007
20104	2-1120-048	Pramuka	Ray Pramuka	ROT	DOM	2008
20104	2-1120-052	Tony	Aldo Abondio Albertoni	ROT	UNU	2009
20104	2-1120-053	Willy	Annie Levy Estate	ROT	DOM	2011
20104	2-1120-056	Jack	Moloa'a Valley	ROT	DOM	2010
20104	2-1120-057	Kahu Main	Kahu Association	ROT	DOM	2011
20104	2-1120-058	Garcia	Mark A. & Susie M. Garcia	ROT	DOM	2013
20104	2-1120-059	Buck	Frederick Bucholz		DOM	
20104	2-1121-006	Lepeuli	Michille Swartman	ROT	DOM	2007
20105	2-1120-022	Moloa'a-Waldau	Peter Waldau	ROT	DOM	1997
20105	2-1120-026	Steve	Steve Goldberg (Oasis Water Systems, Inc.)	ROT	DOM	1999
20105	2-1120-049	#1 Main	Patricia Hanwright		IRRLA	1980
20105	2-1120-050	#2 Back-up	Steve Frailey (Sunrise Organic Farms)		AGRCP	1987
20105	2-1120-055	High House	Steve Frailey (Sunrise Organic Farms)	ROT	AGRCP	2010
20105	2-1121-001	Nancy Irene	Joseph Kobayashi	ROT	DOM	2001

Aquifer System	Well No.	Well Name	Owner/User	Well Type	Use	Year Drilled
20105	2-1121-002	Falko Ko'olau 3	Steve Pilkington (Falko Partners, LLC)	ROT	UNU	2006
20105	2-1121-003	Falko Ko'olau 4	Steve Pilkington (Falko Partners, LLC)	ROT	UNU	2007
20105	2-1121-004	Falko Ko'olau 5	Steve Pilkington (Falko Partners, LLC)	ROT	UNU	2007
20105	2-1121-005	Falko Ko'olau 6	Steve Pilkington (Falko Partners, LLC)	ROT	UNU	2007
20105	2-1122-001	Green Thumb	Carol Orr (Keala Ranch)	ROT	UNU	2003
20105	2-1122-003	Friedman	Melinda Friedman	ROT	DOM	2009
20105	2-1122-005	Kane	David & Sandy Lear Family Trust	ROT	UNU	2009
20105	2-1122-006	Aquaholic	Justin & Robyn May		UNU	2012
20105	2-1122-007	Ketten	Sonja Geiger	ROT	DOM	2013
20105	2-1123-001	Hanalei-Barnard	B. J. Barnard	ROT	DOM	2001
20105	2-1123-002	Hermitage	Gordon Haas	ROT	DOM	1998
20105	2-1123-003	Scoratow	Alan Arita	ROT	DOM	1999
20105	2-1123-004	Fountain Youth	Sustainable Kaua'i	ROT	UNU	2000
20105	2-1123-005	McDonald	Pu'uhonua	ROT	DOM	2001
20105	2-1123-006	'Ānuenue	Mary Lou Norris	ROT	DOM	2001
20105	2-1123-008	Max 1	John Maxwell	ROT	DOM	2003
20105	2-1123-009	Todd	Robert Todd	ROT	DOM	2007
20105	2-1124-001	Koa 1	Neal Norman (Kaua'i Organic Farms)	ROT	DOM	2003
20105	2-1124-002	Mad Jack	John & Marilyn Wells Trust	ROT	DOM	2008
20105	2-1124-003	Hidden Valley	Eric Taylor (Aliomanu Sandcastles LLC)	ROT	DOM	2008
20105	2-1125-001	Kīlauea 1	Department of Water Kaua'i, KDOW	PER	MUNCO	1972
20105	2-1125-002	Kīlauea 2	Department of Water Kaua'i, KDOW	PER	MUNCO	1975
20105	2-1220-001	Sunrise Farms #1	Steve Frailey (Sunrise Organic Farms)		AGRCP	1983
20105	2-1220-002	Sunrise Farms #2	Steve Frailey (Sunrise Organic Farms)		AGRCP	1983
20105	2-1220-003	Sunrise Farms #3	Steve Frailey (Sunrise Organic Farms)		AGRCP	1984
20105	2-1220-004	Hanwright 1	Patricia Hanwright		AGRCP	1987
20105	2-1220-005	Hanwright 2	Patricia Hanwright		AGRCP	1987
20105	2-1221-001	Ko'ohio	John Miller (Koohio Reality Trust)	ROT	DOM	1998
20105	2-1221-003	Waipake	Ken O'Conner	ROT	DOM	1997
20105	2-1221-005	Wai Ola	Scott Rautmann	ROT	UNU	2001
20105	2-1221-008	Falko Ko'olau 1	Falko Partners, LLC	ROT	DOM	2001
20105	2-1221-009	Falko Ko'olau 2	Falko Partners, LLC	ROT	DOM	2002

Aquifer System	Well No.	Well Name	Owner/User	Well Type	Use	Year Drilled
20105	2-1221-010	Pīla'a 1	James Pflueger	ROT	UNU	2002
20105	2-1221-014	Ke Hoomaka 2	Algosa Masters	PER	UNU	2008
20105	2-1222-002	Rajput Elixer	Virginia Lyon		DOM	1996
20105	2-1222-003	Lokahi Gardens	Teresa Goldberg	ROT	DOM	1999
20105	2-1222-004	Kaua'i Org Farms	Kaua'i Organic Farms	ROT	AGRCP	2001
20105	2-1222-005	Pīla'a 3	James Pflueger	ROT	AGRCP	2002
20105	2-1222-007	Bubbles	Christine & Thomas Lynch	ROT	DOM	2008
20105	2-1222-008	Moorhead	Aimee Moorhead	ROT	UNU	2009
20105	2-1222-009	Kilden	Terje Haakonsen	ROT	DOM	2009
20105	2-1222-013	Kingston	David Kingston	ROT	DOM	2011
20105	2-1222-014	Olson	Egret Park	ROT	DOM	2011
20105	2-1223-001	Zweben	4110 Wailapa Road, LLC	ROT	AGRON	2001
20105	2-1223-002	Na 'Āina Kai	Chris Fernandes (Na 'Āina Kai Botanical Gardens)	ROT	IRROTH	2007
20105	2-1223-003	Bill's Well	William Kreutzmann	PER	DOM	2007
20105	2-1223-004	Mana 'Olana Spring	Cheryl Wright Trust	ROT	DOM	2009
20105	2-1223-005	Northcutt	Mana Mele CPR	ROT	DOM	2012
20105	2-1223-006	KFR Well	Paradise Pacific Homes		DOM	2011
20105	2-1223-008	Orchard	Mauna Ota LLC	PER	IRR	2012
20201	2-1126-001	Princeville 1	Princeville Utilities Company, Inc.	PER	MUNPR	1970
20201	2-1126-002	Princeville 2	Princeville Utilities Company, Inc.	PER	MUNPR	1970
20201	2-1126-003	Princeville 5	Princeville Utilities Company, Inc.	ROT	UNU	1995
20201	2-1224-001	Gina	Gina Zapara (Rule 21C)	ROT	UNU	2001
20201	2-1224-005	Secret Beach	Secret Beach Plantation, LLC	ROT	IRR	2011
20201	2-1225-001	Kalihiwai Tunnel	David Estrella (David Estrella Enterprises)	TUN	UNU	
20201	2-1225-002	Kīlauea-Halasey	Tom Halasey	PER	DOM	1993
20201	2-1225-003	Kīlauea-KPGI III	William Porter (Porter Revocable Trust)	Per	UNU	1994
20201	2-1225-005	Kai Halalū 1	Peter Miller (Miller Family Trust)	PER	DOM	2006
20201	2-1226-001	Kalihiwai Oasis	Russell Josephson	ROT	UNU	2010
20201	2-1226-002	Luu	Chan Luu	ROT	DOM	2012
20201	2-1324-001	Sunburst Equity	Sunburst Equities, Inc.	ROT	DOM	2001
20201	2-1324-002	Namahana Acres	Jackie Yellin	ROT	DOM	2001
20201	2-1324-004	Pualei Properties	James Antony (Pualei Properties, LLC)	ROT	AGRCP	2005

Aquifer System	Well No.	Well Name	Owner/User	Well Type	Use	Year Drilled
20201	2-1324-005	Hale'ae Kai #1	William Strong	ROT	DOM	2005
20201	2-1324-009	Wai Eli oka Lae	Gary Kading (Gary S. Kading Trust)	ROT	AGR	2009
20201	2-1325-001	Kalihiwai	Gary Swanson	PER	DOM	1986
20201	2-1325-003	Earhart	Anne Earhart	PER	DOM	1998
20201	2-1325-004	Ruddell	Steve Ruddell	ROT	DOM	2007
20201	2-1325-005	Nowai	Kathleen Johnson	ROT	DOM	2008
20201	2-1326-002	Fischer	Gary Fischer	ROT	DOM	1995
20201	2-1326-003	Brescia	Ted Burkart (Torey/Corey LLC)	ROT	UNU	2006
20201	2-1326-004	Kalihikai Fischer 2	Gary Fischer	ROT	DOM	2011
20201	2-1327-001	'Anini Tunnel	4301 Limited Partnership	TUN	UNU	
20201	2-1327-002	Kalihiwai	AMFAC	ROT	UNU	1962
20202	2-1122-002	Hunt	V. Stephen Hunt	ROT	DOM	2009
20202	2-1127-002	Princeville 4	Princeville Utilities Company, Inc..	ROT	MUNPR	1995
20202	2-1130-001	McPeek Kosteletsky	Camille Kostelecky Trust	ROT	DOM	2011
20202	2-1229-001	Hanalei Fishpond	G. Wilcox	PER	UNU	1940
20202	2-1229-002	Hanalei Fishpond	G. Wilcox	PER	UNU	1940
20202	2-1229-003	Maka Ridge	Department of Water Kaua'i, KDOW	PER	MUNCO	1961
20202	2-1229-004		William Mowry		DOM	
20202	2-1329-001	Hanalei	Land Division O'ahu, DLNR-LD	ROT		1959
20202	2-1329-002	Ecdc Effl T H	Princeville Corporation 2	ROT		1970
20203	2-1232-001	Wainiha 1	Department of Water Kaua'i, KDOW	ROT	MUNCO	1961
20203	2-1232-002	Wainiha 2	Department of Water Kaua'i, KDOW	PER	MUNCO	1985
20203	2-1233-001	Jodan	Dane Smith	ROT	DOM	2006
20203	2-1333-001	Hā'ena	Department of Water Kaua'i, KDOW	PER	MUNCO	1965
20204	2-0839-001	Honopū	Sunrise	ROT	DOM	1972
20204	2-0938-001	Kōke'e A F Stn	United States Air Force		MIL	
20301	2-0044-010	Kaunalewa Ks12	Kekaha Sugar	PER	AGRCP	1890
20301	2-0044-015	Kaunalewa Shaft	Kekaha Sugar	SHF	AGRCP	1957
20301	2-0045-004	Barking Sands 2	Naval Facilities Engineering Command Hawai'i, Environmental, NAVFAC Hawai'i	PER	MIL	1974
20301	2-0046-001	Barking Sands 1	Naval Facilities Engineering Command Hawai'i, Environmental, NAVFAC Hawai'i	PER	UNU	1969
20301	2-0145-004	Camp 2 Ks13	Kekaha Sugar	PER	UNU	1890

Aquifer System	Well No.	Well Name	Owner/User	Well Type	Use	Year Drilled
20301	2-0145-010	Mānā 6	Kekaha Sugar	PER	AGRCP	1901
20301	2-0145-012	Mānā 8	Kekaha Sugar	PER	AGRCP	1901
20301	2-0145-013	Mānā 9	Kekaha Sugar	PER	AGRCP	1901
20301	2-0145-016	Mānā 12	Kekaha Sugar	PER	AGRCP	1901
20301	2-0245-002	Mānā Shaft	Kekaha Sugar	SHF	MUNCO	1938
20301	2-0345-003	Saki Mānā Ks17	Kekaha Sugar		UNU	1902
20301	2-0345-004	Saki Mānā Shaft	Kekaha Sugar	SHF	AGRCP	1957
20301	2-0545-001	Ka'ula'ula	Division of State Parks Kaua'i, DLNR-SP	PER	IRRPA	1967
20301	2-5740-001	Waimea	Kekaha Sugar		UNU	
20301	2-5840-001	Waimea A	Department of Water Kaua'i, KDOW	PER	MUNCO	1966
20301	2-5840-002	Waimea B	Department of Water Kaua'i, KDOW	PER	MUNCO	1983
20301	2-5841-001	Kīkīaola	Milohae Limited Part.	ROT	DOM	1999
20301	2-5841-002	Kapilimao Valley	Department of Water Kaua'i, KDOW	ROT	MUNCO	1999
20301	2-5842-002	AMFAC Shaft 11	Kekaha Sugar	SHF	MUNST	1932
20301	2-5842-003	Huluhulunui Shft	Kekaha Sugar	SHF	AGRCP	1948
20301	2-5843-001	Kekaha Shaft 12	Department of Water Kaua'i, KDOW	SHF	MUNCO	1948
20301	2-5844-001	Kekaha-Sunkiss Shrim	Sunkiss Shrimp Co., Ltd.	DUG	AGRAQ	1996
20301	2-5844-002	Hi-Bred 1	Pioneer Hi-Bred International, Inc., Kaua'i	PER	AGRCP	1997
20301	2-5844-006	Sunkiss Shrimp	Sunkiss Shrimp Co., Ltd.	PER	AGRAQ	1997
20301	2-5942-001	Kekaha No. 1	Department of Water Kaua'i, KDOW	PER	MUNCO	1970
20301	2-5943-001	Waiawa Shaft	Kekaha Sugar	SHF	AGRCP	1935
20301	2-5943-002	Kekaha No. 2	Department of Water Kaua'i, KDOW	PER	MUNCO	1978
20301	2-5945-001	Ceatech Pltns 1	Jim Sweeny (Sunrise Capitol)	PER	AGRAQ	1998
20301	2-5945-002	Ceatech Pltns 2	Jim Sweeny (Sunrise Capitol)	PER	AGRAQ	1998
20301	2-5945-003	Ceatech Pltns 3	Jim Sweeny (Sunrise Capitol)	PER	AGRAQ	2001
20301	2-5945-004	Ceatech Pltns 4	Jim Sweeny (Sunrise Capitol)	PER	AGRAQ	2001
20302	2-0738-001	Kōke'e-Waineke	Division of State Parks Kaua'i, DLNR-SP	ROT	UNU	2005
20302	2-0739-001	Kōke'e Park A	Division of State Parks Kaua'i, DLNR-SP	PER	MUNST	1986
20302	2-0739-002	Kōke'e Park B	Division of State Parks Kaua'i, DLNR-SP	PER	UNU	1986
20302	2-0739-003	Kōke'e-Noe	Land Division Kaua'i, DLNR	PER	MUNST	1996
20302	2-5939-001	Waimea Shaft 9	Department of Water Kaua'i, KDOW	SHF	UNU	1932
20303	2-5634-001	Hanapēpē Ridge	Land Division O'ahu, DLNR-LD	PER	UNU	1961

Aquifer System	Well No.	Well Name	Owner/User	Well Type	Use	Year Drilled
20303	2-5634-002	Hanapēpē 4	Department of Water Kaua'i, KDOW	PER	MUNCO	1993
20303	2-5635-001	Domestic Water	Gay & Robinson, Inc.	TUN	MUNPR	1947
20303	2-5635-002	500 H.P Irr	Gay & Robinson, Inc.	PER	AGRCP	1969
20303	2-5638-001	Mahinauli Shaft	Gay Robinson	SHF	UNU	1933
20303	2-5639-001	Pakala	Richland Mortgage Corp.	DUG	DOM	1997
20304	2-5533-001	Hanapēpē Valley A	Department of Water Kaua'i, KDOW	PER	MUNCO	1974
20304	2-5533-002	Hanapēpē Valley B	Department of Water Kaua'i, KDOW	PER	MUNCO	1980
20304	2-5534-001	Hanapēpē Pump 3	McBryde Sugar Co. Ltd.	SHF	AGRCP	1899
20304	2-5534-002	Hanapēpē Pump 1	McBryde Sugar Co. Ltd.	SHF	UNU	1899
20304	2-5534-003	Hanapēpē 1	Department of Water Kaua'i, KDOW	ROT	MUNCO	1966
20304	2-5534-004	Hanapēpē Pump 2	McBryde Sugar Co. Ltd.	SHF	UNU	1899

APPENDIX B

Inventory of Diversions

Aquifer System	SW Hydrologic Unit	Owner/Operator	Stream Name	Declared Use (mgd)	Notes
20101	2047	KIPUKAI RANCH	Unnamed	0.018	Stream diversion, pipe from Unnamed intermittent stream. Seasonal, intermittent use from November through February.
20101	2048	MCBRYDE SUGAR	Waihohonu	0.000	Stream diversion, Wilcox Ditch Intake F-610 from Waihohonu. Land owned by Knudsen/Bishop Trust. Flows go to Waita Reservoir.
20101	2048	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Puu O Hewa Reservoir from Unnamed stream. Land owned by Knudsen/Bishop Trust.
20101	2048	MCBRYDE SUGAR	Waihohonu	0.000	Stream diversion, Waita Reservoir on Waihohonu Stream. Land owned by GROVE FARM.
20101	2048	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion. Mahaulepu Reservoir from Unnamed stream. Land owned by GROVE FARM. See also declaration for Mahaulepu Springs 11, 12, 12A, 13, & 14.
20101	2048	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Warner Dam (754 pump) in Unnamed stream. Shown on field map as "754 Pump." Land owned by GROVE FARM.
20101	2048	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Mauka Reservoir from Unnamed stream. Land owned by Knudsen/Bishop Trust.
20101	2049	KIAHUNA GOLF	Waikomo	0.000	Stream diversion, intake from Waikomo Stream. Land owned by MCBRYDE SUGAR
20101	2049	KUBOTA S	Waikomo	0.000	Stream diversion, pump from Waikomo stream and rights claim.
20101	2049	MCBRYDE SUGAR	Poeleele	0.000	Stream diversion, Piwai Reservoir (Res #17) from Paeleele Stream.
20101	2049	MCBRYDE SUGAR	Lawai Intake Ditch	0.000	Stream diversion, Hanini Reservoir (Res #7) from Lawai stream.
20101	2049	MCBRYDE SUGAR	Waikomo	0.000	Stream diversion, Huinawai Reservoir (Res #18) from Unnamed gulch. Reservoir also receives flow from Hanini Res (Res #7).
20101	2049	MCBRYDE SUGAR	Omao	0.000	Stream diversion, Omao Reservoir (Res #26) on Omao stream. Land owned by Knudsen/Bishop Trust. Declared Q = 934.00 MG measured at Small Smith gauge (total for Gauge). Unsure if it's a flume, weir, etc.
20101	2049	MCBRYDE SUGAR	Omao	0.000	Stream diversion, Big Smith Ditch from Omao stream. Declared Q = 934.00 MG measured at Small Smith gauge (total for Gauge). Unsure if it's a flume, weir, etc.
20101	2049	MCBRYDE SUGAR	Mauka Ditch	0.000	Stream diversion, Pia Mill Reservoir on Unnamed gulch. Land owned by Knudsen/Bishop Trust.
20101	2049	MCBRYDE SUGAR	Poeleele	0.000	Stream diversion, Small Smith Ditch from Poeleele. Declared Q = 934.00 MG measured at Small Smith gauge (total for Gauge). Unsure if it's a flume, weir, etc.
20101	2049	MCBRYDE SUGAR	Unnamed spring	1.000	Spring diversion, from Hakaka spring to Hakaka ditch (new entry). Flows to Pia Mill Reservoir. Land owned by Knudsen/Bishop Trust.
20101	2049	MCBRYDE SUGAR	Waihohonu	0.000	Stream diversion, Pake Kope Gate from Waihohonu stream. Land owned by Knudsen/Bishop Trust.
20101	2050	MCBRYDE SUGAR	Aepo Gulch	0.000	Stream diversion, Manuhonuhonu Reservoir from Unnamed stream. Intermittant stream.
20101	2050	MCBRYDE SUGAR	Aepo Gulch	0.000	Stream diversion, Aepo Reservoir (Res 19) from Aepo Gulch. Intermittant stream.
20101	2050	MCBRYDE SUGAR	Aepo Gulch	0.000	Stream diversion, Aepoalua Reservoir (Res #30) from Aepo Gulch. Intermittant stream.
20101	2050	MCBRYDE SUGAR	Aepo Gulch	0.000	Stream diversion, Aepokolu Reservoir (Res #29) from Aepo Gulch. Intermittant stream.
20101	2050	MCBRYDE SUGAR	Aepo Gulch	0.000	Stream diversion, Aepoeha Reservoir (Res #28) from Aepo Gulch. Intermittant stream.
20101	2051	COFFMAN R	Lawai	0.000	Stream diversion, pump from Lawai stream.
20101	2051	HOP HING CO	Lawai	0.000	Stream diversion, pump from Lawai stream.
20101	2051	KANEKO T	Kalaheo	0.000	Stream diversion, pump from Kalaheo stream. Occasional use as needed.
20101	2051	MATIAS S	Lawai	0.000	Stream diversion, from Margo's Pond on Lawai stream to parcel. Source is "Margo's Pond".
20101	2051	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Lua Wai Reservoir from Unnamed stream.
20101	2051	MCBRYDE SUGAR	Lawai	1.739	Stream diversion, Lawai Intake from Lawai stream. Rating flume is located at Lawai Intake at Hanini Reservoir (Res #7).

