
Chapter 20103

Wailua Aquifer System Area

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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 ASYA 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 Kaua‘i General Plan

The 2000 Kaua‘i 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

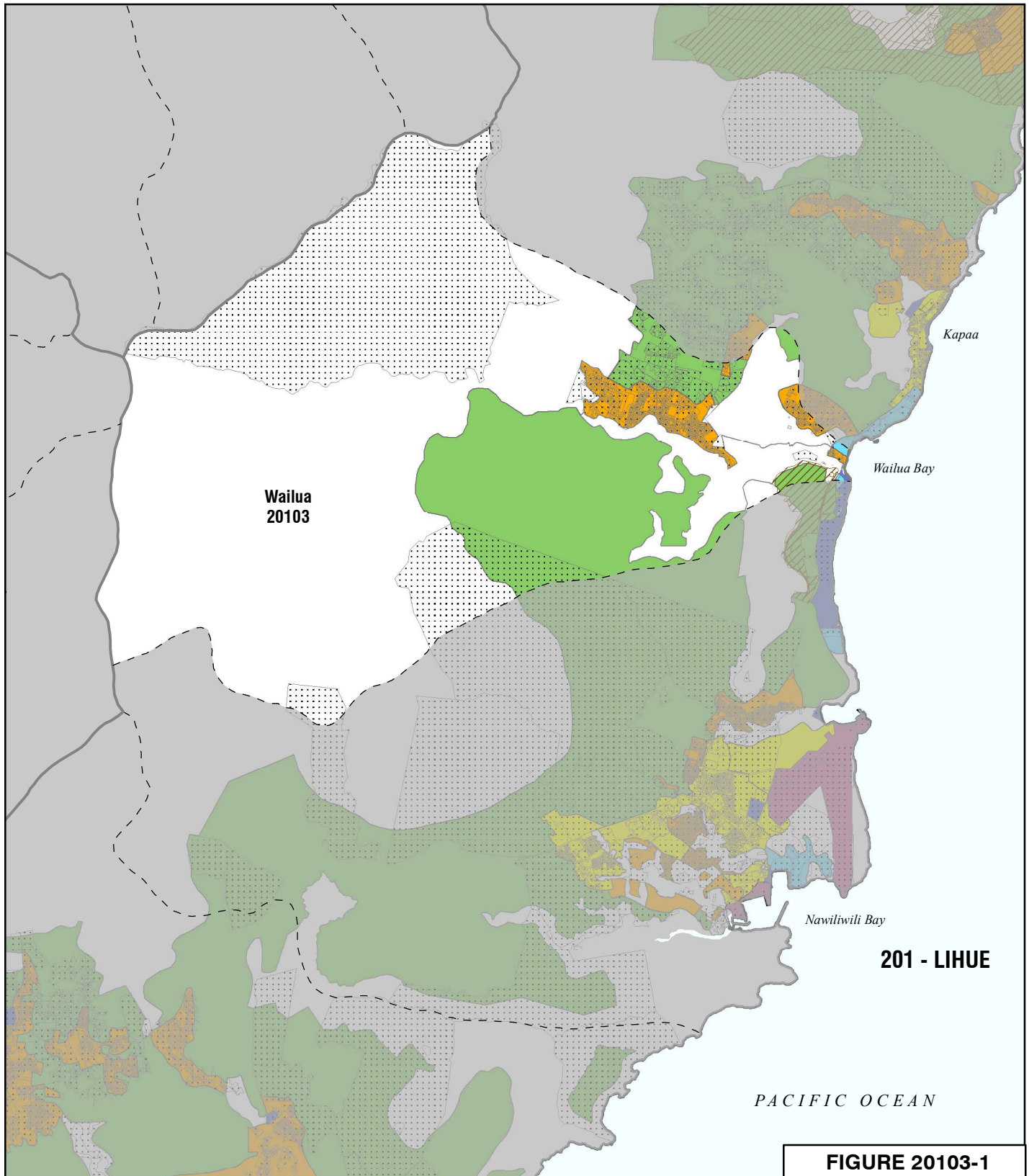
20103-1.3.2 Kaua‘i Zoning

Kaua‘i 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.



201 - LIHUE

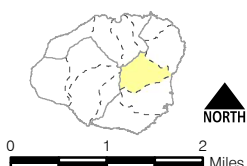
PACIFIC OCEAN

FIGURE 20103-1

**GENERAL PLAN
LAND USE MAP**

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

Land Use Allocation Guide

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

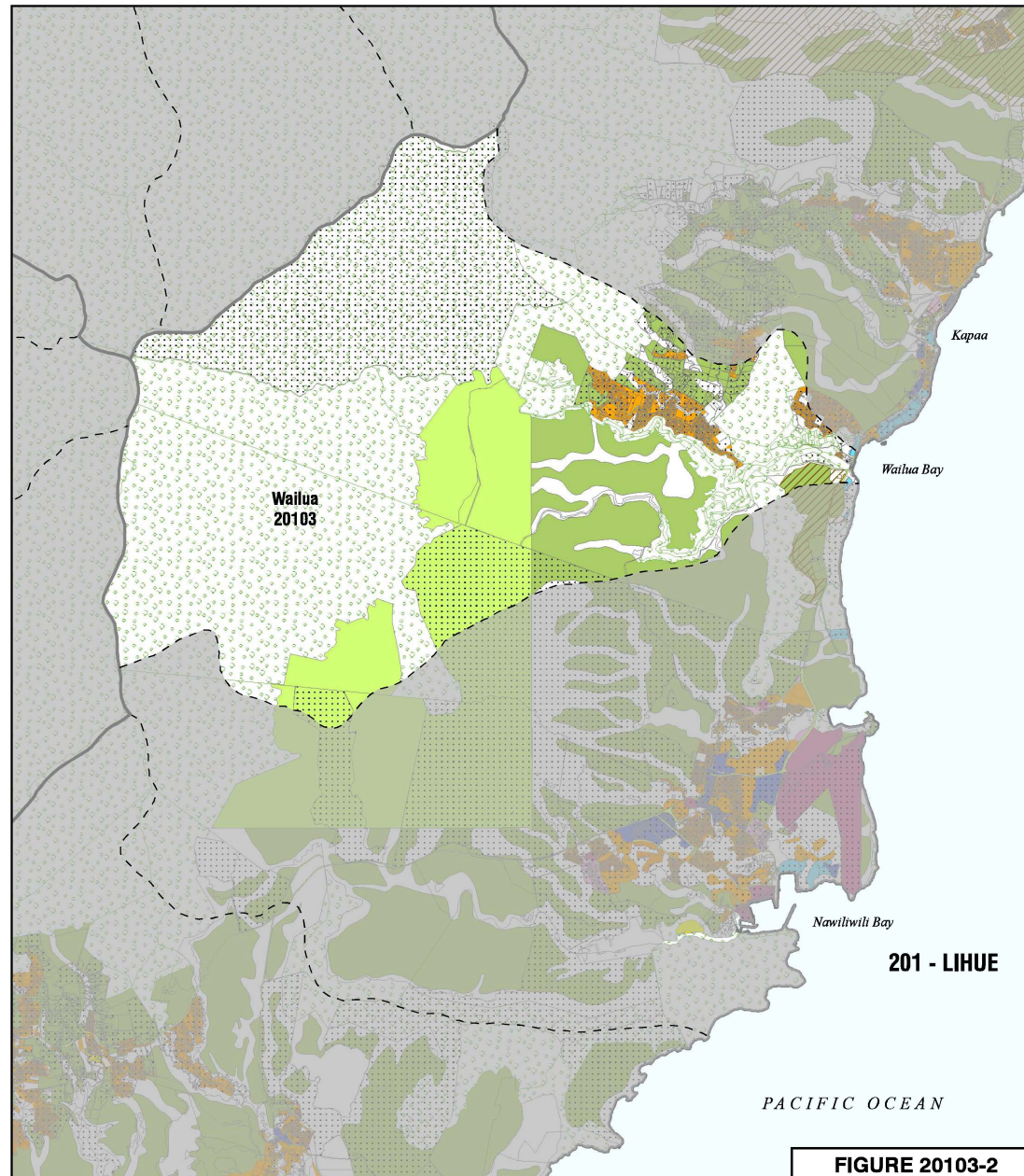
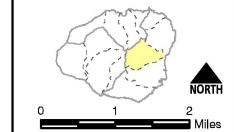