Aquifer System	SW Hydrologic Unit	Owner/Operator	Stream Name	Declared Use (mgd)	Notes
20101	2051	MCBRYDE SUGAR	Kekee Gulch	0.000	Stream diversion, Kaupale Reservoir (Res #21) from Kekee Gulch. Intermittant stream. Map of diversion is attached to the declaration form for Umi Reservoir (Res #10).
20101	2051	MCBRYDE SUGAR	Kekee Gulch	0.000	Stream diversion, Kumano Reservoir (Res #20) from Kekee Gulch. Intermittant stream.
20101	2051	MCBRYDE SUGAR	Kekee Gulch	0.000	Spring diversion, from 504 Spring (new entry). Q not measured.
20101	2051	MEDEIROS G	Unnamed trib to Lawai	0.000	Stream diversion, auwai from Kalahia/Puukalulu.
20101	2051	SWAIN AM&TP	Unnamed trib to Lawai	0.000	Stream diversion, ditch from Kaeahua and rights claim. Although declarant may not be using the water diverted from the stream; the diversion still exists.
20101	2052	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Ipuolono Reservoir (Res #8) from Kalaheo stream. Reservoir is also fed by flows from other reservoirs.
20101	2052	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Ioleau Reservoir (Res #6) from Unnamed stream.
20101	2052	MCBRYDE SUGAR	Kalaheo Gulch	0.000	Spring diversion, from Kawaihaka Intake Spring (new entry). Q not measured.
20101	2052	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Puana Reservoir from Unnamed stream.
20101	2052	MCBRYDE SUGAR	Kalaheo Gulch	0.000	Stream diversion, Elima Reservoir (Res #5) from Kalaheo Gulch. Reservoir feeds the Power House Ditch.
20101	2052	MCBRYDE SUGAR	Kalaheo Gulch	0.000	Stream diversion, Mau Reservoit (Res #4) from Kalaheo Gulch. Reservoir also receives flow from Elima Res (Res #5).
20101	2052	MCBRYDE SUGAR	Kalaheo Gulch	0.000	Stream diversion, Elua Reservoir (Res #2) from Kalaheo Gulch.
20101	2052	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Hukiwai Reservoir from Unnamed stream. Source of Unnamed stream is the Hanapepe River.
20101	2052	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Umi Res (Res #10) from Unnamed stream. Map provided by declarant is attached to declaration form for Hanini Reservoir (Res #7) in file.
20101	2053	MCBRYDE SUGAR	Wahiawa	7.175	Stream diversion, Alexander Reservoir from Wahiawa stream. End user of this diversion is Kauai DWS. Rating flume located at Kalaheo Hydro Electric Plant.
20102	2042	LIHUE PLANTATI	Hanamaulu	0.000	Stream diversion, Intake #45 from Hanamaulu stream to Manager's House (new entry). Flow is intermittent.
20102	2042	MAHELONA J	Hanamaulu	0.000	Stream diversion, pipe from Hanamaulu Stream.
20102	2042	MAHELONA J	Hanamaulu	0.000	Stream diversion, ditch from Hanamaulu stream through pond. Flow is 1-ft deep in the 2-ft wide ditch.
20102	2042	MAHELONA J	Hanamaulu	0.004	Stream diversion, pump from Hanamaulu stream and rights claim. Q is an estimate based on pump capacity.
20102	2044	HALE KAUAI LTD	Unnamed	0.002	Stream diversion, pump from Unnamed stream. Haiku #1 spring located at reservoir that feeds unnamed stream (no field verification, but has old div # assigned).
20102	2044	HOLI G	Nawiliwili	0.000	Stream diversion, auwai from Nawiliwili and rights claim.
20102	2044	RYDER JS	Nawiliwili	0.001	Stream diversion, pump from Unnamed stream. Declared Q is the pump pressure converted (by the declarant) to GPM.
20102	2045	ACHI SH	Puali	0.066	Stream diversion, ditch from Puali (Nuimalu) stream. See also other entry on OAHU to be corrected to Kauai.
20102	2045	GROVE FARM	Puali	0.000	Stream diversion, pump from Puali stream. Used only when needed (no field verification, but has old div # assigned).
20102	2045	KAUAI IN FARMS	Puali	0.720	Stream diversion, auwai fr Puali stream. Declared Q = 500 gpm converted to MGY. The two entries for KAUAI IN FARMS end uses should be deleted. See new entry for 2nd auwai.
20102	2045	KAUAI IN FARMS	Puali	0.720	Stream diversion, Makaaeae auwai from Puali stream (New entry). Land owner is Grove Farm. Declared Q was 500 gal per minute, 262.8 MGY derived by WOA.
20102	2045	KAUAI NURSERY	Tributary to Puali	0.000	Stream diversion, ditch from Halehaka stream. Occassional use. Land is owned by GROVE FARM.

Aquifer System	SW Hydrologic Unit	Owner/Operator	Stream Name	Declared Use (mgd)	Notes
20102	2045	ACHI SH	Huleia	0.132	Str diversion, ditch from Huleia stream and rights claim. This entry exists in the database as an OAHU diversion. Change island to KAUAI.
20102	2046	BREWER CHEM	Hoinakaunalehua	0.000	Stream diversion, occasional use of pump from Hoinakaunalehua (no field verification, but has old div # assigned).
20102	2046	GROVE FARM	Unnamed water tunnel	0.000	Stream diversion, Kahili Intake pipe #1 from unnamed water tunnels. Diversion is probably from a runoff ditch fed by flow from tunnels (no field verification, has old div #). See also new entry for pipe #2. Tunnels are not registered in the well database
20102	2046	GROVE FARM	Papakolea	0.000	Stream diversion, Papakolea stream intake (no field verification, but has old div # assigned).
20102	2046	GROVE FARM	Unnamed	0.000	Stream diversion, Crusher East intake (no field verification, but has old div # assigned).
20102	2046	GROVE FARM	Unnamed	0.000	Stream diversion, Crusher West intake (no field verification, but has old div # assigned).
20102	2046	GROVE FARM	Unnamed spring	0.000	Spring diversion, Kipu Ranch F824 from Unnamed spring (no field verification, but has old div # assigned).
20102	2046	GROVE FARM	Unnamed	0.000	Stream diversion, Kahili Intake pipe #2 from unnamed water tunnels (new entry). Diversion is probably from a runoff ditch fed by flow from tunnels. Tunnels are not registered in the well database.
20102	2046	GROVE FARM	Kuia	0.000	Stream diversion, Kuia intake, standby. May be a duplicate of MCBRYDE SUGAR diversion #2-5727-001D on land owned by GROVE FARM (no field verification, but has old div # assigned).
20102	2046	GROVE FARM	Unnamed spring	0.000	Spring diversion, Haiku 19 (no field verification, but has old div # assigned).
20102	2046	GROVE FARM	Kuia	0.000	Stream diversion, Kuia Stream Dom Intake. May be a duplicate of MCBRYDE SUGAR div #2-5828-002D on land owned by Knudsen (no field verification, but has old div # assigned).
20102	2046	GROVE FARM	Hoinakaunalehua	0.000	Stream diversion, Hoinakaunalehua intake (no field verification, but has old div # assigned).
20102	2046	LIHUE PLANTATI	Kamoola	0.000	Stream diversion, Intake #29 from Kamoola stream to Koloa ditch (new entry). Diversion located on tributary to Huleia stream. Land owned by GROVE FARM.
20102	2046	LIHUE PLANTATI	Unnamed	0.000	Stream diversion, Intake #34 West from Unnammed stream to Halenanahu Reservoir (new entry). Land owned by GROVE FARM.
20102	2046	LIHUE PLANTATI	Unnamed	0.000	Stream diversion, Intake #34 East from Unnamed stream to Halenanahu Reservoir (new entry). Land owned by GROVE FARM.
20102	2046	LIHUE PLANTATI	Kamoola	0.000	Stream diversion, Intake #30 from Kamoola stream to Papuaa Reservoir (new entry). Diversion located on tributary to Huleia stream. Land owned by GROVE FARM.
20102	2046	LIHUE PLANTATI	Paohia	0.000	Stream diversion, Intake #32 from Paohia stream to Papuaa Reservoir (new entry). Land owned by GROVE FARM.
20102	2046	LIHUE PLANTATI	Paohia	0.000	Stream diversion, Intake #31 from Paohia stream to Koloa ditch (new entry). Diversion located on tributary to Huleia stream. Land owned by GROVE FARM.
20102	2046	LIHUE PLANTATI	Kuia	0.000	Stream diversion, Intake #33 from Kuia stream to Koloa ditch (new entry). Land owned by GROVE FARM.
20102	2046	MALUMALU FARM	Papakolea	0.000	Stream diversion, Wilcox ditch from Papakolea stream. Land owner is GROVE FARM.
20102	2046	MCBRYDE SUGAR	Kuia	0.000	Stream diversion, Kuia Intake from Kuia stream. Declared Q = 6237.00 MG measured at Waita Water Tunnel Gauge (total for Gauge). Land owned by GROVE FARM.
20102	2046	MCBRYDE SUGAR	Kamooloa	0.000	Stream diversion, Kamoola Intake from Kamoola stream. Declared Q = 6237.00 MG measured at Waita Water Tunnel Gauge (total for Gauge). Land owned by GROVE FARM.

Aquifer System	SW Hydrologic Unit	Owner/Operator	Stream Name	Declared Use (mgd)	Notes
20102	2046	MCBRYDE SUGAR	Paohia	0.000	Stream diversion, Bamboo Intake from Paohia stream. Flow measured at F-609 Gauge, but no record in file of measurements taken at F-609 Gauge. Land owned by GROVE FARM.
20102	2046	MCBRYDE SUGAR	Kuia	5.227	Stream diversion, Kuia Intake F-800 to Lihue Ditch. Q is measured at F-608 Rating Flume daily. Land owned by GROVE FARM.
20102	2046	MEDEIROS FARM	Unnamed trib to Huleia	0.001	Stream diversion, pump from Unnamed stream. Declared Q from pump capacity.
20102	2046	NISHI TARO	Unnamed	0.000	Stream diversion, pump from Unnamed stream.
20102	2046	RICE LTD	Unnamed trib to Huleia	0.000	Stream diversion, pump from Huleia stream. Correspondence in file shows correction of stream name from Kipu to Huleia.
20103	2040	LIHUE PLANTATI	Palikea	0.000	Stream diversion, Intake #28 from Palikea stream to Koloa ditch (new entry). Diversion located on tributary to South Fork of Wailua River.
20103	2040	LIHUE PLANTATI	Waiaka/Iliiliula	0.000	Stream diversion, Intake #8 from Waiaka-Iliiliula stream to Hanamaulu ditch (new entry). Tributary to South Fork of Wailua River. Declared Q = 11,357.50 MGD (total measured at Gauge C, USGS # 16060000).
20103	2040	LIHUE PLANTATI	Waiahi	0.000	Stream diversion, Intake #27 from Waiahi stream to Upper Lihue ditch (new entry). Diversion located on tributary to South Fork of Wailua River. Declared Q = 9,641.42 MG (total measured at Gauge D).
20103	2040	LIHUE PLANTATI	Waiahi	0.000	Stream diversion, Intake #17 from Waiahi to Waiahi-Iliiliula ditch (new entry). Diversion located on tributary to South Fork of Wailua River. Declared that Q is measured at Gauges C & D (C total = 11,357.50 MGD and D total = 9,641.42 MG).
20103	2040	LIHUE PLANTATI	Iliiliula	0.000	Stream diversion, Intake #14 from Iliiliula stream to North Wailua ditch (new entry). Diversion located on South tributary to South Fork Wailua River. Declared that Q is measured at Gauges C & D (C total = 11,357.50 MDG and D total = 9,641.42 MG).
20103	2040	LIHUE PLANTATI	Iliiliula	0.000	Stream diversion, Intake #12 from Iliiliula stream to North Wailua ditch (new entry). Diversion located on North tributary to South Fork Wailua River. Declared that Q is measured at Gauges C & D (C total = 11,357.50 MGD and D total = 9,641.42 MG).
20103	2040	LIHUE PLANTATI	Wailua River - N. Branch/ N. Fork	7.564	Stream diversion, Intake #7 from North Branch of North Fork of Wailua River to Stable Storm ditch (new entry). Declared Q measured at Gauge B, USGS # 16062000 (total Q = 2761.00 MG)
20103	2040	LIHUE PLANTATI	Waikoko	0.000	Stream diversion, Intake #11 from Waikoko stream to North Wailua ditch (new entry). Tributary to South Fork of Wailua River. Latest declared Q = 8020.4 CFS in 1984 measured at Gauge E, USGS # 16061200 (1985)
20103	2040	LIHUE PLANTATI	Wailua River - S. Branch/ N. Fork	0.000	Stream diversion, Intake #10 from South Branch of the North Fork of Wailua River to North Wailua ditch (new entry). Tributary to North Fork of Wailua River. Latest declared Q = 8020.4 CFS in 1984 measured at Gauge E, USGS # 16061200 (1985)
20103	2040	LIHUE PLANTATI	Wailua River - N. Fork	0.000	Stream diversion, Intake #35 from North Wailua river to North Wailua ditch (new entry). Declared Q = 5832.09 MGD measured at Gauge F, USGS # 16069000 (Total for Gauge F).
20103	2040	LIHUE PLANTATI	Waiahi	0.000	Stream diversion, Intake #9 from Waiahi stream to Hanamaulu ditch (new entry). Tributary to South Fork of Wailua River. Declared Q = 11,357.50 MGD (total measured at Gauge C, USGS # 16060000).
20103	2040	LIHUE PLANTATI	Waiahi	0.000	Stream diversion, Intake #18 from Waiahi to Waiahi-Iliiliula ditch (new entry). Diversion located on tributary to South Fork of Wailua River. Declared that Q is measured at Gauges C & D (C total = 11,357.50 MGD and D total = 9,641.42 MG).
20103	2040	LIHUE PLANTATI	Iliiliula	0.000	Stream diversion, Intake #13 from Iliiliula stream to North Wailua ditch (new entry). Diversion located on South tributary to South Fork of Wailua River. Declared that Q is measured at Gauges C & D (C total = 11,357.50 MGD and D total = 9,641.42 MG).

Aquifer System	SW Hydrologic Unit	Owner/Operator	Stream Name	Declared Use (mgd)	Notes
20103	2040	LIHUE PLANTATI	Iliiliula	0.000	Stream diversion, Intake #15 from Iliiliula stream to North Wailua ditch (new entry); Diversion located on South tributary to South Fork Wailua River. Declared that Q is measured at Gauges C & D (C total = 11,357.50 MDG and D total = 9,641.42 MG).
20103	2040	LIHUE PLANTATI	Waiahi	0.000	Stream diversion, Intake #19 from Waiahi to Waiahi-Iliiliula ditch (new entry). Diversion located on tributary to South Fork of Wailua River. Declared that Q is measured at Gauges C & D (C total = 11,357.50 MGD and D total = 9,641.42 MG).
20103	2040	LIHUE PLANTATI	Iliiliula	0.000	Stream diversion, Intake #22 from Iliiliula stream to North Intake ditch and Lihue ditch (new entry); Diversion located on tributary to S. Fork Wailua River. Declared that Q is measured at Gauges C & D (C total = 11,357.50 MGD and D total = 9,641.42 MG
20103	2040	LIHUE PLANTATI	Waika	0.000	Stream diversion, Intake #16 from Waiaka stream to Waiahi-Iliiliula ditch (new entry). Diversion located on tributary to South Fork of Wailua River. Declared that Q is measured at Gauges C & D (C total = 11,357.50 MGD and D total = 9,641.42 MG).
20103	2040	LIHUE PLANTATI	Waiahi	0.000	Stream diversion, Intake #20 from Waiahi stream to South Intake ditch (new entry). Diversion located on tributary to South Fork of Wailua River. Declared that Q is measured at Gauges C & D (C total = 11,357.50 MGD and D total = 9,641.42 MG).
20103	2040	LIHUE PLANTATI	Waiaka	0.000	Stream diversion, Intake #23 from Waiaka stream to North Intake ditch and Lihue ditch (new entry). Diversion located on tributary to South Fork Wailua River. Declared that Q is measured at Gauges C & D (C total = 11,357.50 MGD and D total = 9,641.42 MG
20103	2040	LIHUE PLANTATI	Waiahi	0.000	Stream diversion, Intake #21 from Waiahi stream to South Intake ditch (new entry). Diversion located on tributary to South Fork of Wailua River. Declared that Q is measured at Gauges C & D (C total = 11,357.50 MGD and D total = 9,641.42 MG).
20103	2040	LIHUE PLANTATI	Waiaka	0.000	Stream diversion, Intake #24 from Waiaka stream to North Intake ditch and Lihue ditch (new entry). Diversion located on tributary to South Fork of Wailua River. Declared that Q is measured at Gauges C & D (C total = 11,357.50 MGD and D total = 9,641.42
20103	2040	LIHUE PLANTATI	Unnamed	0.000	Stream diversion, Intake #25 from Unnamed Stream to North Intake ditch and Lihue ditch (new entry). Diversion located on tributary to South Fork of Wailua River. Declared that Q is measured at Gauges C & D (C total = 11,357.50 MGD and D total = 9,641.4
20103	2040	LIHUE PLANTATI	Waiahi	0.000	Stream diversion, Intake #26 from Waiahi stream to North Intake ditch and Lihue ditch (new entry). Diversion located on tributary to South Fork Wailua River. Declared that Q is measured at Gauges C & D (C total = 11,357.50 MGD and D total = 9,641.42 MG
20103	2040	NAGAO RC	Wailua River Tributary	0.000	Stream diversion, 2 pipes from Unnamed stream. The two pipes are probably located at the same spot. See also new entry for pump from Wailua River.
20103	2040	NAGAO RC	Wailua River	0.000	Stream diversion, pump from Wailua River (new entry).
20103	2040	SMITH TROP PAR	Wailua River	0.000	Stream diversion, pump and Ditch #1 from Wailua stream. See new entries for ditches #2, #3, and #4.
20103	2040	SMITH TROP PAR	Wailua River	0.000	Stream diversion, Ditch #2 from Wailua River (new entry).
20103	2040	SMITH TROP PAR	Wailua River	0.000	Stream diversion, Ditch #3 from Wailua River (new entry).
20103	2040	SMITH TROP PAR	Wailua River	0.000	Stream diversion, Ditch #4 from Wailua River (new entry).
20103	2040	STATE PARK KAU	Wailua River	0.000	Stream diversion, pump from Wailua River.
20104	2032	BEAN R	Moloaa	0.001	Stream diversion, pump from Moloaa stream. Delcared Q = estimated by tank capacity (no field verification, but has old div # assigned).
20104	2032	BITTNER E	Unnamed water tunnel	0.000	Stream diversion, from water tunnel runoff flow near Moloaa Stream. Diversion is probably from a runoff ditch from tunnel (tunnel not registered in well database) Correct TMK parcel number is 31. Declared daily use of 5,000 to 15,000 gallons.

Aquifer System	SW Hydrologic Unit	Owner/Operator	Stream Name	Declared Use (mgd)	Notes
20104	2032	DANIELS M&D	Moloaa	0.000	Stream diversion, pipe from Moloaa stream. Stream does not touch the parcel boundary. Lat/long coordinates taken at point on stream nearest to the parcel.
20104	2032	DAVIS W&R	Unnamed	0.000	Stream diverson, pump from Maliu stream and rights claim. BOISER DP is the only end user of this diversion.
20104	2032	MOTIL G	Moloaa	0.000	Stream diversion, syphon from Moloaa and rights claim. May intend additional diversions.
20104	2032	PEREIRA JL	Moloaa	0.000	Stream diversion, pump from Moloaa stream.
20104	2032	PEREIRA JL	Moloaa	0.000	Stream diversion, pump from Moloaa stream.
20104	2033	AMFAC PROP DEV	Papaa	0.000	Stream diversion, pump from Papaa stream.
20104	2033	GERBODE TRUST	Papaa	0.003	Stream diversion, pump above main pool and rights claim on Papaa Stream (new entry). Declarant also has another diversion on same property.
20104	2033	GERBODE TRUST	Papaa	0.010	Stream diversion, pump #1above falls from Papaa Stream. See also new entry for second pump below waterfall.
20104	2033	THRONAS H	Papaa	0.000	Stream diversion, pump from Papaa stream.
20104	2033	WILLIAMS T	Papaa	0.000	Stream diversion, pump from Papaa Stream and rights claim.
20104	2035	BITTNER E	Unnamed spring	0.000	Stream diversion, Unnamed spring. Delcared Q for August = 20,000 gal/day; no 1987 Q provided; (no field verification, but has old div # assigned).
20104	2035	BITTNER E	Anahola Tunnel	0.000	Stream diversion, from Anahola Tunnel runoff flow. Diversion is probably from a runoff ditch from tunnel (well no. 0819-01). Delcared Q = maximum estimated use of 5,000 gal/day. File cites source as the Moloaa #3 tunnel instead, but this is most likely a
20104	2035	BODINE DL	Unnamed pond	0.001	Stream diversion, pump from unnamed pond. Declared Q = 1,000 gpd estimated. Also has instream use of pond for waterfowl and fish.
20104	2035	LIHUE PLANTATI	Anahola	0.000	Stream diversion, Intake #44 from Lower Anahola stream to Lower Anahola ditch (new entry). Q last mesured in 1986 at lower Anahola Gauge (Gauge K) near Kealia station. 1987 measurement only in November = 0.06 MGD.
20104	2035	LIHUE PLANTATI	Anahola	0.000	Stream diversion, Intake #43 from Upper Anahola stream to Upper Anahola ditch (new entry); Declared Q = 1562.87 MGD measured at Anahola Gauge located above Kaneha Res (Gauge J), USGS #16088000 (total for Gauge J).
20104	2035	PIA JK	Anahola	0.000	Stream diversion, ditch from Anahola stream. Declarant's other entry for "Spring" in the database should be edited to reflect Category IV: incomplete declaration.
20104	2037	BROWN HD	Unnamed tributary to Kapaa	0.000	Str diversion, pump from Unnamed stream. Occasional use of portable pump throughout the property.
20104	2037	KAPAHI SLA HSE	Tributary to Kapaa	0.000	Stream diversion, ditch from Kapahi stream and rights claim.
20104	2037	KAPAHI SLA HSE	Tributary to Kapaa	0.000	Stream diversion, ditch from Moelepe stream and rights claim. Declared Q = 2.2 cubic feet per second, estimated by floating object method.
20104	2037	LIHUE PLANTATI	Kapaa	2.359	Stream diversion, Intake #36 from Kapaa stream to Kapahi ditch (new entry). Declared Q = 861.32 MG measured at Gauge G, USGS # 16079000 (total for Gauge G).
20104	2037	LIHUE PLANTATI	Mimino	0.000	Stream diversion, Intake #39 from Mimino stream to Unnamed reservoir (new entry). Q not measured.
20104	2037	LIHUE PLANTATI	Makaleha	0.000	Stream diversion, Intake #38 from Makaleha stream to Makaleha ditch (new entry). Declared Q = 1619.57 MGD measured at Makaleha Gauge (Gauge H), USGS #16077000 (total for Gauge H).
20104	2037	LIHUE PLANTATI	Kealia	0.326	Stream diversion, Intake #40 from Kealia stream to Kealia ditch (new entry). Declared Q = 119.00 MG measured at Kealia Ditch Gauge (total for Gauge). Method of measurement listed as "recorder."

Aquifer System	SW Hydrologic Unit	Owner/Operator	Stream Name	Declared Use (mgd)	Notes
20104	2037	LIHUE PLANTATI	Kealia	0.000	Stream diversion, Intake #41 from Kealia stream to Kawano ditch (new entry). Q not measured.
20104	2037	LIHUE PLANTATI	Unnamed	0.000	Stream diversion, Intake #42 from Unnamed to Kaneha Reservoir (new entry). Q not measured. Flow is intermittent.
20104	2037	LIHUE PLANTATI	Kapaa	0.000	Stream diversion, Intake #37 from Kapaa stream to Makaleha ditch (new entry). Declared Q = 1619.57 MGD measred at Makaleha Gauge (Gauge H), USGS #16077000 (total for Gauge H).
20104	2037	UBONGAN FARM	Unnamed trib to Kapaa	0.000	Stream diversion, portable pump from Moalepe stream. Declarant moves the pump between two locations. See new entry for second pumping location.
20104	2037	UBONGAN FARM	Kapaa Tributary	0.000	Stream diversion, portable pump from Moalepe stream (new entry). Declarant moves pump between two locations - see other entry for UBONGAN FARM.
20104	2037	VALLEY HOUSE	Kealia	0.108	Stream diversion, pipe from Kealia stream. Declared Q is estimated from pump capacity.
20104	2038	GOO R	Moikeha Canal	0.053	Stream diversion, pump from Moikeha canal tributary. Diversion is not located on Kapaa Stream (no field verification, but has old div # assigned).
20104	2039	KAHN E	Konohiki	0.100	Stream diversion, pump from Unnamed stream.
20104	2039	ORNELLAS JL	Unnamed	0.000	Stream diversion, pump from Kainahola stream and rights claim. Intermittent use of water.
20105	2028	DYRE BA	Pohakuhono	0.000	Stream diversion, intake #1 from Pohakuhono and right claim. KILAUEA AGRON is the end user of this diversion. Old database included two intakes in one entry. New entry created for intake #2. DYRE BA is owner of Namahana Farms.
20105	2028	DYRE BA	Pohakuhono	0.000	Stream diversion, intake from Pohakuhono stream to Kalihiwai ditch. New entry. See also Namahana Farms (DYRE BA is owner of farm). An enduser of this diversion is KILAUEA AGRON.
20105	2028	KILAUEA AGRON	Pohakuhonu	0.000	Stream diversion, stone dam - Kilauea Mill and rights claim. C. Brewer is parent company of KILAUEA AGRON.
20105	2028	KILAUEA AGRON	Puu Ka Ele	0.000	Stream diversion, Puu Ka Ele ditch from Puu Ka Ele stream. LUCAS EST is end user. C. Brewer is parent company of KILAUEA AGRON.
20105	2028	KILAUEA IRRIGA	Puu Ka Ele	0.000	Stream diversion, Ka Loko ditch from Puu Ka Ele stream.
20105	2028	KILAUEA MANAGE	Wailapa	0.000	Stream diversion, dam on Wailapa stream - Morita residence. LUCAS EST is end user.
20105	2028	NAMAHANA FARMS	Pahakuhonu	0.000	Stream diversion, from Pohakuhono stream. DYRE BA is owner of Namahana Farms. This entry has old diversion code assigned, but no field verification.
20105	2028	OHANA ORGANICS	Wailapa	0.000	Stream diversion, from Wailapa stream. Water used for furrow irrigation. File does not specify manner of taking.
20105	2028	WELLS T	Wailapa	0.000	Stream diversion, pipe from Wailapa stream.
20105	2028		Unnamed	0.000	Stream diversion, dam on Pu Ka Ele stream. (new entry). SCAP-KA-292 after the fact application for impoundment structure for cattle to drink. File unclear as to approval/denial status.
20105	2030	ANDRADE C	Unnamed	0.086	Stream diversion, auwai fr Kawailoli (no field verification, but has old div # assigned).
20105	2030	ANDRADE C	Unnamed	0.072	Stream diversion, auwai from Waikalua (no field verification, but has old div # assigned).
20105	2030	WAIAKALUA NURS	Unnamed	0.000	Stream diversion, Waiakalua stream. Water use only during summer months.
20105	2030	WARTHER FX	Unnamed & Unmapped	0.000	Stream diversion, pipe from Oioi (Huddy) stream for irrigation (new entry). Unclear as to whether declarant also has a pump at the diversion site.

Aquifer System	SW Hydrologic Unit	Owner/Operator	Stream Name	Declared Use (mgd)	Notes
20105	2030		Unnamed	0.000	Stream diversion, upper Waiakalua dam. (new entry). SCAP-KA-292 after the fact application for impoundment structure for cattle to drink. File unclear as to approval/denial status.
20105	2030		Unnamed	0.000	Stream diversion, lower Waiakalua dam (new entry). SCAP-KA-292 after the fact application. File unclear as to approval/denial status.
20105	2031	KIRKWOOD J	Waipake	0.164	Stream diversion, pumps from Waipake stream. Declared Q = estimate from storage tank volume
20201	2021	BRODIE L&AB	Anini	0.000	Stream diversion, pump from Anini stream. Also has instream use (cattle) on same parcel.
20201	2021	BRODIE L&AB	Anini	0.000	Stream diversion, pump from Aninilili stream.
20201	2021	HASHIMOTO JK	Anini	0.000	Stream diversion, ditch from Anini stream and rights claim. Stream also known as Wanini stream. Land owned by Princeville Corp.
20201	2021	PRINCEVILLE CO	Anini	0.092	Stream diversion, sump from Anini Stream. Declared Q is estimated from pump capacity.
20201	2025	GOO LES	Unnamed	0.000	Stream diversion, pump from Unnamed stream.
20201	2025	GOO LES	Unnamed	0.000	Stream diversion, dam & pipe from Unnamed stream.
20201	2025	NAMAHANA FARMS	Kalihiwai	0.000	Stream diversion, Upland Intake-Kakimoto. DYRE BA is owner of Namahana Farms. This entry has old div code assigned, but no field verification.
20201	2025	NAMAHANA FARMS	Kalihiwai	0.000	Stream diversion, Vly Intake-Kakimoto S. DYRE BA is owner of Namahana Farms. This entry has old div code assigned, but no field verification.
20201	2025	PACIFIC HYDRO	Unnamed trib to Kalihiwai	0.000	Stream diversion, Rice Ditch from Pake stream. This is the only declaration for Rice Ditch.
20201	2025		Pake	0.000	Stream diversion, Intake from Pake stream (new entry). SCAP-KA-060 Construction of diversion and culverts for aquaculture. Q not to exceed 0.67 CFS.
20201	2026	BAILEY C	Puukumu	0.000	Stream diversion, stone and pipe from Puukumu stream (no field verification, but has old div # assigned).
20201	2026	SCHAEFER B	Unnamed trib to Puukumu	0.001	Stream diversion, Pipe #1 from Puukumu stream tributary. Declared Q includes both Pipes #1 & #2. Q estimated from capacity of storage tank.
20201	2026	SCHAEFER B	Puukumu Tributary	0.001	Stream diversion, Pipe #2 from Puukumu stream tributary (new entry). Declared Q inlcudes both pipes #1 and #2. Q estimated from capacity of storage tank.
20202	2017	DAVIS WG	Waipa	0.000	Stream diversion, bucket from Waipa stream and rights claim. Also has an instream use on the same parcel that is not reflected in the data base.
20202	2017	STRIEGEL R&K	Waipa	0.000	Stream diversion, ditch from Waipa Stream.
20202	2018	REYES J	Waioli	0.000	Stream diversion, ditch from Waioli Stream.
20202	2019	HANALEI LAND	Hanalei River	0.002	Stream diversion, ditch from Hanalei river to makai fish pond (no field verification, but has old div # assigned).
20202	2019	HANALEI LAND	Unnamed	0.002	Str div, ditch from Unnamed (Waiaula) stream to mauka fish pond (no field verification, but has old div # assigned).
20202	2019	LIHUE PLANTATI	Hanalei	0.000	Stream diversion, Intake #4 from Hanalei river to Hanalei Tunnel (new entry). Tributary to Hanalei River. Latest declared Q = 5910.17 MG for 1984 at Hanalei Tunnel Outlet Gauge (Gauge A), USGS # 16100000 (1984 total for Gauge A). Last measured during the
20202	2019	LIHUE PLANTATI	Kaapoko	0.000	Stream diversion, Intake #1 from Kaapoko stream to Hanalei Tunnel (new entry). Tributary to Hanalei River. Latest declared Q = 5910.17 MG for 1984 at Hanalei Tunnel Outlet Gauge (Gauge A), USGS # 16100000 (1984 total for Gauge A). Last measured during t

Aquifer System	SW Hydrologic Unit	Owner/Operator	Stream Name	Declared Use (mgd)	Notes
20202	2019	LIHUE PLANTATI	Hanalei	0.000	Stream diversion, Intake #5 from Hanalei River to Hanalei Tunnel (new entry). Tributary to Hanalei River. Latest declared Q = 5910.17 MG for 1984 at Hanalei Tunnel Outlet Gauge (Gauge A), USGS # 16100000 (1984 total for Gauge A). Last measured during th
20202	2019	LIHUE PLANTATI	Kaapoko	0.000	Stream diversion, Intake #2 from Kaapoko stream to Hanalei Tunnel (new entry). Tributary to Hanalei River. Latest declared Q = 5910.17 MG for 1984 at Hanalei Tunnel Outlet Gauge (Gauge A), USGS # 16100000 (1984 total for Gauge A). Last measured during t
20202	2019	LIHUE PLANTATI	Hanalei	0.000	Stream diversion, Intake #6 from Hanalei River to Hanalei Tunnel (new entry). Tributary to Hanalei River. Latest declared Q = 5910.17 MG for 1984 at Hanalei Tunnel Outlet Gauge (Gauge A), USGS # 16100000 (1984 total for Gauge A). Last measured during th
20202	2019	LIHUE PLANTATI	Kaapoko	0.000	Stream diversion, Intake #3 from Kaapoko stream to Hanalei Tunnel (new entry). Tributary to Hanalei River. Latest declared Q = 5910.17 MG for 1984 at Hanalei Tunnel Outlet Gauge (Gauge A), USGS # 16100000 (1984 total for Gauge A). Last measured during t
20202	2019	SPENCER CHK	Hanalei River	0.000	Stream diversion, from Hanalei River and rights claim. Land is leased from US Dept. of Fish & Wildlife.
20202	2019	U S FISH KAUAI	Hanalei River	0.023	Stream diversion, 2 gates from Hanalei River.
20203	2012	MOORE MM	Limahuli	0.000	Stream diversion, pipe from Limahuli Stream.
20203	2012	NATL TROP BOT	Limahuli	0.144	Stream diversion, pipe from Unnamed stream and rights claim.
20203	2012	NATL TROP BOT	Limahuli	0.001	Stream diversion, pipe from Limahuli stream and rights claim. Use of this diversion was discontinued after approval of SCAP-KA-155 for a new diversion #2-1234-002D.
20203	2012	NATL TROP BOT	Limahuli	0.288	Stream diversion, two pipes from Limahuli stream and rights claim.
20203	2012	WANN MK	Limahuli	0.000	Stream diversion, pipe from Limahuli stream.
20203	2012	WICHMAN ETAL	Unnamed spring	0.000	Spring diversion, 2 pipes from Unnamed (Kawaialoha) spring and rights claim. Both pipes are located at the same place.
20203	2012		Limahuli	0.216	Stream diversion, pipe from Limahuli stream (new entry). SCAP-KA-155 Limahuli Stream Diversion and Amendment of IIFS, Limahuli Stream. Q not more than 150 gpm.
20203	2013	MAHUIKI S	Manoa	0.000	Stream diversion, pipe from Manoa stream and rights claim. Location of use is TMK 5-9-005:057.
20203	2014	CHANDLER F&E	Wainiha	0.000	Unsure if diversion is in use. Rights claim.
20203	2014	CHANDLER F&E	Wainiha	0.000	Unsure if diversion is in use. Rights claim.
20203	2014	HOUMEA J	Wainiha River	0.000	Stream diversion, ditch from Wainiha (no field verification, but has old div # assigned).
20203	2014	LYNN JT	Wainiha River	0.000	Stream diversion, 2 pipes at one location on Wainiha stream. Two intake pipes are co-located at the same place.
20203	2014	MCBRYDE SUGAR	Wainiha River	0.000	Stream diversion, Wainiha Intake weir from Wainiha River. Declared Q is estimate from 2,629.8 x 106 cubic ft (total for all diversions measured at Wainiha Intake Gauge).
20203	2014	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Intake #17 from Unnamed Stream (new entry). Declared Q is estimate from 2,629.8 x 106 cubic ft (total for all diversions measured at Wainiha Intake Gauge).
20203	2014	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Intake #18 from Unnamed stream (new entry). Declared Q is estimate from 2,629.8 x 106 cubic ft (total for all diversions measured at Wainiha Intake Gauge).
20203	2014	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, 1st Side Stream Intake ditch from Unnamed. Declared Q is estimate from 2,629.8 x 106 cubic ft (total for all diversions measured at Wainiha Intake Gauge).
20203	2014	MCBRYDE SUGAR	Maunahina Ditch	0.000	Stream diversion, Intake #7 from Maunahina stream. Declared Q is estimate from 2,629.8 x 106 cubic ft (total for all diversions measured at Wainiha Intake Gauge).

Aquifer System	SW Hydrologic Unit	Owner/Operator	Stream Name	Declared Use (mgd)	Notes
20203	2014	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Intake #18A from Unnamed stream (new entry). Declared Q is estimate from 2,629.8 x 106 cubic ft (total for all diversions measured at Wainiha Intake Gauge).
20203	2014	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, No. 3 Intake Pipe from Unnamed stream. Declared Q is estimate from 2,629.8 x 106 cubic ft (total for all diversions measured at Wainiha Intake Gauge).
20203	2014	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Intake #8 from Unnamed stream (new entry). Declared Q is estimate from 2,629.8 x 106 cubic ft (total for all diversions measured at Wainiha Intake Gauge).
20203	2014	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Intake #19 from Unnamed stream (new entry). Declared Q is estimate from 2,629.8 x 106 cubic ft (total for all diversions measured at Wainiha Intake Gauge).
20203	2014	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, ditch (tunn 1 to 1A) from Unnamed stream. Declared Q is estimate from 2,629.8 x 106 cubic ft (total for all diversions measured at Wainiha Intake Gauge).
20203	2014	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Intake #8A from Unnamed stream (new entry). Declared Q is estimate from 2,629.8 x 106 cubic ft (total for all diversions measured at Wainiha Intake Gauge).
20203	2014	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Intake #20 from Unnamed stream (new entry). Declared Q is estimate from 2,629.8 x 106 cubic ft (total for all diversions measured at Wainiha Intake Gauge).
20203	2014	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, open ditch intake. Tunnel 1A from Unnamed stream. Declared Q is estimate from 2,629.8 x 106 cubic ft (total for all diversions measured at Wainiha Intake Gauge).
20203	2014	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Intake #9 fr Unnamed stream (new entry). Declared Q is estimate from 2,629.8 x 106 cubic ft (total for all diversions measured at Wainiha Intake Gauge).
20203	2014	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Intake #21 from Unnamed stream (new entry). Declared Q is estimate from 2,629.8 x 106 cubic ft (total for all diversions measured at Wainiha Intake Gauge).
20203	2014	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Intake #1 from Unnamed stream (new entry). Declared Q is estimate from 2,629.8 x 106 cubic ft (total for all diversions measured at Wainiha Intake Gauge).
20203	2014	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Intake #10 from Unnamed stream (new entry). Declared Q is estimate from 2,629.8 x 106 cubic ft (total for all diversions measured at Wainiha Intake Gauge).
20203	2014	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Intake #22 from Unnamed stream (new entry). Declared Q is estimate from 2,629.8 x 106 cubic ft (total for all diversions measured at Wainiha Intake Gauge).
20203	2014	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Intake #4 from Unnamed stream (new entry). Declared Q is estimate from 2,629.8 x 106 cubic ft (total for all diversions measured at Wainiha Intake Gauge).
20203	2014	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Intake #12 from Unnamed stream (new entry). Declared Q is estimate from 2,629.8 x 106 cubic ft (total for all diversions measured at Wainiha Intake Gauge).
20203	2014	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Intake #23 from Unnamed stream (new entry). Declared Q is estimate from 2,629.8 x 106 cubic ft (total for all diversions measured at Wainiha Intake Gauge).
20203	2014	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Intake #5 from Unnamed stream (new entry). Declared Q is estimate from 2,629.8 x 106 cubic ft (total for all diversions measured at Wainiha Intake Gauge).
20203	2014	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Intake #24 from Unnamed stream (new entry). Declared Q is estimate from 2,629.8 x 106 cubic ft (total for all diversions measured at Wainiha Intake Gauge).
20203	2014	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Intake #26 spillway from Unnamed stream (new entry). Declared Q is estimate from 2,629.8 x 106 cubic ft (total for all diversions measured at Wainiha Intake Gauge).

Aquifer System	SW Hydrologic Unit	Owner/Operator	Stream Name	Declared Use (mgd)	Notes
20203	2014	MCBRYDE SUGAR	Unnamed	0.000	Stream diversion, Intake #6 from Unnamed stream (new entry). Declared Q is estimate from 2,629.8 x 106 cubic ft (total for all diversions measured at Wainiha Intake Gauge).
20204	2071	KEKAHA SUGAR	Kokee Ditch	19.011	Stream diversion, Kokee ditch gaging station. Declared Q = 6939.000 mg (total for all diversions measured at Kokee Gauge).
20204	2073	STATE PARK KAU	Milolii	0.000	Stream diversion, pipe from Milolii stream.
20301	2061	KEKAHA SUGAR	Kekaha Ditch	32.849	Stream diversion, Kekaha ditch gaging station. Declared Q = 11,990.000 (total for all diversions at Kekaha Gauge - measured daily).
20301	2063	KEKAHA SUGAR	Kinekine Ditch	0.000	Stream diversion, Kapue valley dam to Kokee ditch. Declared Q = 6939.000 mg (total for all diversions measured at Kokee Gauge).
20301	2066	STATE PARK KAU	Kokee Ditch	0.000	Stream diversion, (new entry). May be a duplicate of STATE PARK KAU entry for TMK 1-4-001:007
20302	2060	PIONEER HI INT	Waimea River	0.000	Stream diversion, pump from Waimea stream. Estimated water use declared for 1987 is 10 million acre-inches.
20302	2060	DUNSENBERRY FD	Waimea River	0.000	Stream diversion, occasional use of pump from Waimea stream and rights claim.
20302	2060	EGO K	Maluapopoki	0.000	Stream diversion, pipe from Maluapopoki stream. Location of use is TMK 1-4-004:035.
20302	2060	EGO K	Kokee	0.000	Stream diversion, pump from Kokee stream. Location of use is TMK 1-4-004:035
20302	2060	GAY & ROBINSON	Loli	0.000	Stream diverson, hand carry from Loli stream (no field verification, but has old div # assigned).
20302	2060	GAY & ROBINSON	Waimea River	0.164	Stream diversion, Peekauai ditch from Waimea river. There are seven individual end users downstream (no field verification, but has old div # assigned).
20302	2060	HEE RJ	Halemanu	0.000	Stream diversion, dam in Halemanu stream. Located on State Forest Reserve land.
20302	2060	HOOKANO I	Unnamed	0.000	Spring diversion, pump from spring. Diversion is on an intermittant stream.
20302	2060	KAOHI AG	Waimea River	0.000	Stream diversion, pipe from Waimea river and rights claim.
20302	2060	KEKAHA SUGAR	Mohihi Stream	0.000	Stream diversion, Mohihi stream intake to Kokee ditch. Declared Q = 6939.000 mg (total for all diversions measured at Kokee Gauge).
20302	2060	KEKAHA SUGAR	Mohihi Ditch	0.000	Stream diversion, Mohihi #3 from Unnamed stream to Kokee ditch. Declared Q = 6939.000 mg (total for all diversions measured at Kokee Gauge).
20302	2060	KEKAHA SUGAR	Mohihi Ditch	0.000	Stream diversion, Nawaimaka stream to Kokee ditch. Declared Q = 6939.000 mg (total for all diversions measured at Kokee Gauge).
20302	2060	KEKAHA SUGAR	Mohihi Ditch	0.000	Stream diversion, Mohihi #2 from Unnamed stream to Kokee ditch. Declared Q = 6939.000 mg (total for all diversions measured at Kokee Gauge).
20302	2060	KEKAHA SUGAR	Mohihi Ditch	0.000	Stream diversion, Waiakoali stream dam to Kokee ditch. Declared Q = 6939.000 mg (total for all diversions measured at Kokee Gauge).
20302	2060	KEKAHA SUGAR	Mohihi Ditch	0.000	Stream diversion, Kumuwela #4 from Unnamed stream to Kokee ditch (new entry). Declared Q = 6939.000 mg (total for all diversions measured at Kokee Gauge).
20302	2060	KEKAHA SUGAR	Mohihi Ditch	0.000	Stream diversion, Kumuwela #1 from Unnamed stream to Kokee ditch (new entry). Declared Q = 6939.000 mg (total for all diversions measured at Kokee Gauge).
20302	2060	KEKAHA SUGAR	Waimea River	0.000	Stream diversion, Kukui tributary-Waimea to Kekaha ditch. Declared Q = 11,990.000 (total for all diversions at Kekaha Gauge - measured daily).
20302	2060	KEKAHA SUGAR	Waimea River	0.000	Stream diversion, Koaie stream dam to Kekaha ditch. Declared Q = 11,990.000 (total for all diversions at Kekaha Gauge - measured daily).
20302	2060	KEKAHA SUGAR	Mohihi Ditch	0.000	Stream diversion, Halemanu stream to Kokee ditch. Declared Q = 6939.000 mg (total for all diversions measured at Kokee Gauge).
20302	2060	KEKAHA SUGAR	Mohihi Ditch	0.000	Stream diversion, Kawaikoi stream to Kokee ditch. Declared Q = 6939.000 mg (total for all diversions measured at Kokee Gauge).