FIGURE 20103-2

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:
 WAILUA - 20103

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

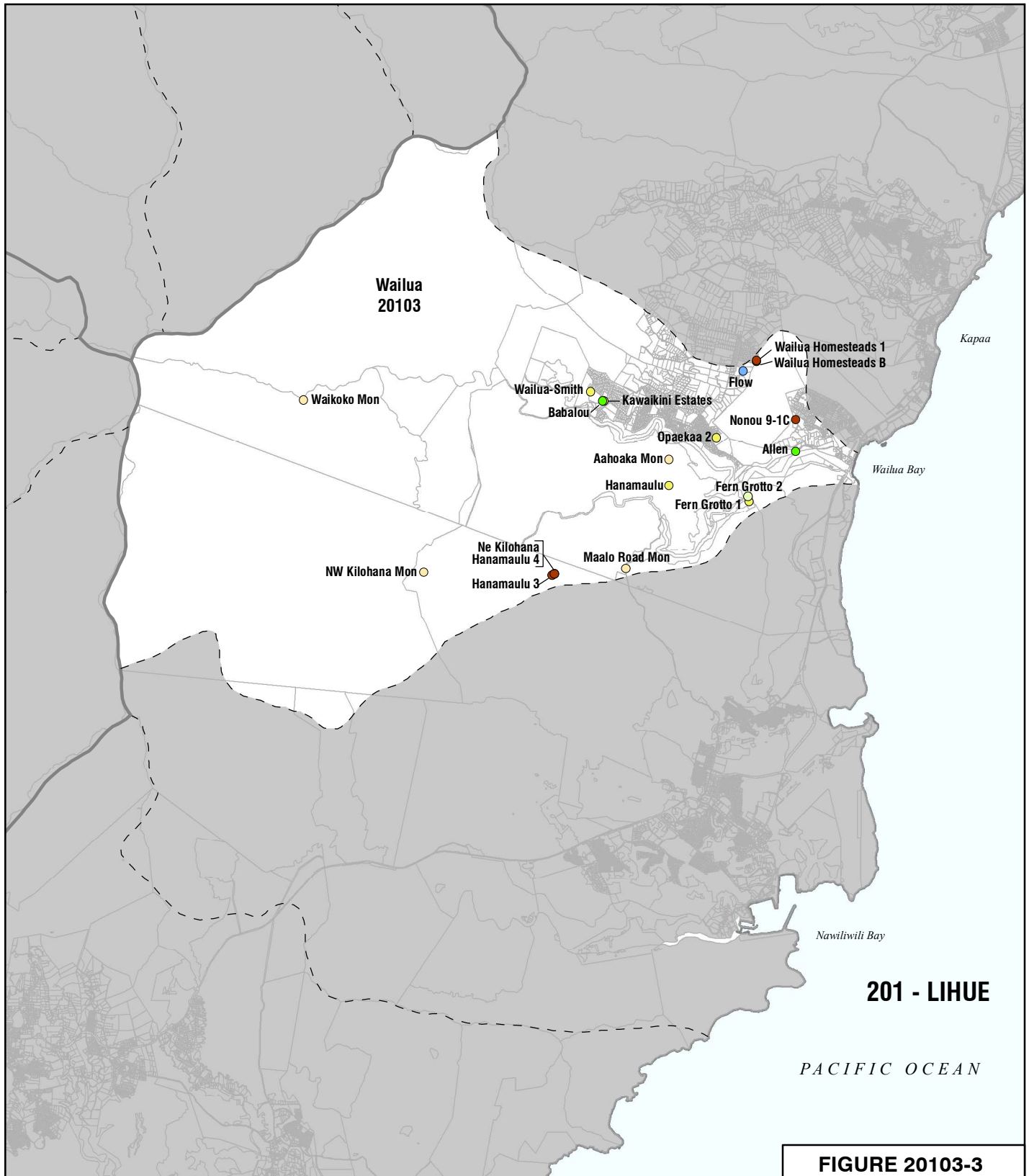
Water conservation increases the amount of water available and helps to ensure the long-term viability of water resources. Water conservation measures for this ASYA are as described in **Section 1.5.7** of this report. There are no ASYA specific special conservation measures in place at this time.

20103-2.4 Rainwater Catchment

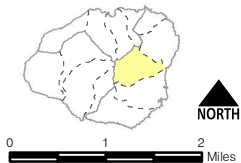