Aquifer System	SW Hydrologic Unit	Owner/Operator	Stream Name	Declared Use (mgd)	Notes
20302	2060	KEKAHA SUGAR	Mohihi Ditch	0.000	Stream diversion, Kumuwela #5 from Unnamed stream to Kokee ditch (new entry). Declared Q = 6939.000 mg (total for all diversions measured at Kokee Gauge).
20302	2060	KEKAHA SUGAR	Mohihi Ditch	0.000	Stream diversion, Kokee stream to Kokee ditch. Declared Q = 6939.000 mg (total for all diversions measured at Kokee Gauge).
20302	2060	KEKAHA SUGAR	Mohihi Ditch	0.000	Stream diversion, Kumuwela #2 from Unnamed stream to Kokee ditch (new entry). Declared Q = 6939.000 mg (total for all diversions measured at Kokee Gauge).
20302	2060	KEKAHA SUGAR	Waimea River	0.000	Stream diversion, Waihulu dam on Waimea river to Kekaha ditch (called Waihulu dam in file). Declared Q = 11,990.000 (total for all diversions at Kekaha Gauge - measured daily).
20302	2060	KEKAHA SUGAR	Mohihi Ditch	0.000	Stream diversion, Kauikinana stream to Kokee ditch. Declared Q = 6939.000 mg (total for all diversions measured at Kokee Gauge).
20302	2060	KEKAHA SUGAR	Mohihi Ditch	0.000	Stream diversion, Kumuwela #3 from Unnamed stream to Kokee ditch (new entry). Declared Q = 6939.000 mg (total for all diversions measured at Kokee Gauge).
20302	2060	KIKIAOLA LAND	Halemanu	0.000	Stream diversion, pipe from Halemanu stream and rights claim.
20302	2060	MILLER R&D	Elekeniiki	0.000	Stream diversion, Miller Intake from Elekeniike.
20302	2060	NORTHRUP KING	Waimea River	0.016	Stream diversion, pump from Waimea River.
20302	2060	NORTHRUP KING	Waimea River	0.099	Stream diversion, pump from Waimea River.
20302	2060	STATE PARK KAU	Elekeninui	0.000	Stream diversion, pump from Elekeninui Stream.
20302	2060	WARTHER FX	Elekeninui	0.000	Stream diversion, pipe from Elekeninui stream. See also new entry for WARTHER FX; found another declaration form in file.
20302	2060	WILCOX C&G	Elekeninui	0.000	Stream diversion, pump from Unnamed stream.
20302	2060	WILLIAMSON HD	Unnamed and unmapped	0.000	Stream diversion, pipe from Unnamed stream. Land is leased from the State.
20303	2054	GAY & ROBINSON	Waikai	0.500	Stream diversion, Waikai stream-Olokele (no field verification, but has old div # assigned).
20303	2054	GAY & ROBINSON	Hanonui Valley	0.000	Stream diversion, Hanonui valley-Olokele. Use when stream is flowing (no field verification, but has old div # assigned).
20303	2057	GAY & ROBINSON	Maku	0.000	Stream diversion, Maku stream-Olokele. Use when stream is flowing (no field verification, but has old div # assigned).
20303	2058	GAY & ROBINSON	Kunalele	0.000	Stream diversion, Kunalele str-Olokele. Use when stream is flowing (no field verification, but has old div # assigned).
20303	2058	GAY & ROBINSON	Hikilei Valley	0.000	Stream diversion, Hikilei stream-Olokele. Use when stream is flowing (no field verification, but has old div # assigned).
20303	2058	ROBINSON BB	Unnamed	0.216	Stream diversion, pipe from Kunalele stream.
20303	2059	GAY & ROBINSON	Mahaikona	0.000	Stream diversion, Mahaikona stream-Oloke. Use when stream is flowing (no field verification, but has old div # assigned).
20303	2060	GAY & ROBINSON	Unnamed	3.000	Stream diversion, Kalopopo Stream-Olokele. Delcared Q=Nonopahu Guage (included in Olokele System Q figures); (no field verification, but has old div # assigned).
20303	2060	GAY & ROBINSON	Unnamed	1.973	Stream diversion, Kaluawai stream-Olokele. Declared Q=Nonopahu guage (included in Olokele System Q figures); (no field verification, but has old div # assigned).
20303	2060	GAY & ROBINSON	Waianuenue	12.000	Stream diversion, Waianuenue stream-Olokele. Declared Q=Nonopahu guage (included in Olokele System Q figures); (no field verification, but has old div # assigned).
20303	2060	GAY & ROBINSON	Makaweli River	0.000	Stream diversion, Makaweli ditch #2 from Makaweli river. One end user of this diversion (no field verification, but has old div # assigned).
20303	2060	GAY & ROBINSON	Kahana	0.018	Stream diversion, pipe from Kahana stream. Diversion to Pilipiliahaumaka (no field verification, but has old div # assigned).

Aquifer System	SW Hydrologic Unit	Owner/Operator	Stream Name	Declared Use (mgd)	Notes
20303	2060	GAY & ROBINSON	Unnamed	0.164	Stream diversion, Kalopopo stream-Olokele. Declared Q=Nonopahu guage (included in Olokele System Q figures); (no field verification, but has old div # assigned).
20303	2060	GAY & ROBINSON	Olokele	0.035	Stream diversion, dam at Olokele river-Olokele. Declared Q=Nonopahu guage (included in Olokele System Q figures); (no field verification, but has old div # assigned).
20303	2060	GAY & ROBINSON	Kahana	0.026	Stream diversion, Kahana stream-Halemoki. (no field verification, but has old div # assigned).
20303	2060	GAY & ROBINSON	Makaweli River	0.164	Stream diversion, Makaweli ditch #1 from Makaweli river. There are nine individual end users of this diversion (no field verification, but has old div # assigned).
20303	2060	GAY & ROBINSON	Unnamed spring	0.000	Spring diversion, from Unnamed spring to Kanekula. New entry, diverted flow is only used by one tenant.
20303	2060	GAY & ROBINSON	Makaweli River	0.016	Stream diversion, pump from Makaweli river (no field verification, but has old div # assigned).
20303	2060	NORTHRUP KING	Waimea River	0.019	Stream diversion, pump from Waimea River.
20304	2054	GAY & ROBINSON	Unnamed	0.028	Stream diversion, Paliemo to Koula ditch. Declared Q= Hanonui gauge (no field verification, but has old div # assigned).
20304	2054	GAY & ROBINSON	Manawaiopuna	0.028	Stream diversion, Manawaiopuna to Koula. Declared Q= Hanonui gauge (no field verification, but has old div # assigned).
20304	2054	GAY & ROBINSON	Unnamed	2.000	Stream diversion, Lana stream to Koula ditch (no field verification, but has old div # assigned).
20304	2054	GAY & ROBINSON	Hanapepe River	3.000	Stream diversion, Hanapepe ditch from Hanapepe river. There are eight end users of this diversion (no field verification, but has old div # assigned).
20304	2054	GAY & ROBINSON	Kala	3.000	Stream diversion, Kala stream to Koula (no field verification, but has old div # assigned).
20304	2054	MCBRYDE SUGAR	Hanapepe River	0.000	Stream diversion, Pump One Intake from Hanapepe stream. This diversion has 17 small end users.
20304	2054	MCBRYDE SUGAR	Hanapepe River	11.265	Stream diversion, Pump #3 Intake from Hanapepe River.

APPENDIX C

Public Meeting Summaries

APPENDIX C1

First Round of Public Meeting Summaries (2015)

Kauai Water Use & Development Plan Update
First Series of Public Meetings
October 20, 2015
Kilauea Neighborhood Center
5PM to 6:15 PM

ATTENDANCE:
KDOW: Kirk Saiki (Manager and Chief Engineer), Edward Doi (Head of Water Resources & Planning Division, WR&P), Regina Flores (WR&P), Kim Tamaoka (Public Relations, PR), Jonell Kaohelaulii (PR)
Fukunaga & Associates, Inc. (Consultant): Lynn Malinger, Amanda Tanaka, Amanda Kimi
Resolutions Hawaii (Facilitator): Dee Dee Letts

PURPOSE:
The purpose of this series of five (5) public meetings is to present the information that will be covered in the update, the sources for this information, how it will be presented, as well as any information that is available regarding the status of the resource on the Island. There will be a second series of public information meetings in about a year that will present all of the data gathered.

The intent of this series of meetings is to create an understanding of the purpose and intent of the Kauai Water Use & Development Plan Update and the context within which it is being developed. This series is to give the community an opportunity to express any concerns or voice any questions they may have about the process to be used to create the update. This will allow the consultant and the Department of Water to factor these into the planning process as the data is being collected and analyzed.

The meeting started with a presentation by Fukunaga & Associates. This presentation is posted on KauaiWater.org. There is a one page handout from the meetings that is also posted on the same website.

DISCUSSION:
These notes reflect the questions and concerns voiced by attendees at the Kilauea meeting.
(Q = question; A = answer; C = comment.)

1) C: Surface water is abundant on the North Shore, but there is not enough storage available.

2) Q: Will information on reservoirs and dams be included?
   A: Yes, but the main source of information will come from the Agricultural Water Use and Development Plan (AWUDP).

3) C: Hearings on Kauai for other components of the Hawaii Water Plan, including the AWUDP, should be well-publicized.

4) C: Agricultural water use projection of 3,400 gpad seems low.

5) Q: How does this process propose to integrate Federal water use?
A: Federal water use would be included in County [meter] data if the water comes from the County water system. If the water use is served by surface water, such as is the case for U.S. Fish & Wildlife Service's Hanalei National Wildlife Refuge, then that use should be accounted for in the Instream Flow Standards and diversion data, which are the responsibility of CWRM. [If the use is served by a well, that information should be reported to the Commission on Water Resource Management (CWRM).]

6) Q: Are water catchment systems legal?
A: Yes, but they are not regulated by the Department of Health.

7) C: An attendee had thought water was a limiting factor for development. Based on the presentation, it doesn't seem like it.
A: Infrastructure, getting the water from the aquifer to the faucet, is the limiting factor. Maintaining irrigation systems is also difficult/costly.

8) C: There needs to be a balance. More water being used for irrigation may mean more recharge. However, more water left in the stream will promote the health of the stream as well as the health of the ocean.

9) C: Concern was raised over the Kalihiwai Reservoir. Residents want it to look full and beautiful, while users want to use the water when needed. In addition, maintenance is difficult due to the costs and number of owners/users.

10) C: People take water for granted and need to understand the cost of getting the water to them and should be willing to pay more for this service. An attendee encouraged Kauai Department of Water (KDOW) to charge more for water so they have money to maintain and build more infrastructure.

NEXT STEPS:
FAINC will continue to collect and analyze data and will explore the issues that were raised during the meeting. The findings will be presented at the next public information meeting. In the meantime, new and updated information will be posted on the DOW website periodically.

Kauai Water Use & Development Plan Update
First Series of Public Meetings
October 21, 2015
Kapaʻa Middle School (Cafeteria)
5PM to 6:15 PM

ATTENDANCE:
KDOW: Kirk Saiki (Manager and Chief Engineer), Edward Doi (Head of Water Resources & Planning Division, WR&P), Regina Flores (WR&P), Joel Bautista (WR&P), Kim Tamaoka (Public Relations, PR), Jonell Kaohelaulii (PR)
Fukunaga & Associates, Inc. (Consultant): Lynn Malinger, Amanda Tanaka, Amanda Kimi
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The intent of this series of meetings is to create an understanding of the purpose and intent of the Kauai Water Use & Development Plan Update and the context within which it is being developed. This series is to give the community an opportunity to express any concerns or voice any questions they may have about the process to be used to create the update. This will allow the consultant and the Department of Water to factor these into the planning process as the data is being collected and analyzed.

The meeting started with a presentation by Fukunaga & Associates. This presentation is posted on KauaiWater.org. There is a one page handout from the meetings that is also posted on the same website.

DISCUSSION:
These notes reflect the questions and concerns voiced by attendees at the Kapaʻa meeting.
(Q = question; A = answer; C = comment.)

1) Q; Is there an inventory for existing water uses? How much water is the military taking?
   A: Existing water use is being inventoried. The gathered information will be presented at the second series of public meetings next year.

2) Q: What is the difference between the CWRM categories, "Irrigation" and "Agriculture"?
   A: Agriculture refers to uses for agriculture, such as crops or nursery plants, while Irrigation includes uses such as park and golf course irrigation.

3) Q: Should the Island of Kauaʻi be divided up by ahupuaʻa instead of by aquifer systems? For example, the Kapaʻa watershed and Anahola watershed are characteristically different but are grouped together in the same aquifer system.
A: The Commission on Water Resource Management (CWRM) requires that the WUDP update be based on the hydrologic units established by the CWRM. Therefore, all data for each of the Hawaii Water Plan components are compiled and summarized using the aquifer or hydrographic systems as basic study area units.

4) Q: How confident are you that the reported pumpage numbers are accurate? Is reporting required?
A: Reporting is required. Although we are aware that not all well owners report pumpage to the CWRM (< 100%), it is currently the best available information. It should be noted however that CWRM generally pursues most of the larger well owners to report.

5) Q: There was some confusion about the definition of a privately-owned public water system.
A: A public water system is one that has 15 or more service connections or serves 25 people daily for at least 60 days of the year. Public water systems can be privately owned. Princeville was given as an example of a privately-owned public water system.

6) Q: When the General Plan and/or Zoning are approaching the Sustainable Yield, what is the definition of approaching? Is it a percent?
A: As of now, there is no definition (%) set, but it is generally based on a relative scale when compared with conditions of other areas islandwide; this must be discussed further. [“Sensitive” areas are those areas where the General Plan full build-out demand or Zoning full build-out demand exceed Sustainable Yield. This is a very conservative approach as SY and full build-out concept are both conservative.]

7) C: A legend for the Zoning categories should be provided. [A legend was created and was posted with the zoning map at the remaining public meetings].

8) C: Label the quantities on the slides with their units (i.e., MGD). [The slides were revised to add unit labels for the remaining public meetings.]

9) C: The Sustainable Yield line should decrease over time, given that we are getting less rainfall, i.e. climate change.

10) C: We need to reuse wastewater. People should not be squeamish about reusing treated wastewater.

11) C: Springs need to be identified.
A: This is CWRM’s responsibility. [Spring discharge would be accounted for in Instream Flow Standards.]

12) Q: How often is the Sustainable Yield document updated? Is climate change accounted for in this document?
A: The current sustainable yield numbers are from the 2008 Water Resource Protection Plan (WRPP). The Sustainable Yield is currently being updated by CWRM. [Climate change is accounted for in that the SY numbers are conservative. CWRM is working with climatology scientists to better understand climate change, but until more information becomes available, CWRM is taking a precautionary approach and uses the most conservative estimate.]

13) Q: For the 20-year demand projections, are resorts, industrial uses, etc. included in the calculation?
A: Yes, they are included. As population increases, not only will residential demands increase, these other demands will also increase.

14) Q: When was the last Kauai Water Use and Development Plan (KWUDP)?
A: The KWUDP was first adopted in 1990. It was updated in 1992, but that update was not adopted by the CWRM.

15) Q: Will we ever get a clear picture of where stream diversions are (ex. Waimea is a problem area)?
A: CWRM is responsible to inventory the stream diversions, and they are working on this.

16) Q: For Full Build-out, is it built out to the maximum capacity? Are there any areas of concern that are close to the Sustainable Yield (SY)?
A: The full build-out concept assumes that all land area is built out to the theoretical maximum extent. Based on the 2008 WRPP SY, there are no areas that are close to SY.

17) C: Concerns were expressed that the General Plan was developed a long time ago.
A: The General Plan was adopted in 2000 and is currently being updated. Zoning hasn't changed; some places are just more developed than before.

18) Q: What was discussed at the stakeholder meeting? How often do they meet?
A: The stakeholders have met once so far. They were given a similar presentation, and we discussed the update process/methodology as well as obtained their input on water resource issues.

19) Q: How long has the stakeholder group been in existence?
A: Approximately one year.

20) Q: How were the stakeholders chosen?
A: The stakeholder group is a cross-section of the community; there are representatives for farmers, developers, and Native Hawaiians.

21) C: Concern regarding water being diverted to Grove Farm and Kauai Island Utility Cooperative was raised.

22) Q: Why were Condominium Property Regimes (CPR) not included in the past General Plan?
A: [CPRs are a means of dividing ownership]. The County Comprehensive Zoning Ordinance (CZO) is what regulates the development of lots and the allowable density. Dwelling units on agricultural land, as allowed by the CZO, were accounted for in the full build-out calculations.

23) C: Form-based code was mentioned.
A: Information from the recent community plans [for South Kauai and Lihue] has been obtained and will be analyzed.

24) C: Please take Native Hawaiian water rights into consideration when writing the KWUDP.

25) C: An attendee expressed approval that the KWUDP Update will be taking a comprehensive look at the island's water needs and availability.

NEXT STEPS:
FAINC will continue to collect and analyze data and will explore the issues that were raised during the meeting. The findings will be presented at the next public information meeting. In the meantime, new and updated information will be posted on the DOW website periodically.

Kauai Water Use & Development Plan Update
First Series of Public Meetings
October 29, 2015
Lihuʻe Neighborhood Center
5PM to 6:45 PM

ATTENDANCE:
KDOW: Kirk Saiki (Manager and Chief Engineer), Edward Doi (Head of Water Resources & Planning Divison, WR&P), Kim Tamaoka (Public Relations, PR), Jonell Kaohelaulii (PR)
Fukunaga & Associates, Inc. (Consultant): Jon Nishimura, Lynn Malinger, Amanda Tanaka, Amanda Kimi
CWRM: Lenore Ohye (Hydrologic Planning Program Manager)
Resolutions Hawaii (Facilitator): Dee Dee Letts

PURPOSE:
The purpose of this series of five (5) public meetings is to present the information that will be covered in the update, the sources for this information, how it will be presented, as well as any information that is available regarding the status of the resource on the Island. There will be a second series of public information meetings in about a year that will present all of the data gathered.

The intent of this series of meetings is to create an understanding of the purpose and intent of the Kauai Water Use & Development Plan Update and the context within which it is being developed. This series is to give the community an opportunity to express any concerns or voice any questions they may have about the process to be used to create the update. This will allow the consultant and the Department of Water to factor these into the planning process as the data is being collected and analyzed.

The meeting started with a presentation by Fukunaga & Associates. This presentation is posted on KauaiWater.org. There is a one page handout from the meetings that is also posted on the same website.

DISCUSSION:
These notes reflect the questions and concerns voiced by attendees at the Lihue meeting.
(Q = question; A = answer; C = comment.)

1) Q: What is the difference between General Plan and Zoning?
   A: The General Plan and Zoning full build-out analyses are completely separate island-wide assessments. General Plan is conceptual and is the County's vision for land use and Zoning is what is legally developable.

2) C: Moloaʻa needs to be looked at.

3) C: Concern was expressed about using Important Agricultural Lands (IAL) and the County's IAL Study for analysis of agricultural water demand. An attendee was part of the Technical Advisory Committee for the IAL Study and expressed frustration with the document.

4) Q: Why are there only two rounds of public meetings? There is a lot of information that will be gathered and analyzed between the two rounds. There should be interim meetings so the amount of data presented at each meeting is not overwhelming.
A: Two rounds of public meetings [and two advisory group meetings] are planned.

5) C: It was suggested that, if frequent interim meetings are not feasible, a website be used to publish new information as it becomes available for the public to see.

6) C: The Sustainable Yield (SY) numbers are wrong. They are based on a 25 year old model that is obsolete.
A: CWRM is working on updating the SY numbers.

7) Q: The SY numbers are not sustainable at all because there is so much groundwater pumping that streams and rivers are drying up. The SY numbers are based on an inappropriate model. You have the accepted model [USGS model]; why won't you use the best information available?
A: We can look at other models, but ultimately, we need to use the numbers that are established and approved by CWRM. Determining the SY numbers is CWRM's responsibility. [CWRM generally relies on the USGS for recharge studies, which are the basis of the SY estimates.]

8) Q: Based on the SY & Pumping graph in the presentation, Wailua is currently pumping 0.5 MGD and the SY is 43 MGD. If there is so much groundwater available, why would you build a treatment plant for surface water? The law states to only use surface water if you cannot use groundwater. All natural resources, including fish and fauna, should be protected. We are in current violation of the State Code and Public Trust Doctrine.
A: [The Hawaii Supreme Court has identified four Public Trust purposes applicable to water resources that equally have priority: maintenance of water in its natural state; domestic use; traditional and customary rights; and Department of Hawaiian Home Lands reservations. Therefore, using surface water for domestic use, including for drinking water, is lawful.]

9) C: Water should guide land use, not the other way around. We should develop where there is available groundwater.
A: This WUDP update process helps the County do that.

10) Q: Regarding the SY & Pumping graph: is the blue part in the Hanamaulu graph the current pumpage? Is that what is being delivered? How much surface water are we using? Have

we determined that this surface water is not in violation of the Public Trust? Based on the Kauai Springs case, every government entity has the duty to show that the Public Trust Doctrine is not being violated. You as individuals are liable.
A:
- The blue bars in the Hanamaulu graph represents groundwater pumpage.
- Approximately 2 MGD of surface water goes into the County water system.
- There is currently a lack of data. Setting instream flow standards is extremely complex. This is an issue state-wide. CWRM is now looking back at diversions that had been grandfathered to see if they violate the Public Trust Doctrine.

11) C: We need to think about how to maintain the irrigation systems.

12) C: Sometimes surface water cannot be used because of the amount of nitrates.

13) C: An attendee gave testimony at a CWRM meeting on Kauai. He has all the data that supposedly doesn't exist. This is in violation of the Public Trust Doctrine and Federal Water Law. Groundwater should be reserved for potable drinking water as it is high quality water.

14) C: The sugar irrigation systems are what dried our streams.

15) C: A memorandum of understanding is needed between the Department of Aquatic Resources and CWRM.

16) Q: How can you move forward without SY and AWUDP numbers?
A: SY is available from the CWRM Water Resource Protection Plan. In the absence of AWUDP numbers, assumptions need to be made until the AWUDP becomes available.

17) C: More detail should be provided.
A: When we come back, we will have a breakdown of meter data.

18) C: Data on all water sources should be gathered. There are some sources that you do not have data for.

19) C: It was recommended that USGS data be used instead of CWRM data, when possible.

20) Q: There are a lot of wells that are pumping and not reporting. How is this being addressed?
A: CWRM is the only entity that has legal authority to collect the data. Regulating wells and diversions are CWRM's responsibility. CWRM recently updated their policy. Private individual domestic users are now required to report. CWRM is currently going after the larger users first. They are also working with the Department of Agriculture.

21) Q: The KWUDP is supposedly a living document, but are we anticipating it will take 10-20 years before it is updated again? When you update the plan, how much does it cost to update the plan? Why are we continuing to use outdated data? It is important to get it right now. The margin of error is too large to be acceptable.
A:
- Risk and risk tolerance needs to be considered. Things are always going to change. The County has to make decisions on where and how to grow. The County needs to look at all resources and water is one of them. Each island is different. Kauai's problem is trying to get the water out of the ground. We are looking at the worst case scenario in terms of demand. Even with the uncertainty of the sustainable yield values, if these conservatively derived (high) demand numbers are way below the SY, wouldn't that provide some comfort that the land planning policies are sustainable?
- Ultimately, we want the County to have the best information available to make decisions. [This KWUDP Update will provide the County with information on demand that will help them make land use decisions].

22) C: We should encourage water catchment and gray water use.

23) C: U.S. Fish and Wildlife Service altered the course of Hanalei River with a stream bank restoration project. The project restricts the stream from its natural evolution and meandering.

24) C: Watershed protection is important.

25) Q: How did we start down the road of taking surface water?
A:
- If there is an expansion of a diversion, an amendment is needed. This triggers CWRM to look at the existing diversion and its impacts.
- [Many factors contributed to the decision to use surface water to serve the Lihue area. The water table in the Lihue area has decreased over time, therefore, some of the existing wells have been taken offline. The closing of the plantation and cessation of related irrigation practices may have affected ground water recharge and contributed to the lowering of the water table. In addition, it has been difficult to develop high yielding wells in the Puhi/Hanamaulu area due to the geology and lava formation in the area. Economics and the availability of surface water are additional reasons DOW started to use surface water to meet the needs of the community.]

26) Q: Even if a diversion is grandfathered in, the water must be returned in the same condition. Who regulates that?
A:

- CWRM understands that grandfathered diversions are not necessarily right. CWRM is working to address diversions.
- Regarding wells, it was mentioned that there are well construction standards, pumping tests, and studies of drawdown before a well is allowed.

27) Q: What happens if the new SY numbers are exactly the same as or lower than the General Plan & Zoning full build-out numbers?
A: These areas would be considered sensitive and should be looked at more closely. [Also, it is anticipated and will be verified that under existing conditions, water consumption is within the SY, and there is time to make corrections in the implementation of the land use policies to stay within sustainable limits of the resources.]

28) C: It was proposed that the scope for the KWUDP Update be reduced to just the inventory portion instead of moving forward with the analyses based on outdated SY numbers and assumptions.

29) C: It was proposed that the efforts for the KWUDP Update be focused on collecting and developing all the necessary information instead of depending on other agencies, such as CWRM and DOA.

NEXT STEPS:
FAINC will continue to collect and analyze data and will explore the issues that were raised during the meeting. The findings will be presented at the next public information meeting. In the meantime, new and updated information will be posted on the DOW website periodically.

Kauai Water Use & Development Plan Update
First Series of Public Meetings
October 27, 2015
Kalaheo Neighborhood Center
5PM to 6:15 PM

ATTENDANCE:
KDOW: Kirk Saiki (Manager and Chief Engineer), Edward Doi (Head of Water Resources & Planning Division, WR&P), Joel Bautista (WR&P), Kim Tamaoka (Public Relations, PR), Jonell Kaohelaulii (PR), Andrea Suzuki (Deputy County Attorney)
Fukunaga & Associates, Inc. (Consultant): Lynn Malinger, Amanda Tanaka, Amanda Kimi
Resolutions Hawaii (Facilitator): Dee Dee Letts

PURPOSE:
The purpose of this series of five (5) public meetings is to present the information that will be covered in the update, the sources for this information, how it will be presented, as well as any information that is available regarding the status of the resource on the Island. There will be a second series of public information meetings in about a year that will present all of the data gathered.

The intent of this series of meetings is to create an understanding of the purpose and intent of the Kauai Water Use & Development Plan Update and the context within which it is being developed. This series is to give the community an opportunity to express any concerns or voice any questions they may have about the process to be used to create the update. This will allow the consultant and the Department of Water to factor these into the planning process as the data is being collected and analyzed.

The meeting started with a presentation by Fukunaga & Associates. This presentation is posted on KauaiWater.org. There is a one page handout from the meetings that is also posted on the same website.

DISCUSSION:
These notes reflect the questions and concerns voiced by attendees at the Kalaheo meeting. (Q = question; A = answer; C = comment.)

1) Q: Are all the wells metered?
   A: Data for all wells is required to be reported to the Commission on Water Resource Management (CWRM). However, not all [private] well owners report to CWRM. All Department of Water wells are metered and report to CWRM.

2) Q: What are reclaimed water systems?

A: Reclaimed water systems are systems that distribute recycled water for irrigation after it has been treated at wastewater treatment plants.

3) Q: In the past, population projections have been inaccurate. How are you addressing this?
A: The population projections from a technical study for the Planning Department's General Plan Update are being used. The growth rate is approximately 1-2%, which is reasonable compared to historical growth rates.

4) Q: It seems that there is more than enough water to meet the demands. Is that true? Has global warming been taken into account? For example, it used to rain a lot here but it doesn't any more.
A: Climate change does need to be considered and monitored.

5) Q: Is there a possibility of salt water intrusion and the water lens being pierced? Who monitors this?
A: Everyone must be careful. Public and private well owners are supposed to report chlorides to CWRM. DOW monitors their own wells and reports to CWRM.

6) Q: Is there technology that shows the rate at which aquifers are being recharged? Has the aquifer capacity diminished or stayed the same? Is there historical data for the aquifers?
A: CWRM is responsible for studying the aquifers and analyzing/updating recharge rates. There are observation wells that are used to study the aquifers.

7) Q: Is the water quality monitored for the wells?
A: Water from wells used for drinking water must meet the Safe Drinking Water Standards.

8) Q: The Sustainable Yield numbers are from the 2008 Water Resource Protection Plan (WRPP). Will the updated numbers be used in the KWUDP?
A: Yes, when they become available.

9) Q: Will both public and private water systems be looked at?
A: Yes.

10) Q: Do we have a policy for allocating water? Who gets the water if we end up using more than the Sustainable Yield (SY)?
A: No one owns the water. Uses that have equal priority were identified by the Hawaii Supreme Court. There are 4 Public Trust Purposes: Maintenance of water in its natural state; Domestic Use; Traditional and Customary Rights; Department of Hawaiian Home Lands reservations. Also, CWRM has a process for designating Water Management Areas. [Upon designation, applicants for water use permits in designated Water Management Areas are required to show that they meet the 7 statutory conditions for obtaining a water use permit under HRS 174C-49(a).]

11) C: A discussion on the process for designating Water Management Areas would be helpful.

12) Q: Are private water systems/wells not required to report their pumpage?
A: They are required to report their pumpage to CWRM but if private entities don't disclose their information, we cannot get the information.

13) Q: Is there an enforcement mechanism for wells that are not reporting?
A: Yes, CWRM can pursue reporting.

14) Q: Is there a time when we have to worry about agricultural companies using groundwater for irrigation?
A: Well permits can be requested for agricultural uses. [If there is competition or threats to water resources, CWRM may designate a water management area and institute a water use permitting system.]

15) Q: Is there a priority for water? Who protects existing users?
A: Water belongs to the public. The Public Trust Doctrine prioritizes certain uses. [Upon designation of a water management area, the shared use doctrine is replaced by a water use permitting system, and all existing users must apply for a permit to continue their existing use. The Water Code gives some priority to existing users.]

16) Q: Is there any discussion for new reservoirs (for potable water)?
A: No.

17) Q: What is the water in the reservoirs used for?
A: Primarily for agricultural use.

18) C: The waterfall at the end of Wailua River was mentioned.
A: There is a very small pump there. However, the reason the water was not flowing was because there was no rain.

NEXT STEPS:

FAINC will continue to collect and analyze data and will explore the issues that were raised during the meeting. The findings will be presented at the next public information meeting. In the meantime, new and updated information will be posted on the DOW website periodically.

Kauai Water Use & Development Plan Update
First Series of Public Meetings
October 28, 2015
Waimea Neighborhood Center
5PM to 6:15 PM

ATTENDANCE:
KDOW: Kirk Saiki (Manager and Chief Engineer), Edward Doi (Head of Water Resources & Planning Division, WR&P), Kim Tamaoka (Public Relations, PR), Jonell Kaohelaulii (PR)
Fukunaga & Associates, Inc. (Consultant): Lynn Malinger, Amanda Tanaka, Amanda Kimi
Resolutions Hawaii (Facilitator): Dee Dee Letts

PURPOSE:
The purpose of this series of five (5) public meetings is to present the information that will be covered in the update, the sources for this information, how it will be presented, as well as any information that is available regarding the status of the resource on the Island. There will be a second series of public information meetings in about a year that will present all of the data gathered.

The intent of this series of meetings is to create an understanding of the purpose and intent of the Kauai Water Use & Development Plan Update and the context within which it is being developed. This series is to give the community an opportunity to express any concerns or voice any questions they may have about the process to be used to create the update. This will allow the consultant and the Department of Water to factor these into the planning process as the data is being collected and analyzed.

The meeting started with a presentation by Fukunaga & Associates. This presentation is posted on KauaiWater.org. There is a one page handout from the meetings that is also posted on the same website.

DISCUSSION:
These notes reflect the questions and concerns voiced by attendees at the Waimea meeting. (Q = question; A = answer; C = comment.)

1) C: An attendee expressed enthusiasm that this update is happening and that the update is being coordinated to the extent possible with the General Plan Update which is also currently underway.

2) C: It appears there are a lot of water resources but we're missing the infrastructure, which is already old.
   A: Water Plan 2020 is addressing the aging infrastructure.

3) C: A concern was expressed about Eleele relying on Hanapepe for its water and the existing transmission main.
   A: Presently, the Department of Water (DOW) has two wells in Hanapepe Valley and one well located above Hanapepe Heights. Water is provided to the Eleele service zone by two booster pumps located in Hanapepe Valley which pump water through a transmission main that traverses the cliff to DOW's storage tanks. DOW is in the process of installing a transmission main from Hanapepe town to the Eleele water system [near the intersection of Kaumualii Highway and Waialo Road adjacent to Eleele Shopping Center].

NEXT STEPS:
FAINC will continue to collect and analyze data and will explore the issues that were raised during the meeting. The findings will be presented at the next public information meeting. In the meantime, new and updated information will be posted on the DOW website periodically.

Kauai Water Use & Development Plan Update
October 2015 Public Information Meetings
Summary of Meeting Notes

A series of five (5) public meetings were conducted to create an understanding of the purpose and intent of the *Kauai Water Use & Development Plan* Update and the context within which it is being developed. The meetings were held to present the information that will be covered in the update, the sources for this information, how it will be presented, as well as any information that is available regarding the status of the resource on the Island. This series provided the community an opportunity to express any concerns or voice any questions they may have about the process to be used to create the update.

The *Hawaii Water Plan* consists of 5 components, each of which is prepared by a different agency. The *Kauai Water Use and Development Plan*, prepared by the Kauai Department of Water, is one of the 5 components and coordinates and integrates information from the other components at the county level. Please refer to the meeting handout for additional information on the *Hawaii Water Plan* components. The following table summarizes the questions and comments received from the series of public meetings, and is organized by the related *Hawaii Water Plan* component which addresses the issue raised. The questions and comments will be shared with the appropriate agencies.

Minutes Summarized by *Hawaii Water Plan* Component

Question/Comment	Response, If Applicable
***KAUAI WATER USE AND DEVELOPMENT PLAN(KWUDP)* - Kauai Department of Water (KDOW)**	
When was the last KWUDP?	The KWUDP was first adopted in 1990. It was updated in 1992, but that update was not adopted by the Commission on Water Resource Management (CWRM).
What was discussed at the stakeholder meeting? How often do they meet?	The stakeholders have met once so far. They were given a similar presentation, and we discussed the update process/methodology as well as obtained their input on water resource issues.
How long has the stakeholder group been in existence?	Approximately one year.
How were the stakeholders chosen?	The stakeholder group is a cross-section of the community; there are representatives for farmers, developers, and Native Hawaiians.
An attendee expressed approval that the KWUDP Update will be taking a comprehensive look at the island’s water needs and availability.	
An attendee expressed enthusiasm that this update is happening and that the update is being coordinated to the extent possible with the General Plan Update which is also currently underway.	

Question/Comment	Response, If Applicable
Why are there only two rounds of public meetings? There is a lot of information that will be gathered and analyzed between the two rounds. There should be interim meetings so the amount of data presented at each meeting is not overwhelming.	Two rounds of public meetings [and two advisory group meetings] are planned.
It was suggested that, if frequent interim meetings are not feasible, a website be used to publish new information as it becomes available for the public to see.	
The KWUDP is supposedly a living document, but are we anticipating it will take 10-20 years before it is updated again? When you update the plan, how much does it cost to update the plan? Why are we continuing to use outdated data? It is important to get it right <u>now</u>. The margin of error is too large to be acceptable.	• Risk and risk tolerance needs to be considered. Things are always going to change. The County has to make decisions on where and how to grow. The County needs to look at all resources and water is one of them. Each island is different. Kauai's problem is trying to get the water out of the ground. We are looking at the worst case scenario in terms of demand. Even with the uncertainty of the sustainable yield values, if these conservatively derived (high) demand numbers are way below the Sustainable Yield (SY), wouldn't that provide some comfort that the land planning policies are sustainable? • Ultimately, we want the County to have the best information available to make decisions. [This KWUDP Update will provide the County with information on demand that will help them make land use decisions].
It was proposed that the scope for the KWUDP Update be reduced to just the inventory portion instead of moving forward with the analyses based on outdated SY numbers and assumptions.	
It was proposed that the efforts for the KWUDP Update be focused on collecting and developing all the necessary information instead of depending on other agencies, such as CWRM and Department of Agriculture (DOA).	
Will both public and private water systems be looked at?	Yes.
More detail should be provided.	When we come back, we will have a breakdown of meter data.
Data on all water sources should be gathered. There are some sources that you do not have data for.	

Question/Comment	Response, If Applicable
How did we start down the road of taking surface water?	• If there is an expansion of a diversion, an amendment is needed. This triggers CWRM to look at the existing diversion and its impacts. • [Many factors contributed to the decision to use surface water to serve the Lihue area. The water table in the Lihue area has decreased over time, therefore, some of the existing wells have been taken offline. The closing of the plantation and cessation of related irrigation practices may have affected ground water recharge and contributed to the lowering of the water table. In addition, it has been difficult to develop high yielding wells in the Puhi/Hanamaulu area due to the geology and lava formation in the area. Economics and the availability of surface water are additional reasons KDOW started to use surface water to meet the needs of the community.]
Are water catchment systems legal?	Yes, but they are not regulated by the Department of Health.
How does this process propose to integrate Federal water use?	Federal water use would be included in County [meter] data if the water come from the County water system. If the water use is served by surface water, such as is the case for U.S. Fish & Wildlife Service's Hanalei National Wildlife Refuge, then that use should be accounted for in the Instream Flow Standards and diversion data, which are the responsibility of CWRM. [If the use is served by a well, that information should be reported to the CWRM.]
Is there an inventory for existing water uses? How much water is the military taking?	Existing water use is being inventoried. The gathered information will be presented at the second series of public meetings next year.
For the 20-year demand projections, are resorts, industrial uses, etc. included in the calculation?	Yes, they are included. As population increases, not only will residential demands increase, these other demands will also increase.
In the past, population projections have been inaccurate. How are you addressing this?	The population projections from a technical study for the Planning Department's General Plan Update are being used. The growth rate is approximately 1-2%, which is reasonable compared to historical growth rates.

Question/Comment	Response, If Applicable
Water should guide land use, not the other way around. We should develop where there is available groundwater.	This KWUDP update process helps the County do that.
Concerns were expressed that the General Plan was developed a long time ago.	The General Plan was adopted in 2000 and is currently being updated. Zoning hasn't changed; some places are just more developed than before.
What is the difference between General Plan and Zoning?	The General Plan and Zoning full build-out analyses are completely separate island-wide assessments. General Plan is conceptual and is the County's vision for land use and Zoning is what is legally developable.
Why were Condominium Property Regimes (CPR) not included in the past General Plan?	[CPRs are a means of dividing ownership]. The County Comprehensive Zoning Ordinance (CZO) is what regulates the development of lots and the allowable density. Dwelling units on agricultural land, as allowed by the CZO, were accounted for in the full build-out calculations.
Form-based code was mentioned.	Information from the recent community plans [for South Kauai and Lihue] has been obtained and will be analyzed.
When the General Plan and/or Zoning are approaching SY, what is the definition of approaching? Is it a percent?	As of now, there is no definition (%) set, but it is generally based on a relative scale when compared with conditions of other areas islandwide; this must be discussed further. ["Sensitive" areas are those areas where the General Plan full build-out demand or Zoning full build-out demand exceed SY. This is a very conservative approach as SY and full build-out concept are both conservative.]
For Full Build-out, is it built out to the maximum capacity? Are there any areas of concern that are close to SY?	The full build-out concept assumes that all land area is built out to the theoretical maximum extent. Based on the 2008 Water Resource Protection Plan (WRPP) SY, there are no areas that are close to SY.
An attendee had thought water was a limiting factor for development. Based on the presentation, it doesn't seem like it.	Infrastructure, getting the water from the aquifer to the faucet, is the limiting factor. Maintaining irrigation systems is also difficult/costly.
The SY numbers are from the 2008 WRPP. Will the updated numbers be used in the KWUDP?	Yes, when they become available.

Question/Comment	Response, If Applicable
How can you move forward without SY and Agriculture Water Use and Development Plan (AWUDP) numbers?	SY is available from the CWRM WRPP. In the absence of AWUDP numbers, assumptions need to be made until the AWUDP becomes available.
What happens if the new SY numbers are exactly the same as or lower than the General Plan & Zoning full build-out numbers?	These areas would be considered sensitive and should be looked at more closely. [Also, it is anticipated and will be verified that under existing conditions water consumption is within the SY, and there is time to make corrections in the implementation of the land use policies to stay within sustainable limits of the resources.]
People take water for granted and need to understand the cost of getting the water to them and should be willing to pay more for this service. An attendee encouraged KDOW to charge more for water so they have money to maintain and build more infrastructure.	
Is there any discussion for new reservoirs (for potable water)?	No.
It appears there are a lot of water resources but we’re missing the infrastructure, which is already old.	Water Plan 2020 is addressing the aging infrastructure.
A concern was expressed about Eleele relying on Hanapepe for its water and the existing transmission main.	Presently, the KDOW has two wells in Hanapepe Valley and one well located above Hanapepe Heights. Water is provided to the Eleele service zone by two booster pumps located in Hanapepe Valley which pump water through a transmission main that traverses the cliff to KDOW’s storage tanks. KDOW is in the process of installing a transmission main from Hanapepe town to the Eleele water system [near the intersection of Kaumualii Highway and Waialo Road adjacent to Eleele Shopping Center].
We need to reuse wastewater. People should not be squeamish about reusing treated wastewater.	
We should encourage water catchment and gray water use.	
Watershed protection is important.	
Concern regarding water being diverted to Grove Farm and Kauai Island Utility Cooperative was raised.	
Please take Native Hawaiian water rights into consideration when writing the KWUDP.	

Question/Comment	**Response, If Applicable**
The waterfall at the end of Wailua River was mentioned.	There is a very small pump there. However, the reason the water was not flowing was because there was no rain.
Moloa‘a needs to be looked at.	
U.S. Fish and Wildlife Service altered the course of Hanalei River with a stream bank restoration project. The project restricts the stream from its natural evolution and meandering.	
WATER RESOURCE PROTECTION PLAN (WRPP) **- Commission On Water Resource Management (CWRM)**	
Are all the wells metered?	Data for all wells is required to be reported to CWRM. However, not all [private] well owners report to CWRM. All KDOW wells are metered and report to CWRM.
How confident are you that the reported pumpage numbers are accurate? Is reporting required?	Reporting is required. Although we are aware that not all well owners report pumpage to CWRM (< 100%), it is currently the best available information. It should be noted however that CWRM generally pursues most of the larger well owners to report.
Are private water systems/wells not required to report their pumpage?	They are required to report their pumpage to CWRM but if private entities don’t disclose their information, we cannot get the information.
There are a lot of wells that are pumping and not reporting. How is this being addressed?	CWRM is the only entity that has legal authority to collect the data. Regulating wells and diversions are CWRM’s responsibility. CWRM recently updated their policy. Private individual domestic users are now required to report. CWRM is currently going after the larger users first. They are also working with the DOA.
Is there an enforcement mechanism for wells that are not reporting?	Yes, CWRM can pursue reporting.
Is there a possibility of salt water intrusion and the water lens being pierced? Who monitors this?	Everyone must be careful. Public and private well owners are supposed to report chlorides to CWRM. KDOW monitors their own wells and reports to CWRM.
There needs to be a balance. More water being used for irrigation may mean more recharge. However, more water left in the stream will promote the health of the stream as well as the health of the ocean.	