Rainwater catchment is a viable resource for areas that are not served by ground water or surface water. **Figure 20103-5** shows the possible catchment areas, or parcels with a building value greater than \$20,000 and assumed to be developed but without a ground water or surface water source.

20103-2.5 Recycled Water

There are no wastewater reclamation facilities in the Wailua ASYA.



INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- - - Aquifer System Areas
- TMK

Well Use Types

- Abandoned
- Agriculture
- Domestic
- Industrial

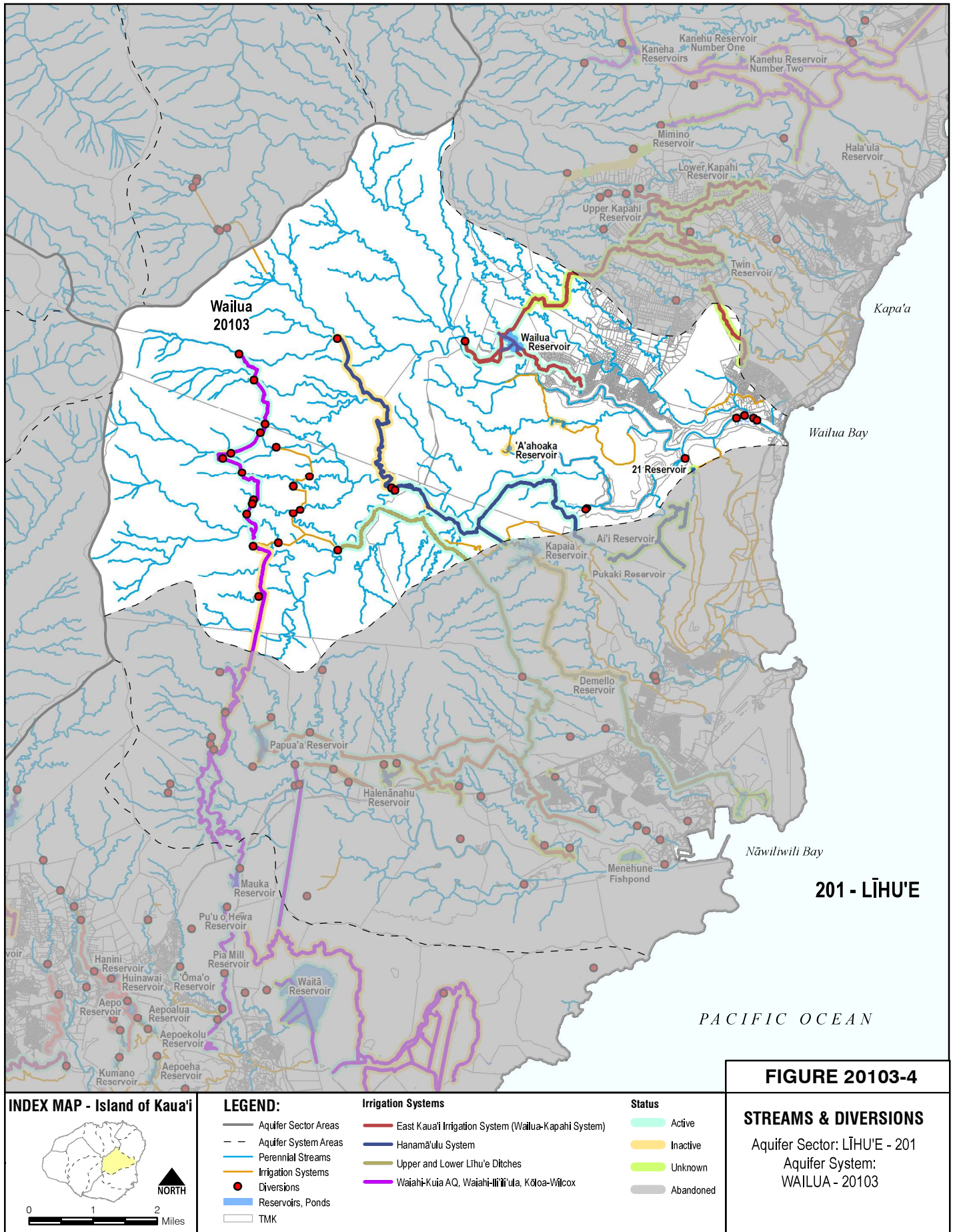
- Irrigation
- Military
- Municipal
- Observation
- Other

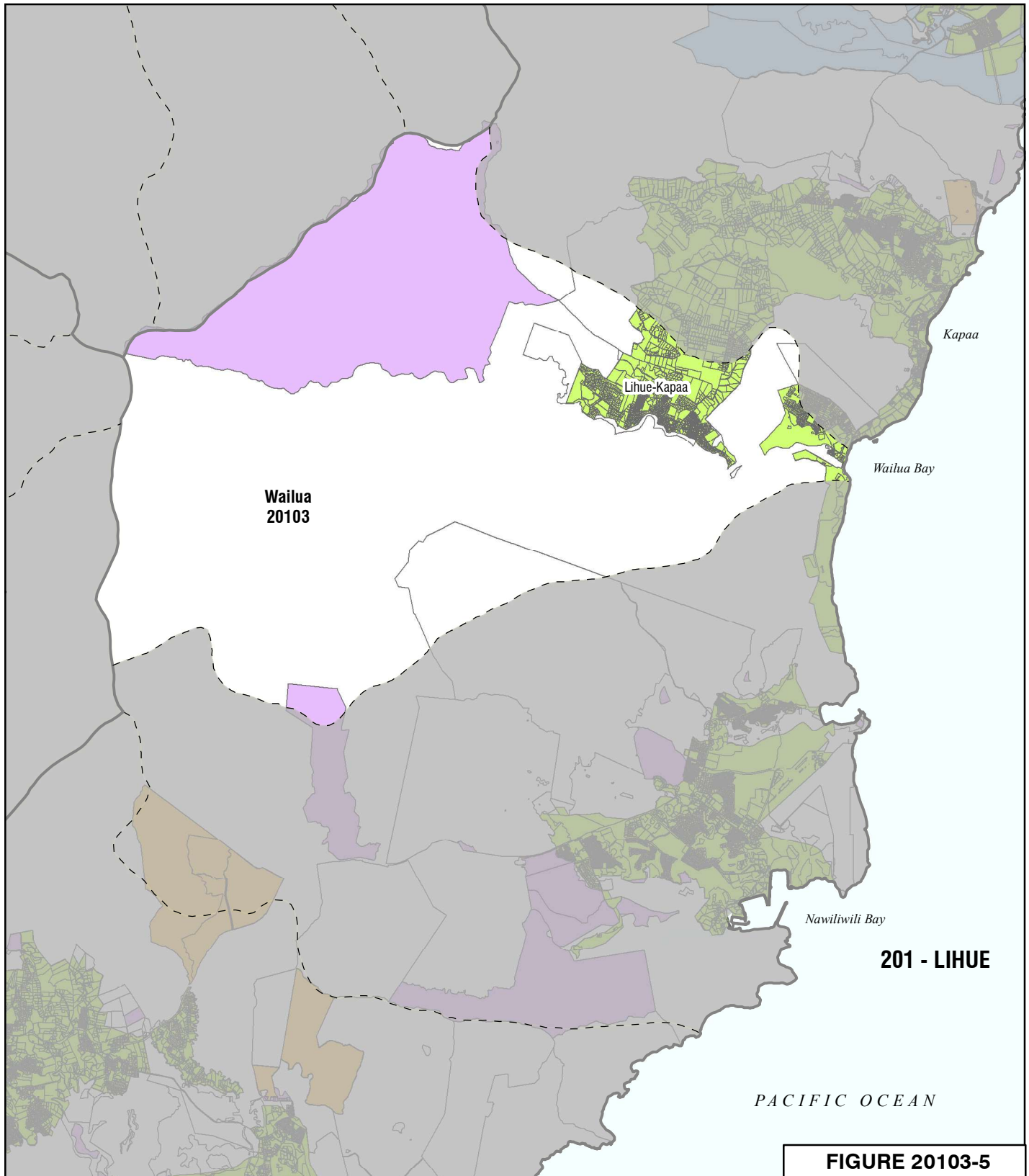
- Unused

FIGURE 20103-3

WELL LOCATION

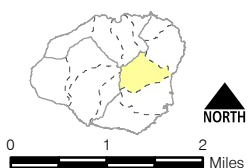
Aquifer Sector: LIHUE - 201
Aquifer System:
WAILUA - 20103





201 - LIHUE

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 20103-5

WATER SYSTEM & SERVICE AREA

Aquifer Sector: LIHUE - 201
Aquifer System:
WAILUA - 20103

20103-3 EXISTING WATER USE

20103-3.1 General

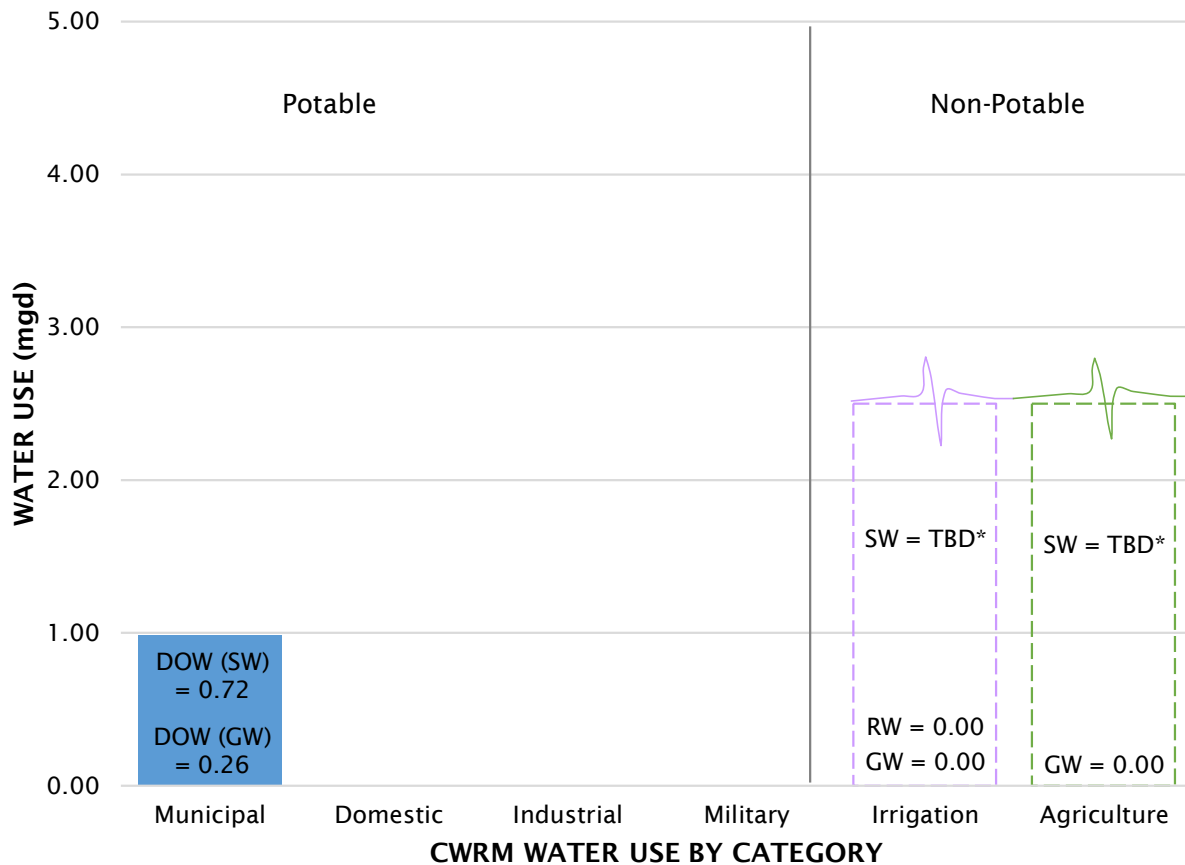
The following section presents the total estimated average water use within the Wailua ASYA. The total estimated average water use was based on data from CWRM (well pumpage) and DOH (Sanitary Surveys for Public Water Systems and estimated recycled water usage) for the year of 2014. Well classification 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 diversion¹, 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 Līhu‘e Plantation Company for their sugar operations and were later sold to KIUC when Līhu‘e 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