Question/Comment	**Response, If Applicable**
Will we ever get a clear picture of where stream diversions are (ex. Waimea is a problem area)?	CWRM is responsible to inventory the stream diversions, and they are working on this.
Even if a diversion is grandfathered in, the water <u>must</u> be returned in the same condition. Who regulates that?	• CWRM understands that grandfathered diversions are not necessarily right. CWRM is working to address diversions. • Regarding wells, it was mentioned that there are well construction standards, pumping tests, and studies of drawdown before a well is allowed.
Springs need to be identified.	This is CWRM's responsibility. [Spring discharge would be accounted for in Instream Flow Standards.]
Do we have a policy for allocating water? Who gets the water if we end up using more than the Sustainable Yield (SY)?	No one owns the water. Uses that have equal priority were identified by the Hawaii Supreme Court. There are 4 Public Trust Purposes: Maintenance of water in its natural state; Domestic Use; Traditional and Customary Rights; Department of Hawaiian Home Lands reservations. Also, CWRM has a process for designating Water Management Areas. [Upon designation, applicants for water use permits in designated Water Management Areas are required to show that they meet the 7 statutory conditions for obtaining a water use permit under HRS 174C-49(a).]
Is there a priority for water? Who protects existing users?	Water belongs to the public. The Public Trust Doctrine prioritizes certain uses. [Upon designation of a water management area, the shared use doctrine is replaced by a water use permitting system, and all existing users must apply for a permit to continue their existing use. The Water Code gives some priority to existing users.]
An attendee gave testimony at a CWRM meeting on Kauai. He has all the data that supposedly doesn't exist. This is in violation of the Public Trust Doctrine and Federal Water Law. Groundwater should be reserved for potable drinking water as it is high quality water.	
Is there a time when we have to worry about agricultural companies using groundwater for irrigation?	Well permits can be requested for agricultural uses. [If there is competition or threats to water resources, CWRM may designate a water management area and institute a water use permitting system.]

Question/Comment	**Response, If Applicable**
The SY line should decrease over time, given that we are getting less rainfall, i.e. climate change.	
How often is the SY document updated? Is climate change accounted for in this document?	The current sustainable yield numbers are from the 2008 WRPP. The SY is currently being updated by CWRM. [Climate change is accounted for in that the SY numbers are conservative. CWRM is working with climatology scientists to better understand climate change, but until more information becomes available, CWRM is taking a precautionary approach and uses the most conservative estimate.]
It seems that there is more than enough water to meet the demands. Is that true? Has global warming been taken into account? For example, it used to rain a lot here but it doesn't any more.	Climate change does need to be considered and monitored.
Is there technology that shows the rate at which aquifers are being recharged? Has the aquifer capacity diminished or stayed the same? Is there historical data for the aquifers?	CWRM is responsible for studying the aquifers and analyzing/updating recharge rates. There are observation wells that are used to study the aquifers.
The SY numbers are wrong. They are based on a 25 year old model that is obsolete.	CWRM is working on updating the SY numbers.
The SY numbers are not sustainable at all because there is so much groundwater pumping that streams and rivers are drying up. The SY numbers are based on an inappropriate model. You have the accepted model [USGS model]; why won't you use the best information available?	We can look at other models, but ultimately, we need to use the numbers that are established and approved by CWRM. Determining the SY numbers is CWRM's responsibility. [CWRM generally relies on the USGS for recharge studies, which are the basis of the SY estimates.]

Question/Comment	Response, If Applicable
Based on the SY & Pumping graph in the presentation, Wailua is currently pumping 0.5 MGD and the SY is 43 MGD. If there is so much groundwater available, why would you build a treatment plant for surface water? The law states to only use surface water if you cannot use groundwater. All natural resources, including fish and fauna, should be protected. We are in current violation of the State Code and Public Trust Doctrine.	• [The Hawaii Supreme Court has identified four Public Trust purposes applicable to water resources that equally have priority: maintenance of water in its natural state; domestic use; traditional and customary rights; and Department of Hawaiian Home Lands reservations. Therefore, using surface water for domestic use, including for drinking water, is lawful.] • [Many factors contributed to the decision to use surface water to serve the Lihue area. The water table in the Lihue area has decreased over time, therefore, some of the existing wells have been taken offline. The closing of the plantation and cessation of related irrigation practices may have affected ground water recharge and contributed to the lowering of the water table. In addition, it has been difficult to develop high yielding wells in the Puhi/Hanamaulu area due to the geology and lava formation in the area. Economics and the availability of surface water are additional reasons KDOW started to use surface water to meet the needs of the community.]
Regarding the SY & Pumping graph: is the blue part in the Hanamaulu graph the current pumpage? Is that what is being delivered? How much surface water are we using? Have we determined that this surface water is not in violation of the Public Trust? Based on the Kauai Springs case, every government entity has the duty to show that the Public Trust Doctrine is not being violated. You as individuals are liable.	• The blue bars in the Hanamaulu graph represents groundwater pumpage. • Approximately 2 MGD of surface water goes into the County water system. • There is currently a lack of data. Setting instream flow standards is extremely complex. This is an issue state-wide. CWRM is now looking back at diversions that had been grandfathered to see if they violate the Public Trust Doctrine.
It was recommended that USGS data be used instead of CWRM data, when possible.	
Should the Island of Kaua‘i be divided up by ahupua‘a instead of by aquifer systems? For example, the Kapa‘a watershed and Anahola watershed are characteristically different but are grouped together in the same aquifer system.	CWRM requires that the WUDP update be based on the hydrologic units established by the CWRM. Therefore, all data for each of the Hawaii Water Plan components are compiled and summarized using the aquifer or hydrographic systems as basic study area units.

Question/Comment	Response, If Applicable
A memorandum of understanding is needed between the Department of Aquatic Resources and CWRM.	
A discussion on the process for designating Water Management Areas would be helpful.	
Hearings on Kauai for other components of the Hawaii Water Plan, including AWUDP, should be well-publicized.	
***WATER QUALITY PLAN (WQP)* - Department of Health (DOH)**	
Is the water quality monitored for the wells?	Water from wells used for drinking water must meet the Safe Drinking Water Standards.
***AGRICULTURAL WATER USE AND DEVELOPMENT PLAN (AWUDP)* - Department of Agriculture (DOA)**	
Surface water is abundant on the North Shore, but there is not enough storage available.	
Will information on reservoirs and dams be included?	Yes, but the main source of information will come from the AWUDP.
Agricultural water use projection of 3,400 gpad seems low.	
Concern was raised over the Kalihiwai Reservoir. Residents want it to look full and beautiful, while users want to use the water when needed. In addition, maintenance is difficult due to the costs and number of owners/users.	
What is the water in the reservoirs used for?	Primarily for agricultural use.
Concern was expressed about using Important Agricultural Lands (IAL) and the County's IAL Study for analysis of agricultural water demand. An attendee was part of the Technical Advisory Committee for the IAL Study and expressed frustration with the document.	
We need to think about how to maintain the irrigation systems.	
Sometimes surface water cannot be used because of the amount of nitrates.	
The sugar irrigation systems are what dried our streams.	

Summary of public comment sheets received

Question/Comment	**Response, If Applicable**
Water diversion on Kauai was authorized years ago for SUGAR CANE PRODUCTION. Sugar cane is no longer grown, so the waterways should be restored. Many rivers have lost much of their water. This should be investigated by the CWRM, and restored. How much non-potable water is being used, by whom, and for what use? GMO companies are allowed to use carcinogenic chemicals. This endangers humans, as wells as land and sea life forms. Please stop this. The proposed Koloa area being farmed threatens the health of everyone in the area, plus the entire Poipu tourist industry. Water drainage will be full of cow feces, possibly cause an epidemic. This should be stopped before it starts, which would be too late.	CWRM understands that grandfathered diversions are not necessarily right and is working to address diversions. Existing water use is being inventoried. Water quality concerns can also be directed to the Department of Health, Clean Water Branch.
Irrigation of agriculture is a way to recharge ground water.	
1. I am distressed that your boss, the State of Hawaii, does not recognize ancient ahupuaʻa boundaries. Not only is an insult to ancient Hawaiian wisdom and practices, but also you are ignoring modern science, by linking two different watersheds, Anahola (drier) and Kapaʻa (wetter). Nearshore Kapaʻa, sea has relatively low salinity (about 33) illustrating the presence of freshwater runoff. 2. I am concerned your graph showing availability of water over time depicts a rather flat line, not a downward curve. I understand that our as tradewinds and rainfall lessen, we will face a decline in available water. Please adjust the effects of global warming, changes in winds, etc on sustainability. 3. Please consider wastewater treatment improvement, such as “ENVIROCYCLE” instead of failing cesspool/septic?? Thank you for inviting the public.	CWRM requires that the WUDP update be based on the hydrologic units established by CWRM. Therefore, all data for each of the Hawaii Water Plan components are compiled and summarized using the aquifer or hydrologic systems as basic study area units. CWRM has established both ground water hydrologic units and surface water hydrologic units. Please see the Map of Registered Diversions which shows both the ground water hydrologic units and surface water hydrologic units. Since the surface water hydrologic units and ground water hydrologic units are well-correlated, surface water data and analyses are proposed to be presented based on the ground water hydrologic units.

APPENDIX C2

Second Round of Public Meeting Summaries (2023)

Kauaʻi Water Use & Development Plan Update
Second Series of Public Meetings
August 31, 2023
Kīlauea Neighborhood Center
5 PM to 7:00 PM

ATTENDANCE:
KDOW: Joseph Tait (Manager and Chief Engineer), Michael Hinazumi (Deputy Manager), Jason Kagimoto (Engineering Division Head), Regina Flores (Engineering Division, Water Resources & Planning, WRP Section Head), Erin Doi, Margie Mills (Engineering Division, WRP Section), Scott Suga (Engineering Division, Project Management Section), Jonell Kaohelauliʻi (Public Relations, PR)
Fukunaga & Associates, Inc. (Consultant): Amanda Waki, Amanda Miyahara
Planning: Leanora Kaiʻaokamalie

PURPOSE:
The purpose of this series of five (5) public meetings is to present the draft Kauaʻi Water Use and Development Plan (KWUDP) Update and its findings.

The intent of this series of meetings is to create an understanding of the purpose and intent of the KWUDP Update and the context in which it is being developed. The public meetings give the community an opportunity to provide feedback and express any concerns that they may have on the KWUDP Update.

The meeting started with an introduction by Jason Kagimoto and was followed by a presentation by Fukunaga & Associates. The draft KWUDP Update is posted on KauaiWater.org/KWUDP.asp.

DISCUSSION:
These notes reflect the questions and concerns voiced by attendees at the Kīlauea meeting. (Q = question; A = answer; C = comment.)

1) Q: Are you sure all of the water in Kalihiwai comes from Princeville?
   A: The Princeville Water System is a privately-owned public water system in the Kalihiwai aquifer system area (ASYA) and is supplied by two wells. There are also two KDOW water systems that serve portions of the Kalihiwai ASYA: the ʻAnini Water System and the Kīlauea Water System. The KDOW ʻAnini Water System receives water purchased from the Princeville Water System. The KDOW Kīlauea Water System serves areas in the Kalihiwai ASYA and Kīlauea ASYA. [The KDOW Kīlauea Water System spans from the Waipakē Subdivision in east Kīlauea to the Kalihiwai River.] The KDOW Kīlauea Water

System is supplied by two wells in the Kīlauea ASYA. [See Figure 20201-5 for the service areas of the water systems.]

2) Q: Land planning is determined by who? Is it like Kōloa where it's determined by project development?
   A: Land use planning is done by the COK Planning Department.

3) Q: How do you determine sustainable yield (SY)? How can you tell whether aquifers are drying up?
   A: CWRM establishes the sustainable yield (SY) estimates, which is evaluated by using analytical ground water models (Robust Analytical Model, please see Appendix F of the 2019 WRPP for a detailed discussion). CWRM applied the precautionary principle in selecting the SY for the 2019 WRPP Update, and in general, selected the most conservative SY for each ASYA as the SY. CWRM does not have any monitor wells on Kauaʻi. Groundwater conditions can be monitored by the level of chlorides (salinity) in production wells.

4) Q: Is the SY from 1990?
   A: No, the original WRPP was published in 1990 but has since been updated twice. The latest update was in 2019 and the 2019 WRPP is where the SY numbers are from.

5) Q: Can you go over the Hanalei/Princeville/Kilauea population projections?
   A: The population projections are from the Planning Department and were published in the 2018 General Plan.

6) Q: I saw another plan that included an analysis based on unit counts and land area (e.g., can build 5 houses on 1,000 acres of land). What did the KWUDP Update do?
   A: The demand analysis was performed two ways. The first evaluated the existing demand and projected future demand based on the population projections. The second evaluated the General Plan and zoning full-build out (FBO), which multiplied land areas by appropriate water use rates and allowable development densities. It is noted that the analysis is a conservative preliminary analysis and does not evaluate water demand at a more precise/detailed level (property/parcels), which would decrease the FBO water demand projection. More information on the FBO analysis can be found in Section 2.2.2 of the KWUDP Update.

7) Q: What's a dwelling unit?
   A: A dwelling unit is essentially the equivalent of a home. [A dwelling unit is defined as "any building or any portion thereof which is designed or intended for occupancy by one (1) family or persons living together or by a person living alone and providing complete living facilities, within the unit for sleeping, recreation, eating and sanitary facilities, including installed equipment for only one (1) kitchen. Any building or portion thereof

that contains more than one (1) kitchen shall constitute as many dwelling units as there are kitchens" per the Title IV Chapter 8 of the Kauaʻi County Code.]

8) Q: If we barely have enough water to support ourselves now, how can we expect to support up to the FBO scenario? Were schools, shopping centers, and new housing development considered?

A: The FBO scenario analyzed the maximum water needs if all land is developed to its theoretical highest extent allowed by current land use plans and policies (General Plan and zoning), including areas of land designated or zoned as residential, resort, etc. The FBO analysis assumes that every square foot is developed to the maximum extent and does not account for area needed for roads, buffer areas, or undevelopable topography. Therefore, the FBO scenario is extremely conservative as its main purpose was to determine if the existing land use plans and policies are sustainable. If the schools, shopping centers, and new housing development were included in the General Plan/zoning, then it was considered as part of the FBO scenario analysis. Source development and infrastructure improvements are separate from the FBO land use comparison to SY.

9) Q: The sustainability of land use policies (FBO scenario) vs. projected demand seems misleadingly low.

A: The FBO water demands are conservatively high, which may contribute to the projected demands seeming low.

10) Q: The KWUDP Update seems very esoteric. How does this plan affect projects 20 years from now and what feedback do you need to adjust it? This study doesn't address our "we don't have water" mentality.

A: The primary objective of the KWUDP Update is to analyze Kauaʻi's land use plans and policies (General Plan and zoning) to see if the land use plans and policies are sustainable (i.e. FBO < SY), which is the case for all ASYAs on Kauaʻi. KDOW is also working on the Water Systems Investment Plan (WSIP), which is a separate planning project. That project will evaluate KDOW's water systems and recommend projects for infrastructure improvements, expansion, etc.

11) Q: How can Kīlauea and Kalihiwai survive when only 5% of the water needs can be sustained? [This is in reference to the Irrigation of Agricultural Lands table for the Kīlauea ASYA shown in the presentation.]

A: There is limited available information on agricultural water use and surface water. For the purpose of providing a general comparison of agriculture demand to surface water, it was assumed that no additional surface water diversions are allowed without amendment of the interim instream flow standards (IIFS), and declared surface water diversions were used to represent surface water supply. These declared diversion quantities are published in the WRPP, and most of the quantities have not yet been verified by CWRM. The table showed that only 5% of agricultural lands that scored ≥ 28 in the County of Kauaʻi's Important Agricultural Lands (IAL) Study can be irrigated at a rate of 3,400 gallons per acre per day, which is the diversified water use rate that was estimated in the 2004 AWUDP (i.e., this analysis is for agricultural lands only) using only the declared surface water diversions.

12) Q: How much water is available in the aquifers based on how much water is being withdrawn to serve existing demand? People can't develop here because there's not enough water.

A: The sustainable yield (SY) is the maximum rate at which water may be withdrawn from a water source without impairing the utility or quality of the water source. However, it is noted that SY does not consider the feasibility of developing the groundwater and should not be equated to developable groundwater. Due to Kauaʻi's age, it has complex hydrogeology, and the SY is not directly related to the productivity of the groundwater wells. Several models have been developed to estimate the sustainable yield, which have been analyzed by CWRM to assist with selecting the sustainable yield. The models are explained in more detail in Appendix F of the 2019 WRPP.

13) Q: I've talked to CWRM recently about my well. Within 1 mile of my well, there's 60 other domestic water wells. Of those 60 wells, only 12 report their pumpage to CWRM. There's no penalty to the well owners who don't report. You're basing your analysis off their lack of knowledge.

A: The CWRM well database provides the best available information on wells and was used to evaluate existing ground water resources. Well pumpage reporting is relatively high with the large users; however, your concern will be passed along to CWRM.

14) Q: What is the long-term plan to provide agricultural water to properties when reservoirs are planned to be decommissioned?

A: This question will be sent to CWRM and the Department of Agriculture (DOA). It is noted that several of the irrigation systems in this area are inactive and DOA does not recommend repair per the draft 2019 of the Agricultural Water Use and Development Plan (AWUDP). More information on the existing status of the irrigation systems can be found in the 2004 AWUDP (available here) and the 2019 AWUDP (public review draft, available here).

15) Q: What is being done to preserve surface assets like Kalihiwai Reservoir?

A: [DOA is responsible to prepare the AWUDP, which inventories the larger irrigation systems and assesses their rehabilitation potential and needs. KDOW does not own or manage reservoirs and surface water irrigation systems.]

16) Q: By what criteria is a well, storage tank, or reservoir decommissioned? Does CWRM consider these storage/source taps comprehensively with regards to future land use?

A: [The decommissioning of a well, storage tank, or reservoir is not taken lightly, and the decision is made by the owner. There are costs associated with operating, maintaining, and repairing these elements, and the costs and risks need to be considered by the owner against the benefits. CWRM does not have input on the decommissioning of these elements as they are not the owner.]

17) Q: How can we utilize non-potable water for fire flow protection?
A: Reservoirs have the ability to store water that could be made available for fire flow purposes. The use of reservoirs for fire protection is typically coordinated between the Fire Department, the reservoir owner, and the DLNR's Division of Forestry and Wildlife (DOFAW).

18) Q: Water is an asset to use for human/wildlife sustenance; however, as we know from Hurricane Iniki, it can also cause destruction. What plans do you have to address disasters and public safety from water misuse?
A: [Agreed; potable water should be used for the most valuable end use, which is human consumption and domestic use.

19) Q: My understanding is that the KWUDP Update should include fire flow protection; it's lacking along our long-haul roads, especially in Hanalei. Where is money being allocated for infrastructure?
A: The primary objective of the KWUDP Update is to set forth the allocation of water to land use to guide the county in its planning, management, and development of land use and water resource strategies and policies for sustainable development. KDOW is concurrently working on the Water Systems Investment Plan (WSIP), which is the long-range plan and one of the items in the scope of work is to update the GIS of the KDOW water systems. Another item in the scope of work is to build the hydraulic model of KDOW's water systems, which will include analyzing the system under emergency situations (fire flow). This information will be used when developing the 20-year capital improvement program (CIP) project list. Public meetings for the WSIP will be held in 2024.

20) Q: Does existing development or affordable housing take priority over new development? There's land that still needs water. In the past, the land developer was responsible to install the infrastructure necessary to supply his development.
A: The water system is evaluated as part of the WSIP. However, the current goal for KDOW is to update the existing water system and to lift water meter restrictions and/or provide fire flow protection. Once that is addressed, then water system expansion can be considered. KDOW is doing their best to support the Mayor's Office in affordable housing.

21) Q: What is the timeline on expanding the water system? What projects is KDOW working on in Kīlauea? There's been talk to drill and develop a new well in Kīlauea for at least 10 years. Whenever we ask KDOW about it, we've been told it'll be another 3-5 years. What is the status of the well?

A: At KDOW, there are currently 30 CIP projects ongoing and 5 projects are in construction across the island. It is anticipated that an additional 3 projects will be in construction in the next year. In Kīlauea, there is a project to replace an existing storage tank with a larger tank. After the tank is constructed, there are plans to drill and develop a well at that tank site. In addition, KDOW is working on acquiring land for a new well in the Kīlauea area and a right-of-entry (ROE) access has already been secured. The public is encouraged to attend the WSIP public meetings next year as well to provide input on the new 20-year CIP projects and their prioritization. KDOW is also considering pursuing federal funding to help pay for projects that are identified in the WSIP.

22) Q: Will the additional capacity at the Puu Pane tank result in more water availability for housing projects 5-10 years from now? There's a water restriction in Kīlauea.

A: The additional capacity will help address storage limitations. Additional source(s) (well(s)) will also be needed. When KDOW develops a well, they are required to report the pumpage to CWRM. Part of the pump installation permit (administered by CWRM) is how much KDOW is permitted to pump from the well without negatively affecting the water source or the well. All wells have a certain capacity. Even if multiple storage tanks are built, there is still only a certain amount of water that can be pumped based on the number of wells in the vicinity. After upgrading the tank, a new groundwater source can be evaluated and possibly developed to fill the tank and supply more water to customers in the future. An environmental assessment (EA) will need to be completed, and KDOW would appreciate the community's support.

23) Q: KDOW does not provide water to properties on Koʻolau Road, between Waipake and Aliomanu. We were told that KDOW would not be able to provide water service for at least 20 years and we had to sign a form acknowledging this. Will we get water soon?

A: Unfortunately, KDOW's current priority is addressing their current water system (infrastructure improvements). Water system expansion is a long-range plan.

24) C: The Kīlauea community would like to help. If KDOW needs any assistance with securing ROE access or with the EA process, the Kīlauea community can help.

25) Q: As principal of the Namanahana School, I would like to know how we can add bathrooms, etc. to our school.

A: KDOW understands that Phase 1 of the project will provide portable restrooms and portable potable water but acknowledges that a permanent, stable supply of water is needed.

26) Q: Rainwater is a valuable resource, but Kauaʻi doesn't allow water catchment. Is that something that will be changing? Is this a Department of Health (DOH) restriction or a KDOW restriction? Can rainwater catchment be used for agricultural purposes?

A: KDOW currently doesn't allow rainwater catchment to be used as a potable water source in areas that are served by the KDOW water system due to concerns with cross-contamination. There are areas that are not served by the KDOW water system that have rainwater catchment. Rainwater catchment may be used for agricultural purposes as this is a non-potable water demand.

27) Q: Why is KDOW having problems/delays in approving water permits? Specifically, a permit application for a farm commercial kitchen, which was approved by other COK departments more than 6 months ago? Why don't you provide a liaison in your department who can follow through with an applicant? Do we not have enough water or is there not enough staff at KDOW to process the permit?

A: For every permit, KDOW needs to assess source, storage and transmission requirements. Currently, there are source and storage limitations in the Kīlauea area, but the Puu Pane Tank upgrade will help alleviate the storage limitation.

28) Q: Are there programs to teach kids in school to conserve water? What efforts are planned to educate the public on conserving water use? For example, it's recommended to wash hair every few days (not every day) or to reuse kitchen sink water, which is great for plants.

A: [Every year, KDOW coordinates an island-wide water education festival for 5th grade students called Make a Splash with Project WET (Water Education for Teachers). This festival brings together parents, students, teachers, government resource agencies and enthusiasts of all kinds for a common goal: to educate and promote awareness of water resources in a fun and interactive environment.]

29) Q: A 2-inch lateral from Kūhiō Highway broke and was replaced with a 1 ½-inch lateral. Six homes are served from this lateral and there is not enough pressure. When we asked KDOW why the 2-inch lateral was replaced with a 1 ½-inch lateral, we were told this is standard practice and a 2-inch lateral is an additional cost. Why?

A: [Please contact DOW Engineering Division with the specific location of the lateral break/replacement for review and response].

30) C: There's a high concentration of wells in Moloaʻa and an increasing need for surface water. I'm also concerned about aquifer recharge.

31) C: There's two separate water systems in the Kalihiwai Ridge area – one is KDOW and one is agricultural. The cost of the water from the agricultural water system is the same as the cost from the KDOW water system. Due to this, no one uses water from the

agricultural water system. What's the point of installing the agricultural water system if it's not feasible to the farmers?

A: It may be more appropriate to ask this question to the owner of the agricultural water system.

NEXT STEPS:

FAINC will brief the Commission on Water Resource Management (CWRM) and revise the KWUDP Update based on comments received from these public meetings and the CWRM briefing. The Pre-Final KWUDP Update will then be presented to the Kauaʻi Board of Water Supply, then to CWRM for adoption. It is noted that the CWRM adoption process also includes public hearings.

Kauaʻi Water Use & Development Plan Update
Second Series of Public Meetings
August 22, 2023
Kapaʻa Neighborhood Center
5 PM to 6:30 PM

ATTENDANCE:
KDOW: Joseph Tait (Manager and Chief Engineer), Michael Hinazumi (Deputy Manager), Jason Kagimoto (Engineering Division Head), Regina Flores (Engineering Division, Water Resources & Planning, WRP, Section Head), Erin Doi, Margie Mills (Engineering Division, WRP Section), Jonell Kaohelauliʻi (Public Relations, PR)
Fukunaga & Associates, Inc. (Consultant): Jon Nishimura, Amanda Waki, Amanda Miyahara
Planning: Leanora Kaiʻaokamalie

PURPOSE:
The purpose of this series of five (5) public meetings is to present the draft Kauaʻi Water Use and Development Plan (KWUDP) Update and its findings.

The intent of this series of meetings is to create an understanding of the purpose and intent of the KWUDP Update and the context in which it is being developed. The public meetings give the community an opportunity to provide feedback and express any concerns that they may have on the KWUDP Update.

The meeting started with an introduction by Jason Kagimoto and was followed by a presentation by Fukunaga & Associates. The draft KWUDP Update is posted on KauaiWater.org/KWUDP.asp.

DISCUSSION:
These notes reflect the questions and concerns voiced by attendees at the Kapaʻa meeting. (Q = question; A = answer; C = comment.)

1) Q: Is there a report that summarizes the rainfall on Kauaʻi in order to determine how much water we have?
   A: The Rainfall Atlas is a resource that summarizes the rainfall on Kauaʻi.

2) Q: Who has evaluated how much water Kauaʻi has?
   A: The Commission on Water Resource Management (CWRM) is responsible for determining the quantity of water resources (groundwater and surface water). Sustainable yield is defined as the maximum rate at which water may be withdrawn from a water source without impairing the utility or quality of the water source as

determined by CWRM. The current sustainable yield values are from the Water Resource Protection Plan (WRPP) which is prepared by CWRM.

3) C: Based on the SY, it appears that there is a large surplus of water available for Kauaʻi.
   A: For all aquifer system areas (ASYAs), SY is greater than the full build-out projections. CWRM utilized the precautionary principle when selecting the SY for each ASYA, and in general, selected the most conservative sustainable yield. Also, as noted in the presentation, full build-out projections are conservatively high. However, it is noted that SY does not consider the feasibility of developing the groundwater and should not be equated to developable groundwater.

4) Q: Does the SY take into account diverted surface water?
   A: The SY study takes the water cycle into account. SY modeling considers groundwater recharge as well as outflow that prevents seawater intrusion or maintains perennial streamflow.

5) Q: How is the SY affected by climate change? USGS just released a report that included how climate change impacted groundwater supply across the islands.
   A: The impact of climate change on water resources is something that CWRM will need to assess, and this question will be relayed to CWRM. Fukunaga & Associates will ask if CWRM is aware of the report and how they plan to use the information from the USGS report.

6) Q: It is understood that revisions to water resource quantities is the responsibility of CWRM, but will the KWUDP Update include a discussion on the potential impacts of climate change?
   A: The KWUDP Update currently has a brief discussion on climate change, but Fukunaga & Associates will see if the discussion can be expanded.

7) Q: Is there water allocation for emergency response (i.e., fire protection)?
   A: The KDOW is currently working on a Water System Investment Plan (WSIP) which is their long-range capital improvements plan and are working on updating their GIS hydraulic model. Evaluation of the KDOW water systems with the hydraulic model, including analyzing the system under emergency situations (fire flow), will help direct future investment in expanding or upgrading the water systems. Public meetings for the WSIP will be held in early 2024.

8) Q: Who regulates the wells? How do we ensure that the aquifers aren't contaminated?
   A: Public wells are regulated by the Department of Health (DOH), who have sampling and reporting requirements. CWRM is responsible to protect Hawaii's water sources, and before a well is drilled, the developer needs to apply for a Well Drilling Permit from CWRM. After the well is drilled, a Pump Installation Permit from CWRM is required to

develop the water source. The well must be drilled and developed by a licensed driller. Once the well is developed, DOH will inspect the well as part of their Wellhead Inspection Program. KDOW is also a member of the Kauaʻi Watershed Alliance, whose goal is to provide for the long-term protection of Kauaʻi's uppermost watershed areas.

9) Q: Is there evidence that groundwater is impacted by cesspools?
   A: New cesspools are banned, and KDOW does not have any evidence that the groundwater is impacted by the existing cesspools. KDOW also publishes an annual water quality report, called the Consumer Confidence Report.

10) Q: Does the Environmental Protection Agency (EPA) regulate CWRM?
   A: No, CWRM is a division of the Department of Land and Natural Resources (DLNR), who manages the "quantity" of water (surface water interim instream flow standards, well drilling and development permits, etc.). The quality of water is the responsibility of DOH, who is overseen by EPA.

11) Q: What is the status of the Kapahi well?
   A: KDOW needs to update the Environmental Assessment (EA) and will do so in early 2024. Once the EA is finalized, KDOW can perform a pump test as part of the Well Drilling Permit and then develop the well.

12) Q: In East Kauaʻi, how are agriculture lands utilized? Specifically looking for potential agriculture uses for the East Kauaʻi Community Plan (food vs. cattle, etc.).
   A: The Statewide Agriculture Land Use Baseline Study inventoried agricultural land use in the State of Hawaiʻi and is a good reference. In terms of agricultural water demand, this information should come from the AWUDP. For the KWUDP Update, it was not realistic to assume that all lands designated or zoned as agriculture would be cultivated and irrigated. Instead, the KWUDP Update provides a general comparison of declared surface water diversions to agricultural lands that meet all Important Agricultural Lands (IAL) criteria based on the County of Kauaʻi IAL Study.

13) Q: What is the threshold that the SY/full build-out (FBO) scenarios/existing and future demands are compared against in order to determine whether the ASYA are "sensitive"?
   A: None of the ASYAs on Kauaʻi are considered sensitive as the FBO scenarios and existing and future demands are less than the SY. The Hanamāʻulu ASYA has a General Plan FBO scenario that is approximately 80% of the SY, but since the SY is conservatively low and the FBO is conservatively high, it is still not considered sensitive. If the FBO scenarios were higher than the SY, the ASYA would be considered "sensitive" and the land use policies (general plan and zoning) would need to be analyzed in greater detail. CWRM has certain criteria that must be met in order to designate an area, see HAR §13-171-7 for the groundwater criteria and §13-171-8 for the surface water criteria

(https://files.hawaii.gov/dlnr/cwrm/regulations/13-171.pdf). Related to land use policies, one criterion for groundwater designation is if the water use is 90% of the SY.

14) Q: There have been reports of contamination due to king tides. Can king tides contaminate the wells?
    A: The majority of KDOW wells are mauka, away from impacts due to king tides. Also, KDOW frequently monitors their wells, and any contamination would be detected and addressed.

15) C: The presentation did not mention the Wailua Wastewater Treatment Plant (WWTP) as a source of recycled water for the Wailua ASYA.
    A: This is due to the delineation of the ASYA, which are based on hydrogeological boundaries. The aquifer system areas don't necessarily correspond with the towns that share the same name. The Wailua WWTP and the area that uses recycled water from the Wailua WWTP are in the Hanamāʻulu ASYA.

NEXT STEPS:

FAINC will brief the Commission on Water Resource Management (CWRM) and revise the KWUDP Update based on comments received from these public meetings and the CWRM briefing. The Pre-Final KWUDP Update will then be presented to the Kauaʻi Board of Water Supply, then to CWRM for adoption. It is noted that the CWRM adoption process also includes public hearings.

Kauaʻi Water Use & Development Plan Update
Second Series of Public Meetings
August 29, 2023
Līhuʻe Neighborhood Center
5 PM to 7:00 PM

ATTENDANCE:
KDOW: Joseph Tait (Manager and Chief Engineer), Michael Hinazumi (Deputy Manager), Jason Kagimoto (Engineering Division Head), Regina Flores (Engineering Division, Water Resources & Planning, WRP Section Head), Erin Doi, Margie Mills (Engineering Division, WRP Section), Scott Suga (Engineering Division, Project Management Section), Jonell Kaohelauliʻi (Public Relations, PR)
Fukunaga & Associates, Inc. (Consultant): Jon Nishimura, Amanda Waki, Amanda Miyahara

PURPOSE:
The purpose of this series of five (5) public meetings is to present the draft Kauaʻi Water Use and Development Plan (KWUDP) Update and its findings.

The intent of this series of meetings is to create an understanding of the purpose and intent of the KWUDP Update and the context in which it is being developed. The public meetings give the community an opportunity to provide feedback and express any concerns that they may have on the KWUDP Update.

The meeting started with an introduction by Jason Kagimoto and was followed by a presentation by Fukunaga & Associates. The draft KWUDP Update is posted on KauaiWater.org/KWUDP.asp.

DISCUSSION:
These notes reflect the questions and concerns voiced by attendees at the Līhuʻe meeting. (Q = question; A = answer; C = comment.)

1) C: The General Plan states that there will be a 10 million gallon per day (mgd) deficit by 2035, which seems contrary to the KWUDP Update findings (sustainable yield is higher than the full build-out scenarios and projected demands).
   A: The sustainable yield (SY) is the maximum rate at which water may be withdrawn from a water source without impairing the utility or quality of the water source. However, it is noted that SY does not consider the feasibility of developing the ground water and should not be equated to developable ground water. SY is not pumped groundwater (developed ground water supply). The deficit mentioned in the County of Kaua'i's General Plan may be in reference to the gap between current pumpage (developed

ground water supply)/existing infrastructure, including storage and distribution system, and future water demand projections.

2) Q: How much KDOW water is supplied by the Grove Farm surface water treatment plant (SWTP)?
   A: KDOW purchases approximately 2.45 mgd of surface water from the Grove Farm SWTP. [The SWTP is rated for a capacity of 3 mgd and has a maximum capacity of 4 mgd. By agreement between the DOW and Grove Farm, DOW is required to accept a minimum of 2 mgd from the SWTP.]

3) Q: Is the County of Kaua'i (COK) planning to buy the Grove Farm SWTP?
   A: The DOW is currently evaluating the feasibility of acquiring the Grove Farm SWTP.

4) Q: If we're paying for Grove Farm to process the surface water and we're paying for the infrastructure, is that reflected in our water bills? At what point do we stop?
   A: The costs to process, operate and maintain the system to provide safe drinking water are calculated into the DOW's water rates similarly to the DOW's own systems. The DOW is in the process of evaluating the feasibility of acquiring the Grove Farm SWTP.

5) Q: What permits are required, and what departments require permits for KDOW?
   A: KDOW obtains permits from CWRM to drill and develop their own wells. Grove Farm is the owner of the Grove Farm SWTP and is responsible to obtain all necessary permissions to operate the SWTP.

6) Q: The County pays for 2/3 of Grove Farm's operating cost every month. When CWRM evaluates the SY, do they consider that at some point in time, the percentage that's taken can shift? Grove Farm also doesn't have the appropriate permits to divert water. How much of that is considered?
   A: The operation of the Grove Farm SWTP and its allowance to withdraw water are not known to KDOW and its consultant and is not reflected in this plan.

7) C: Grove Farm is diverting water, and they don't have the appropriate permits. According to Hawaii Revised Statutes (HRS) §171-58, the right to any mineral, surface, or groundwater shall not be included in any lease agreement, or sale as this right is reserved to the State. Grove Farm can't sell water that they don't own. The public is paying $2 million per month, and we're paying their operating fees. In the January 2019 Board of Water Supply Manager's Report, Grove Farm doesn't know how much water is being used; it took a mediator to determine how much water is being diverted. The diversion amount is very important when it comes to SY and the ability to provide surface water.

A: [Grove Farm provides sustainable stewardship for 37,000 acres of Kauaʻi lands that include vital watersheds, habitats, reservoirs, farming/ranching irrigation systems, public water storage and transmission lines.

In the early 2000ʻs, in partnership with KDOW, to reduce our Island's dependence upon our precious underground aquifers, Grove Farm invested over $10 million and provided the land to build a state-of-the-art surface water treatment plant to provide an added 3 million gallons per day to supplement our Island's drinking water supply. The plant is professionally managed with water quality oversight provided by both DOW and the State Department of Health. DOW currently reimburses Grove Farm a total of $1.90 per 1,000 gallons to cover the plant's operational costs. All water from the plant is provided directly to DOW.]

8) Q: Have any native Hawaiian organizations been consulted with the KWUDP Update?
A: Yes, a Stakeholder Advisory Group (SAG) has been established that represent a broad spectrum of Kauaʻi's community, including native Hawaiians. Debra Lee-Jackson, Peter Kea, and Billy Kaohelauliʻi are all members of the SAG. Billy is the Aha Moku representative for Kauaʻi. [The SAG is encouraged to be a conduit to the public and to share information with community organizations and the public and to provide feedback.]

9) Q: Why was the Department of Hawaiian Home Lands (DHHL), Wailua tract not able to procure water in 2007?
A: The Department of Land and Natural Resources (DLNR) is responsible to prepare the State Water Projects Plan (SWPP), which inventories future State projects and their water demands. In 2017, the SWPP was updated for DHHL only, and included an analysis on how DHHL's future demands are proposed to be met (new or existing well, new or existing water system, surface water, etc.). The 2017 DHHL SWPP is available here. [In 2007, there was not enough KDOW capacity in the Līhuʻe-Hanamāʻulu water system due to source and storage deficiencies to supply water to DHHL's Wailua tract's planned development. It is the responsibility of any developer (inclusive of DHHL) to provide water service by either developing their own water source and/or constructing storage and transmission infrastructure.]

10) Q: The KWUDP Update evaluated projected future demand and full build-out (FBO) demands. Now we're talking about DHHL and homestead uses. Are we planning for that FBO scenario regardless of what's in the General Plan? Is there water available?
A: The General Plan and Zoning FBO water demands include DHHL's projected future use, which was reported in DHHL's Island Plans and in the 2017 DHHL SWPP. KDOW is currently working with DHHL on DHHL's tract in Hanapēpē.

11) Q: Will DOW play a role in supporting the State DHHL so that they don't remove or decommission the surface water reservoirs so that they can be available to support future agriculture by small homestead farmers? If so, how will you support?
   A: The State Department of Agriculture (DOA) is responsible to prepare the Agricultural Water Use and Development Plan (AWUDP), which inventories the larger irrigation systems and assesses their rehabilitation potential and needs. KDOW does not own or manage reservoirs and surface water irrigation systems. [KDOW and DOA are currently trying to establish an initiative to identify which reservoirs could remain and which reservoirs can be removed.]

12) Q: Has the County taken a position in the State's intent to decommission the Wailua reservoir? The State is preparing an Environmental Impact Statement (EIS) and will reach out to COK.
   A: The KDOW has not been in discussion with the State to decommission the Wailua reservoir. The KDOW has concern if the decommissioning of the reservoir would result in an increase of potable water demand for non-potable usage. Comments will be provided during the State's EIS comment period.

13) Q: Where is the water coming from that fills the Waitā Reservoir?
   A: [From the 2004 AWUDP, the Waitā Reservoir is fed by surface waters from perennial streams and are diverted through man-made ditches. More information on the Waitā Reservoir may be found in the 2019 AWUDP Update (public review draft, available here) and the 2004 AWUDP, available here.]

14) Q: Is water diverted from Hanapēpē River to provide agriculture water for Kauaʻi Coffee? How much is diverted daily?
   A: The Kauaʻi Coffee Irrigation System was assessed in the 2004 AWUDP, which can be found here. A description of the Kauaʻi Coffee Irrigation System is included in the KWUDP Update along with a figure of streams and diversions [see 20101 Sections 2.2 and 3.5.3 and Appendix B].

15) Q: Where is the 6.9 mgd diversion?
   A: [This is in reference to the Irrigation of Agricultural Lands table for the Hanamāʻulu aquifer system area (ASYA) shown in the presentation.] 6.87 mgd is the total declared surface water flow from diversions for the Hanamāʻulu ASYA. These diversions were declared in 1989 as part of the interim instream flow standards (IIFS), set by the Commission on Water Resource Management (CWRM). See Appendix B of the KWUDP Update for a list of the declared stream diversions.

16) C: The Kauaʻi County Council did not accept the COK Important Agricultural Lands (IAL) Study.

A: [The Kauaʻi County Council did accept the IAL Study, however it was not adopted as it is not a plan and does not provide policies and therefore does not need to be adopted by charter].

17) Q: How do you assess the quantity of water in our aquifers? How do you know how big the aquifer is? Is there science involved?

A: CWRM establishes the SY estimates, which is based off of several models and utilized the precautionary principle when selecting the SY for each ASYA, and in general, selected the most conservative sustainable yield. The SY was published in the Water Resource Protection Plan (WRPP) prepared by CWRM and is available here. Kauaʻi has the most complex geology because of its age, and multiple overlapping layers of geologic formations. Please see Appendix F of the 2019 WRPP for a detailed discussion of how the SY is estimated.

18) Q: How can the public access information about Kauaʻi's aquifers?

A: Information about Kauaʻi's aquifers are included in the WRPP, see the response to the previous question for a link to the report.

19) C: Streams and aquifers are related.

20) Q: The SY was determined over how long of a period?

A: [The SY published in the 2019 WRPP Update were generally established by selecting the most conservative sustainable yield estimates from the available data sets. See Appendix F of the 2019 WRPP Update for more information.]

21) Q: Does the FBO scenario take into account an estimated gallons per household? Are homes/residents given priority over golf courses, resorts, etc.?

A: The FBO scenario analyzed the maximum water needs if all land is developed to the highest extent allowed by current land use plans and policies (General Plan and zoning), including areas of land designated or zoned as residential, resort, etc. The FBO approach applied standard water use rates [e.g., 500 gallons per single-family unit per day]. The purpose of this analysis was to determine if the existing land use plans and policies are sustainable.

22) Q: Do you know how many aqueducts we have in Hawaiʻi? How far in the data did you go to project the water use?

A: No, we do not know how many aqueducts there are in Hawaiʻi. In terms of the data, the SY is from CWRM. The existing water use is from CWRM (well pumpage), DOH (sanitary surveys), and KDOW (water meter data) and future water use was projected based on population projections. The FBO scenario analyzed the maximum water needs if all land is developed to the highest extent allowed by current land use plans and policies (General Plan and zoning).

23) Q: How do you determine whether an ASYA is "sensitive" or "less sensitive"? What are the criteria for this determination?
 A: All of the ASYAs on Kauaʻi are not considered sensitive as the FBO scenarios and the existing and future demands are all less than the SY. The Hanamāʻulu ASYA has a General Plan FBO scenario that is approximately 80% of the SY, but even with the SY being conservatively low and the FBO being conservatively high, it is still not considered sensitive. If the FBO scenarios were higher than the SY, the ASYA would be considered "sensitive" and the land use policies (General Plan and zoning) would need to be analyzed in greater detail.

24) Q: Shouldn't there be one organization in charge of all Kauaʻi's water, above and below the ground?
 A: CWRM administers the State Water Code. [CWRM's mission is to "protect and manage the waters of the State of Hawaiʻi for present and future generations."] CWRM's responsibilities include, but are not limited to, administering the instream use protection program by recommending IFS and IIFS, processing permits for well drilling, pump installation, stream channel alterations, and diversion works construction, and receiving and processing water-related citizen complaints.