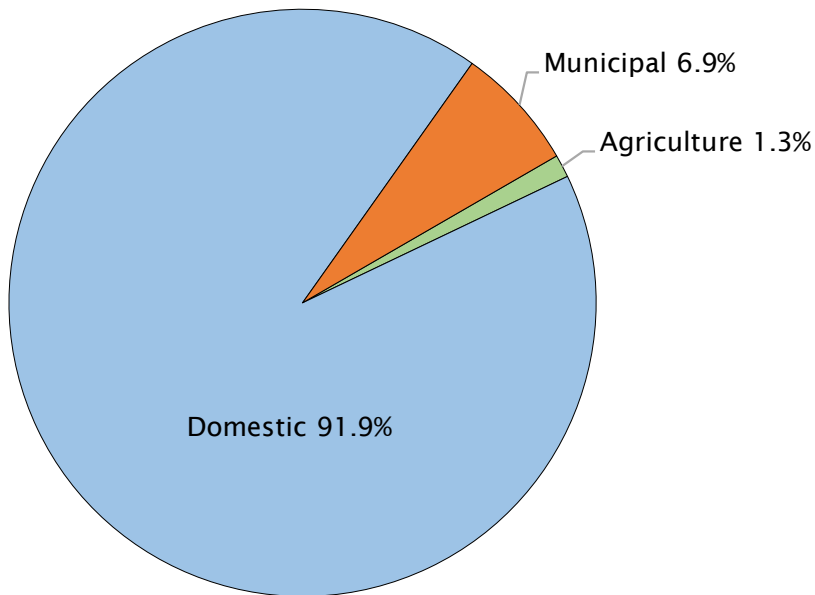
The DOW has one major water system that services the Wailua ASYA. The Līhu‘e-Kapa‘a water system is DOH Public Water System (PWS) No. 400 and is the largest water system on Kaua‘i. This water system services areas in three ASYAs and consists of three subsystems – 1) Līhu‘e-Hanamā‘ulu subsystem, 2) Puhi 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.

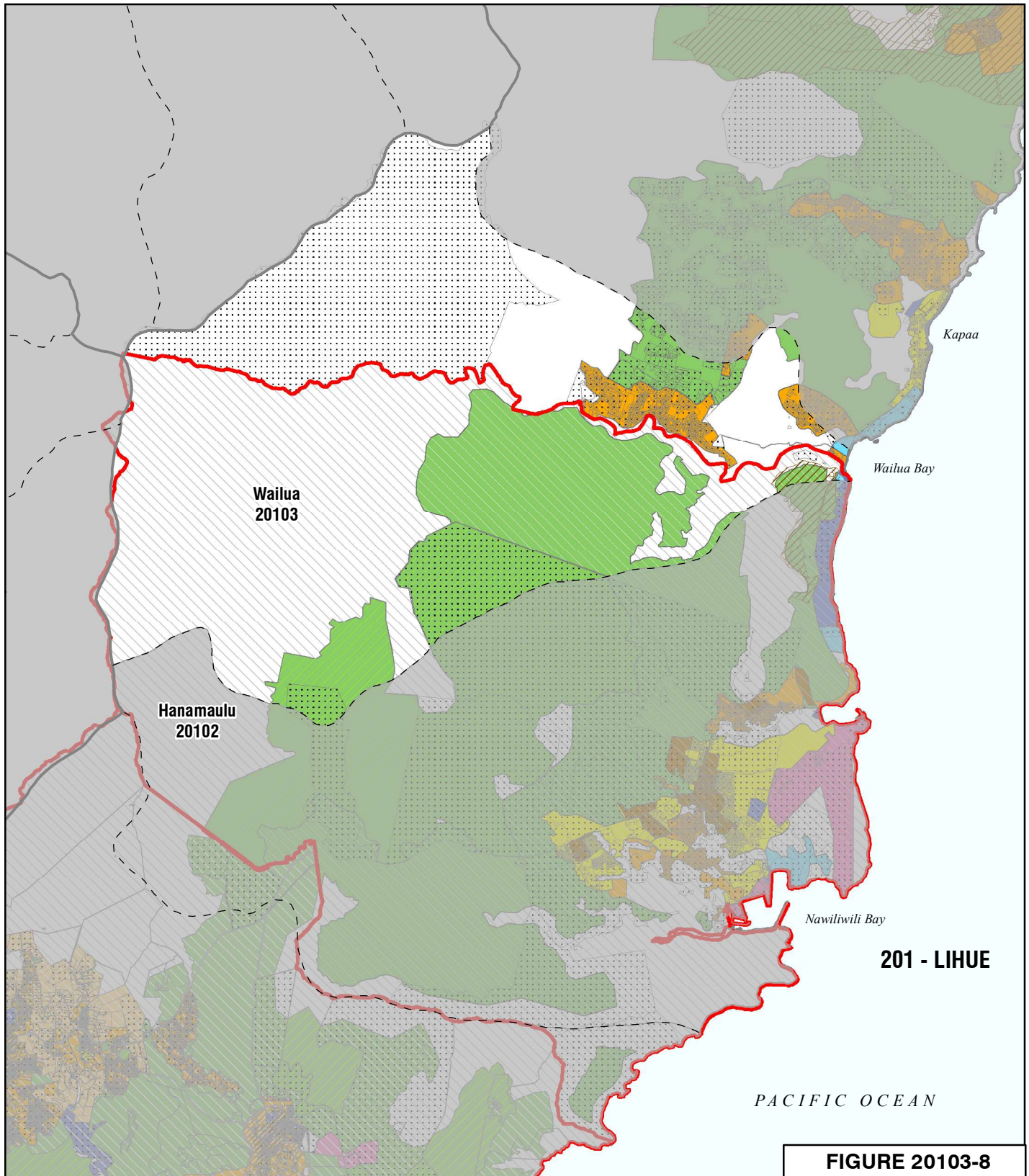
Table 20103-9a: General Plan Full Build-Out Water Demand Projection – Wailua ASYA