25) Q: Who enforces compliance for reporting data? Who verifies that the data is correct? How can we trust the information that's presented to us if it references information from CWRM that hasn't been verified?
 A: CWRM is responsible for enforcing compliance on reporting groundwater well pumpage and surface water use (diversions). Well pumpage reporting compliance is high, but surface water reporting compliance is lower than desired. CWRM is focusing their efforts on getting the large users to report first. CWRM has a Surface Water Branch that is currently working on verifying the diversion locations from the 1989 IIFS (not the diversion amount). It should be noted that it is more difficult to measure surface water use than ground water use. However, CWRM is making strides in monitoring stream flow, most notably in East Kauaʻi by installing surface water gages. The KWUDP is a living document, and we need to rely on the best available information. The KWUDP Update took a preliminary "broad brush" approach to identify any ASYA that is considered sensitive and needs more attention (if FBO > SY). This was not the case for any ASYA on Kauaʻi. The FBO compared to SY analysis focuses on domestic, commercial, and industrial demands compared to ground water source.

26) Q: What is the list of priorities for determining the SY?
 A: The SY is determined by CWRM, and the methodology is included in the WRPP. [Regarding instream and non-instream uses, a project of the 2019 WRPP Update is to manage instream and non-instream uses to provide reasonable beneficial use while protecting public trust uses. Tasks related to this project include prioritizing streams for developing measurable IFS, continuing to develop measurable IFS, and implementing

and enforcing measurable IFS. This project and tasks are for the goal of "water resources, public trust uses, and water rights are protected and balanced against reasonable beneficial uses."]

27) Q: How are water users allowed to take more water than the current IIFS? I have been living in Hanamāʻulu Valley my entire life and I have witnessed water levels decrease since I was young. If the farmers can only water their crops every other day, where is the water going to come from to support development?
    A: Users are not allowed to divert more water than what was declared in the 1989 IIFS without petitioning to amend the IIFS. CWRM is responsible to receive and process water-related citizen complaints.

28) C: I sent videos of dry streams to CWRM. The response from CWRM was that this may be due to a lack of seasonal rainfall and unusual rainfall may have contributed to lower stream levels. I don't believe this to be true.

29) C: Why does our most precious/valuable resource have limited resources to protect it? CWRM needs additional funding to enforce compliance for reporting data. They currently only have $19M in funding whereas Oregon has $224M.

30) Q: Will there be an opportunity for the public to have a meeting with CWRM to discuss enforcement and illegal stream diversions?
    A: CWRM has monthly hybrid (in-person and virtual) commission meetings. Before the pandemic, CWRM held some meetings on Kauaʻi. There will be public hearings as part of the KWUDP Update adoption. We will relay the message to CWRM that the public is interested in having a meeting.

31) Q: Is there anything helping to invest in the aquifer systems?
    A: KDOW supports the Kauaʻi Watershed Alliance (KWA), whose goal is to provide for the long-term protection of Kauaʻi's uppermost watershed areas. KDOW provides grant money to the KWA to help protect the watershed.

32) C: KDOW provide grants [to the KWA], grants should have more direction into supporting more initiative to expand the watershed.

33) Q: Is there any movement to upgrade or are there investments to recharge the aquifer for future generations? Not just upgrading the system taking water? How can the community hold accountability?
    A: [Watershed management is a critical source protection measure. KDOW supports the Kauaʻi Watershed Alliance, whose goal is to provide for the long-term protection of Kauaʻi's uppermost watershed areas.]

34) C: Maui has good GIS maps.
  A: KDOW is concurrently working on the Water System Investment Plan (WSIP), which is the long-range plan and one of the items in the scope of work is to update the GIS of the KDOW water systems.

35) Q: What is the process for communities to advocate for a fire hydrant in a high risk fire area?
  A: A request may be submitted to the DOW Engineering Division for evaluation of the water system to support a fire hydrant.

36) Q: Is there a plan to share water from the places that have the most water with those that have less water but a larger demand such as agriculture or density?
  A: With regard to agriculture, there are some irrigation systems that can transfer water if they are maintained or repaired. With regard to KDOW's water systems [and other public water systems], there is some interconnectivity but it is very limited. On Oʻahu, the Honolulu Board of Water Supply (HBWS) water system is fully interconnected. This is due to the amount of development on Oʻahu that makes it possible to fund and support an expansive water system. There is significantly less development on Kauaʻi which makes it less feasible to construct, operate, and maintain long transmission water lines to interconnect distant water systems.

37) Q: What is COK's strategy to take measures to ensure that what took place on Maui is not going to repeat itself here? Specifically, in regards to the impact of the redirection of water for the sugar plantations has on the current state of the west side.
  A: The WSIP is updating the hydraulic model to assess the capacity and health of KDOW's water systems. Evaluation of the KDOW water systems with the hydraulic model will help direct future investment in expanding or upgrading the water systems. In Waimea, there's the Waimea Watershed Agreement, [which is an agreement between DHHL, Kauaʻi Island Utility Cooperative (KIUC), and the Agribusiness Development Association (ADC)]. This agreement was developed because there was a case where more than what was needed was being diverted, and the IIFS were amended to prevent future waste. CWRM was involved with the development of the Waimea Watershed Agreement.

38) Q: How often is KDOW required to update the WUDP? How long is each WUDP applicable for? The last KWUDP was written in 1990 and so far, the graphs shared have been assigned an end date of 2035. A plan completed and adopted in early 2024 should be planning for more than the next 11 years.
  A: Ideally, KDOW would like to update the KWUDP every 5-10 years. The KWUDP Update process was started in 2015 but waited for the new SY numbers to be finalized (in the 2019 WRPP Update).

39) Q: When is the projected time of completion of the report?
   A: The next steps is to brief CWRM in Fall 2023. Based on comments received from these public meetings and the CWRM briefing, KDOW will finalize the report and present to CWRM for adoption in 2024.

40) Q: Is there a chain of command graph that shows all the agencies (federal, state, county, community)?
   A: Yes, the Hawaii Water Plan handout shows the agencies responsible to prepare the different components (CWRM – Water Resource Protection Plan, DOH – Water Quality Plan, DNLR – State Water Projects Plan, DOA – Agricultural Water Use and Development Plan, Counties Department of Water – County Water Use and Development Plan). The Hawaii Water Plan is described in more detail in Chapter 1 of the KWUDP Update.

41) C: Former U.S. State Representative Kai Kahele asked current U.S. State Representative Ed Case what he is doing about surface water diversions on private land. Rep. Ed Case responded that they only require reporting on state land streams. USGS said if you divert from a stream, you deplete the aquifer, so how can you get an accurate picture of future use? We need to push the State to require anyone who has a diversion on their land to report to CWRM. CWRM hasn't done any enforcement.

NEXT STEPS:

FAINC will brief the Commission on Water Resource Management (CWRM) and revise the KWUDP Update based on comments received from these public meetings and the CWRM briefing. The Pre-Final KWUDP Update will then be presented to the Kauaʻi Board of Water Supply, then to CWRM for adoption. It is noted that the CWRM adoption process also includes public hearings.

Kauaʻi Water Use & Development Plan Update
Second Series of Public Meetings
August 10, 2023
Kalāheo Neighborhood Center
5PM to 6:15 PM

ATTENDANCE:
KDOW: Joe Tait (Manager and Chief Engineer), Michael Hinazumi (Deputy Manager), Jason Kagimoto (Engineering Division Head), Regina Flores (Engineering Division, Water Resources & Planning, WRP, Section Head), Erin Doi, Margie Mills (Engineering Division, WRP Section), Dalenna Lara-Vargas, Kai Mottley (WRP), Claus Bollmann (Project Management), Jonell Kaohelaulii (Public Relations, PR)
Fukunaga & Associates, Inc. (Consultant): Amanda Waki, Amanda Miyahara
Planning: Marie Williams

PURPOSE:
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The meeting started with an introduction by Jason Kagimoto and was followed by a presentation by Fukunaga & Associates. The draft KWUDP Update is posted on KauaiWater.org/KWUDP.asp.

DISCUSSION:
These notes reflect the questions and concerns voiced by attendees at the Kalāheo meeting. (Q = question; A = answer; C = comment.)

1) Q: What is the status of the Agricultural Water Use and Development Plan (AWUDP) Update?
   A: The Department of Agriculture (DOA) published the public review draft of the AWUDP Update in 2019. However, this update primarily focused on inventorying irrigation systems and has not been adopted by CWRM.

2) Q: Who is responsible for fire hydrant maintenance?
   A: The Kauaʻi Department of Water (KDOW) Operations Division. KDOW is coordinating with the Fire Department and is also updating their GIS system.

3) Q: Should DOW consider retaining reservoirs?
   A: This is something that is currently being discussed between KDOW and DOA, who are trying to establish an initiative to identify which reservoirs are to remain and which reservoirs can be removed.

4) Q: Has there been specialized meetings (farmers, developers, etc.) whose needs are different than the general public?
   A: Yes, a Stakeholder Advisory Group (SAG) has been established that represent a broad spectrum of Kauaʻi's community, including farmers, developers, and water operators. Three separate meetings have been held with the SAG.

5) Q: Will recycled water be utilized in the Kōloa area?
   A: There are plans to have a regional system to provide more municipal wastewater collection and treatment that would provide recycled water. Two wastewater treatment plants (WWTPs) in the Kōloa area currently provide recycled water to irrigate golf courses. If demand is warranted, the utilities will need to invest money into infrastructure to distribute the recycled water to farther locations.

6) Q: Is there enough water for future development?
   A: According to the sustainable yield (SY), yes. However, it is noted that the SY does not consider the feasibility of developing the groundwater and should not be equated to available developable groundwater. In addition, money may need to be invested in infrastructure.

7) Q: Is Polihale State Park supplied by KDOW water?
   A: No, Polihale State Park is served from a State water system (Polihale State Park Water System), which is owned by the Department of Land and Natural Resources.

NEXT STEPS:
Fukunaga will brief the Commission on Water Resource Management (CWRM) and revise the KWUDP Update based on comments received from these public meetings and the CWRM briefing. The Pre-Final KWUDP Update will then be presented to the Kauaʻi Board of Water Supply, then to CWRM for adoption. It is noted that the CWRM adoption process also includes public hearings.

Kauaʻi Water Use & Development Plan Update
Second Series of Public Meetings
August 15, 2023
Waimea Neighborhood Center
5 PM

PURPOSE:
The purpose of this series of five (5) public meetings is to present the draft Kaua'i Water Use and Development Plan (KWUDP) Update and its findings.

The intent of this series of meetings is to create an understanding of the purpose and intent of the KWUDP Update and the context in which it is being developed. The public meetings give the community an opportunity to provide feedback and express any concerns that they may have about the KWUDP Update. No members of the public attended this meeting.

The draft KWUDP Update is posted on KauaiWater.org/KWUDP.asp.

NEXT STEPS:
Fukunaga will brief the Commission on Water Resource Management (CWRM) and revise the KWUDP Update based on comments received from these public meetings and the CWRM briefing. The Pre-Final KWUDP Update will then be presented to the Kauaʻi Board of Water Supply, then to CWRM for adoption. It is noted that the CWRM adoption process also includes public hearings.

APPENDIX C3

DHHL Beneficiary Public Meeting Summaries (2023)

Kauaʻi Water Use & Development Plan Update
DHHL Beneficiary Public Meetings
March 21, 2024
Anahola Neighborhood Center
6:30 PM to 7:30 PM

ATTENDANCE:
KDOW: Joe Tait (Manager and Chief Engineer), Michael Hinazumi (Deputy Manager), Jason Kagimoto (Engineering Division Head), Erin Doi, Margie Mills (Engineering Division, Water Resources & Planning, WRP Section), Russell Sagucio (WRP Section)
DHHL: Cherie Kaanana (Water Program Specialist), Nancy McPherson (Kauaʻi Liaison, Planner), Erna Kamibayashi, Jonathan Scheuer
Fukunaga & Associates, Inc. (Consultant): Amanda Waki, Amanda Miyahara, Lance Fukumoto

PURPOSE:
The purpose of these DHHL beneficiary public meetings is to present the draft Kaua'i Water Use and Development Plan (KWUDP) Update and its findings.

The intent of this series of meetings is to create an understanding of the purpose and intent of the KWUDP Update and the context in which it is being developed. The public meetings give the community an opportunity to provide feedback and express any concerns that they may have on the KWUDP Update.

The meeting started with an introduction by Jason Kagimoto and was followed by a presentation by Fukunaga & Associates. The public review draft of the KWUDP Update is posted on KauaiWater.org/KWUDP.asp.

DISCUSSION:
These notes reflect the questions and concerns voiced by attendees at the Anahola meeting. (Q = question; A = answer; C = comment.)

1) Q: What year were the interim instream flow standards (IIFS) adopted and why was that year selected?
   A: The IIFS were adopted in 1988. The Hawaiʻi Water Code, which was enacted in 1987, required that the Commission on Water Resource Management (CWRM) establish instream flow standards for every stream in the state within one year (1988). Due to the lack of staffing and funding, IIFS were adopted by CWRM as the amount of water flowing in each stream at the time the IIFS became effective. It is assumed that no additional diversions beyond what was declared at that time is allowed without amending the IIFS. Some IIFS have been updated since 1988 (e.g., IIFS for streams in the Waimea surface water hydrologic unit were amended to take steps to restore flow in the streams as a result of the Waimea Watershed Agreement).

2) C: I am interested in agriculture. As a beneficiary of DHHL, we haven't been awarded anything since 1985. The Puʻu Opae reservoir was supposed to be rehabilitated, but it hasn't happened. The Agribusiness Development Corporation (ADC) has our water. Water reservations reserve the water, but it is difficult to get the water to where the beneficiaries need it.

3) Q: How is the projected DHHL potable water demand determined? Can you provide a breakdown for how much water will be serving residential development, agriculture development, etc.?
   A: The projected DHHL potable water demand is from the 2017 DHHL State Water Projects Plan (SWPP). The demand was based on the DHHL Island Plans that were available at the time the DHHL SWPP was prepared. The Kauaʻi Island Plan includes land use designations for the future use of DHHL. For example, the Kauaʻi Island Plan proposes the following for the Anahola Tract: ~1,200 residential units, ~100 acres of subsistence agriculture, ~1,000 acres of general agriculture, ~70 acres of commercial, etc. Planning level water rates (gallons per acre or unit per day) were applied to the land use designations in order to calculate the projected (future) water demand, similar to the full build-out demand calculations.

4) Q: Why is 2017 data from DHHL used in the KWUDP update and not more current information?
   A: In coordination with CWRM to prepare the KWUDP update, we were directed to use the most recent adopted/approved reports, which is the 2017 DHHL SWPP. [The 2021 Statewide SWPP also include/incorporate the 2017 DHHL SWPP.]

5) Q: Shouldn't the data be analyzed so that the projected demands are conservatively high, rather than conservatively low?
   A: The full build-out demand projections are conservatively high. The full build-out demand projections assume that all land area is developed to its theoretical maximum extent and results in a conservatively high estimate.

6) Q: How are DHHL water reservations determined? Who else has water reservations?
   A: The DHHL water reservation amounts were supported by preliminary findings in the 2017 DHHL SWPP, which was based on proposed land uses in DHHL's Kauaʻi Island Plan. Currently, only DHHL has water reservations.

7) Q: What needs to be done if DHHL needs more water reservations?
   A: DHHL would need to apply for additional water reservations with CWRM.

8) Q: Does projected water demand mean that we've used almost all of our water and we need more?
   A: No, projected water demands are future water use. The DHHL projected water demands (DHHL future water use) were calculated in a similar way to the full build-out demands

where the tract acreages (future residential, agricultural, commercial, etc.) were multiplied by standard planning water unit rates to estimate the future water needs of DHHL.

9) Q: If DHHL has a 1.47 mgd water reservation for the Anahola and Moloaʻa tracts, who's to say that Līhuʻe or other areas won't take some of this water as they expand?
   A: 1.47 mgd is reserved specifically for DHHL tracts in the Anahola ASYA. CWRM must incorporate and protect the DHHL water reservations in its decisions related to the planning for, regulation, management, and conservation of water resources in the State.

NEXT STEPS:
A public hearing will be held by CWRM on May 21st at the Kauaʻi Community College. The KWUDP Update will then be revised based on comments received at the CWRM briefing held in December 2023, these DHHL public meetings, and the public hearing. The KWUDP Update will then be presented to the Kauaʻi Board of Water Supply, then to CWRM for adoption.

Kauaʻi Water Use & Development Plan Update
DHHL Beneficiary Public Meetings
March 28, 2024
Kekaha Enterprise Center
6:30 PM to 8:30 PM

ATTENDANCE:
KDOW: Joe Tait (Manager and Chief Engineer), Michael Hinazumi (Deputy Manager), Jason Kagimoto (Engineering Division Head), Regina Flores (Engineering Division, Water Resources & Planning, WRP, Section Head), Erin Doi, Margie Mills (Engineering Division, WRP Section), Russell Sagucio (WRP Section)
DHHL: Cherie Kaanana (Water Program Specialist), Nancy McPherson (Kauaʻi Liaison, Planner), Jonathan Scheuer, Rhonda Gadingan
Fukunaga & Associates, Inc. (Consultant): Amanda Waki, Amanda Miyahara, Lance Fukumoto

PURPOSE:
The purpose of these DHHL beneficiary public meetings is to present the draft Kaua'i Water Use and Development Plan (KWUDP) Update and its findings.

The intent of this series of meetings is to create an understanding of the purpose and intent of the KWUDP Update and the context in which it is being developed. The public meetings give the community an opportunity to provide feedback and express any concerns that they may have on the KWUDP Update.

The meeting started with an introduction by Jason Kagimoto and was followed by a presentation by Fukunaga & Associates. The public review draft of the KWUDP Update is posted on KauaiWater.org/KWUDP.asp.

DISCUSSION:
These notes reflect the questions and concerns voiced by attendees at the West Kauaʻi meeting.
(Q = question; A = answer; C = comment.)

1) Q: Can DHHL develop its own water system to serve its beneficiaries so that beneficiaries can get off the waitlist and onto the land? We have been told in the past that DHHL can't develop homestead lots due to the lack of water or infrastructure.
   A (DHHL): Yes, DHHL has the ability to own and operate its own water utilities, but it is very expensive to construct, operate, and maintain water utilities in addition to the expense to construct homestead lots. DOW is generally better equipped to operate and maintain water systems so DHHL and DOW will have discussions on how to plan for the future.

2) Q: The Puʻu ōpae reservoir was supposed to be rehabilitated as part of KIUC's West Kauaʻi Energy Project but it's been cancelled. What's the status of the rehabilitation?
   A (DHHL): The Puʻu ōpae Settlement Plan is still viable but will take a lot longer than originally anticipated since it was dependent on the infrastructure to be installed by KIUC. DHHL will need to find additional funding to enable the settlement as planned.

3) Q: There are reasonable grounds to debate the confidence of the sustainable yield and that it may not be applicable anymore due to lower groundwater aquifer recharge and climate change. How confident is DOW on the sustainable yield numbers for Kauaʻi?
   A (DOW): The sustainable yield is set by CWRM. Even if the sustainable yield is lower, the existing and projected demands are far below the sustainable yield, and infrastructure is what is limiting how much water can be supplied. CWRM did evaluate past studies and generally selected the most conservative (i.e., lowest) sustainable yield estimate. The sustainable yield may change in the future. CWRM will host a public meeting for the KWUDP Update on May 21st, 2024 and this question can be asked then.

4) Q: The sustainable yield as reported isn't necessarily the amount of ground water that can be feasibly developed. Does DOW have an "effective" sustainable yield based on calculations for reasonable infrastructure costs to deliver water to users?
   A: The KWUDP does not evaluate water systems' infrastructure. The KWUDP is a high-level planning document used to assess the sustainability of the County's land use plans and policies. DOW is developing the Water System Investment Plan (WSIP), which is a long-range infrastructure plan to expand or upgrade water systems that will be most beneficial to communities. DOW will conduct public meetings for the WSIP in late summer/early fall.

5) Q: What's the status of the Agricultural Water Use and Development Plan (AWUDP)? Will it include a break down on the surface water consumption for agricultural, commercial, and residential use?
   A: [A public review draft of the AWUDP was published in 2019 but it has not been adopted.] Ideally, the AWUDP will include a break down on surface water consumption but due to funding issues, the Department of Agriculture (DOA) is not able to assess the irrigation systems to the fullest extent.

6) Q: One of the KWUDP resource strategy recommendations is to "meet future demands at a reasonable cost." How does DHHL and DOW get money to develop infrastructure?
   A (DOW): The DOW Manager and Chief Engineer will be in Washington, D.C. in two weeks to advocate for federal funding, which has never been done before for DOW projects.
   A (DHHL): The DHHL Chairman is also working with their federal grants specialist to secure $800 million in federal funding, and has received $600 million from the legislature to reduce the DHHL homestead waitlist. A Strategic Plan to spend the $600 million allocation of funding is published on DHHL's website. DHHL will also be working with DOW to install infrastructure and expand water systems to serve beneficiaries.

7) Q: Are there discussions within the County on prioritizing water needs for Hawaiian homes? Due to low funding, DHHL has been one of the last agencies to install infrastructure. DHHL has a superior right to water.

A: The future demands from the 2017 DHHL State Water Projects Plan (SWPP) has been incorporated into the KWUDP Update. The full build-out projections (which include DHHL's future demands) are lower than the sustainable yield which <u>theoretically</u> means that there is enough water. However, the feasibility of developing the water source varies and installing the infrastructure to distribute the water is costly and takes time.

8) Q: Can the first objective of the KWUDP and WSIP be to serve DHHL beneficiaries?

A (DOW): Ultimately, DOW's objective is to pursue multiple funding sources and based on compliance laws and discussions as a collaborative (including DHHL), decide where and how to spend the money.

9) Q: Who are the people and agencies that need to collaboratively work together in order to best benefit DHHL beneficiaries?

A (DOW): The County Council committee members are elected by the public to represent the public.

10) Q: Are private citizens legally allowed to develop a well on their property for their own personal use?

A: Yes, the property owner will need to obtain a permit from CWRM prior to drilling and development of the well. The property owner is also required to report their usage to CWRM.

NEXT STEPS:
A public hearing will be held on May 21st at the Kauaʻi Community College. The KWUDP Update will be revised based on comments received at the CWRM briefing held in December 2023 and from these DHHL public meetings. The Pre-Final KWUDP Update will then be presented to the Kauaʻi Board of Water Supply, then to CWRM for adoption.