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



201 - LIHUE

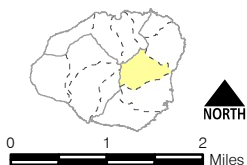
PACIFIC OCEAN

FIGURE 20103-8

**GENERAL PLAN REFINED
BY COMMUNITY PLAN**

Aquifer Sector: LIHUE - 201
Aquifer System:
WAILUA - 20103

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- - Aquifer System Areas
- Community Plan Boundaries
- ▨ Hawaiian Home Lands
- Developed Properties

Land Use Allocation Guide

- Agricultural
- Open
- Park
- Residential Community
- Resort

Community Plan

- Agricultural (IAL)
- Agricultural (Other)
- Natural
- Parks and Recreation
- Resort

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)
 $= 1.78 - 0.03 + 0.05$
 $= \mathbf{1.80 \text{ mgd}}$

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/Municipal	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 Hawai'i 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 Hanamā'ulu 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 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

5,301 acres of agricultural lands within the Wailua 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 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 $\geq$ 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

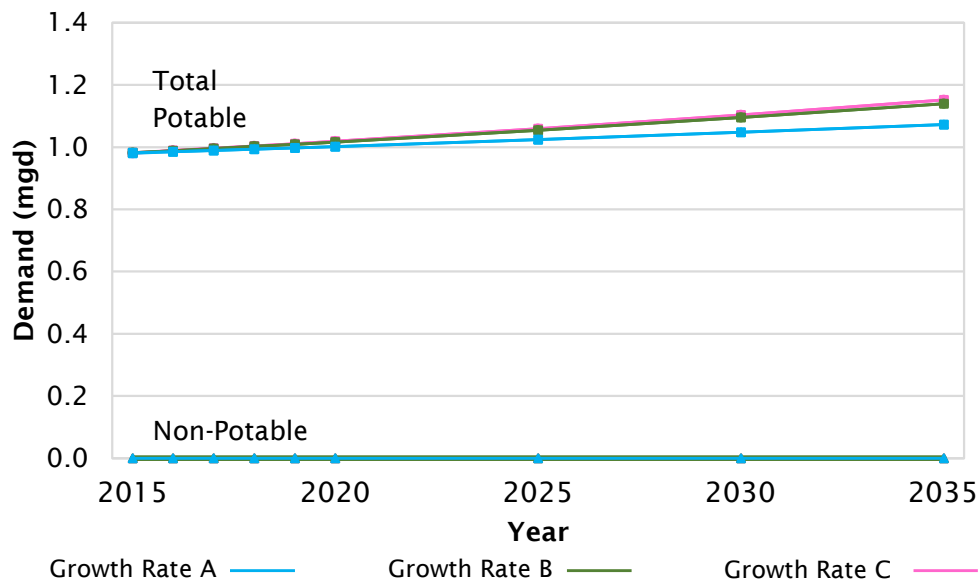


Figure 20103-10 shows the breakdown of water demand projections for a medium growth rate by CWRM categories through the year 2035. Table 20103-14 summarizes this figure.

Figure 20103-10: Medium Growth Rate B Water Demand Projection by Category – Wailua ASYA

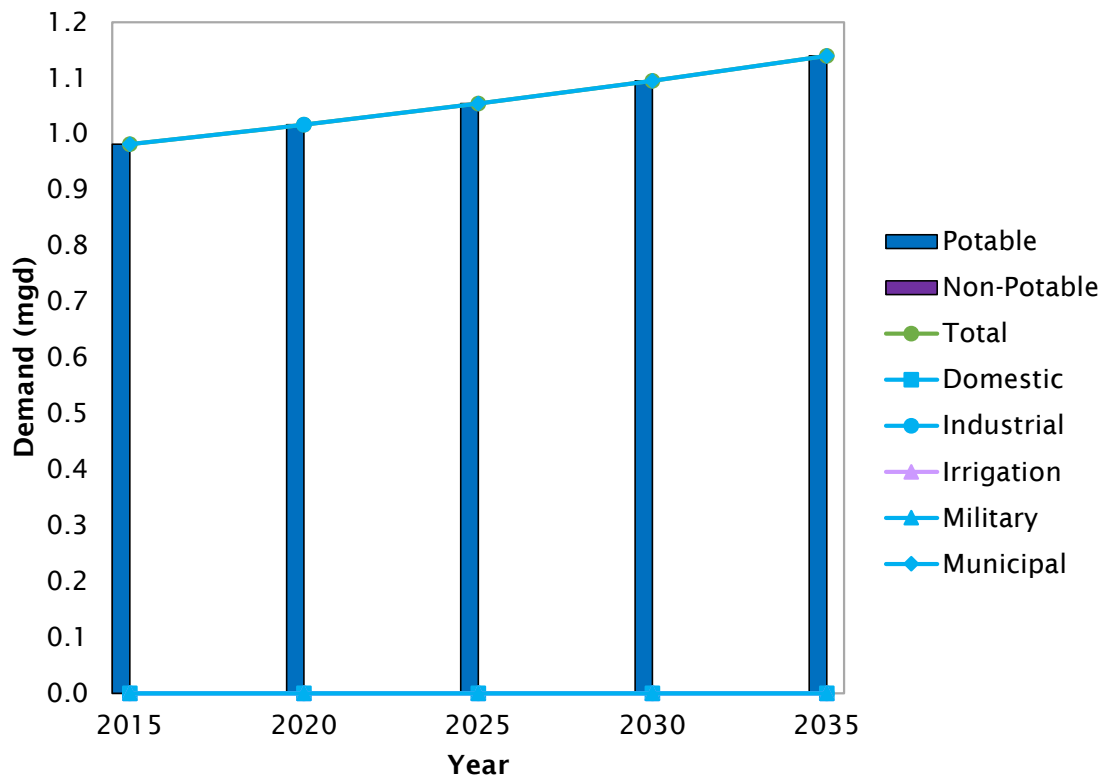


Table 20103-14: Medium Growth Rate B Water Demand Projection by Category – Wailua ASYA

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

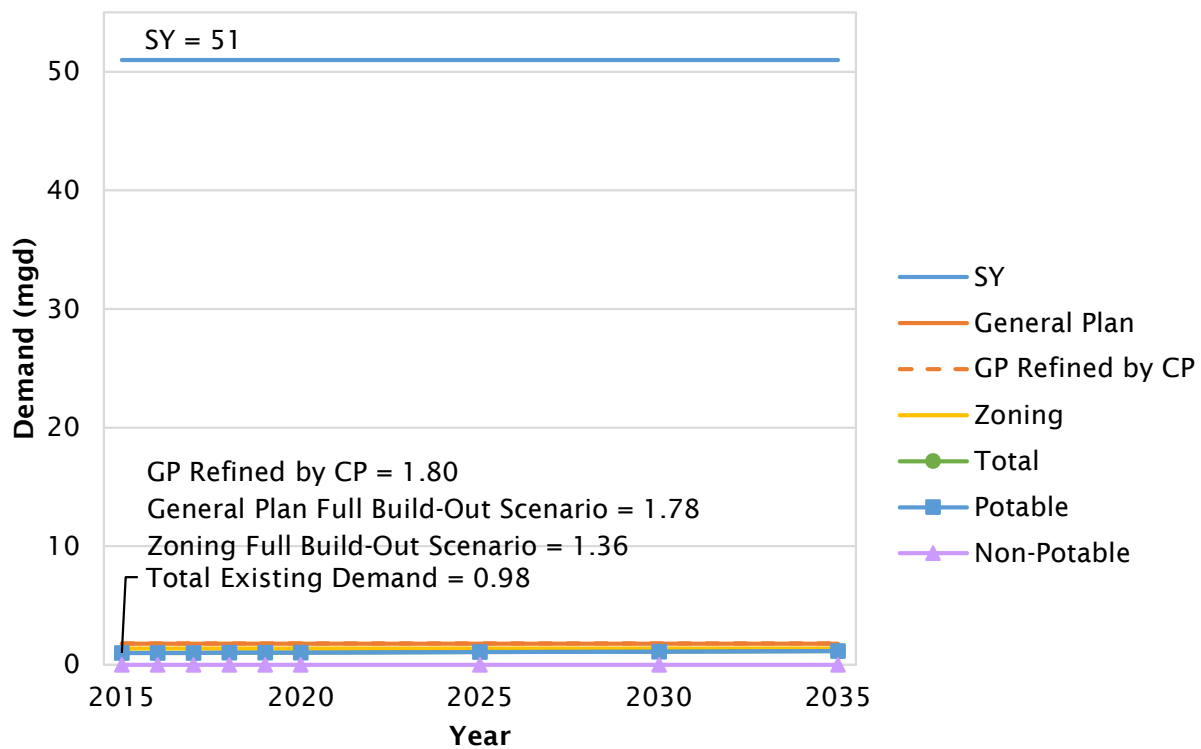
20103-4.3 Summary

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-Kapa'a 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, 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.

The East Kaua'i Irrigation System (EKIS) is a complex system of interconnecting ditches, tunnels, flumes, and reservoirs and extends across the Hanamā'ulu 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-Kapa'a subsystem which services areas in the Hanamā'ulu ASYA, Wailua ASYA, and Anahola ASYA. The Wailua-Kapa'a 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.