
Chapter 20301

Kekaha Aquifer System Area

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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 Hā‘ele‘ele Valley to about Ola Road in Waimea Town, approximately along Waimea Canyon Drive and Kōke‘e Road on the east, and from Kōke‘e Road (east of the Lua Reservoir) back to the shoreline along the south ridge of the Hā‘ele‘ele 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 Kaumuali‘i 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 health 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 Kekaha 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

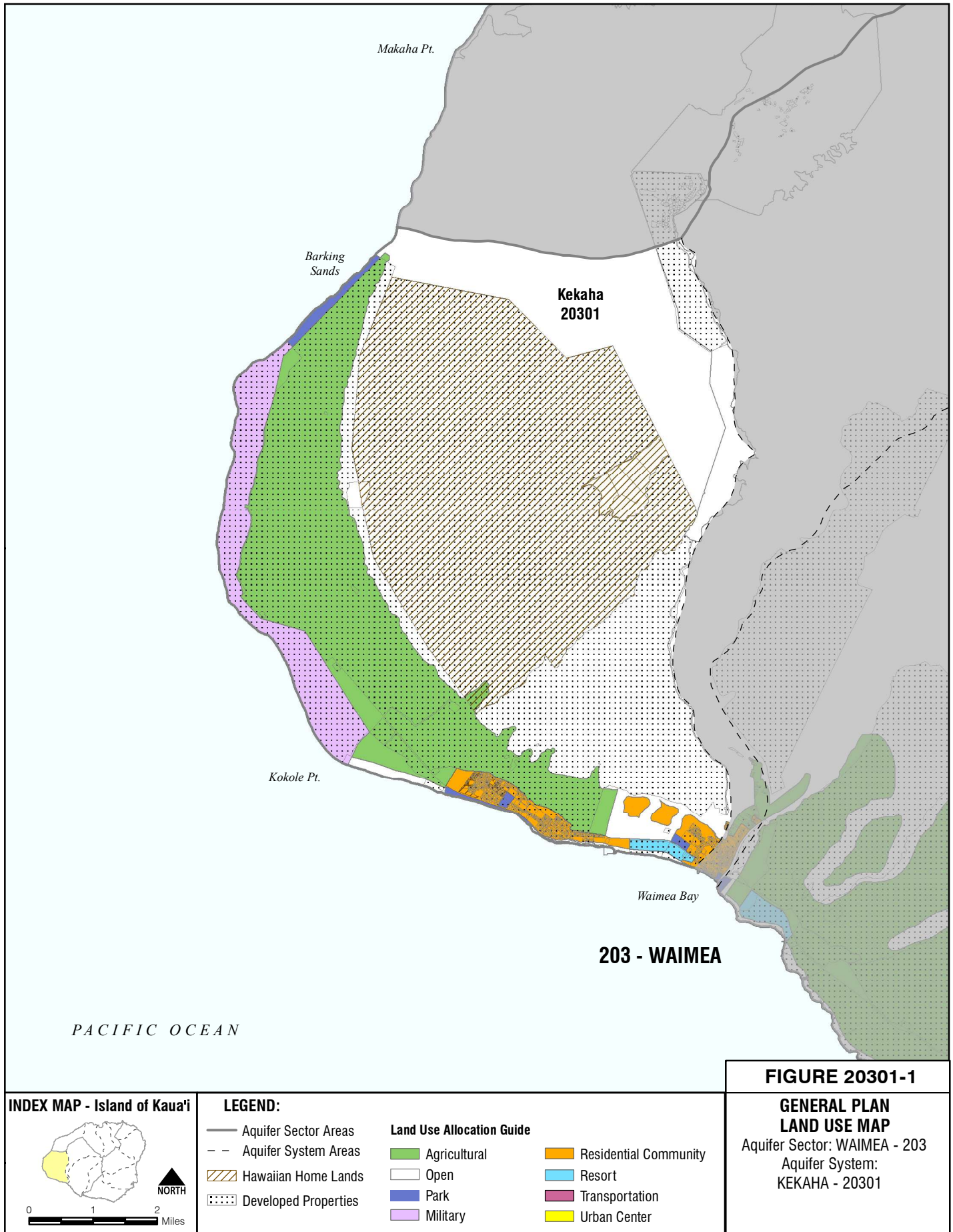
20301-1.3.2 Kaua'i Zoning

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.



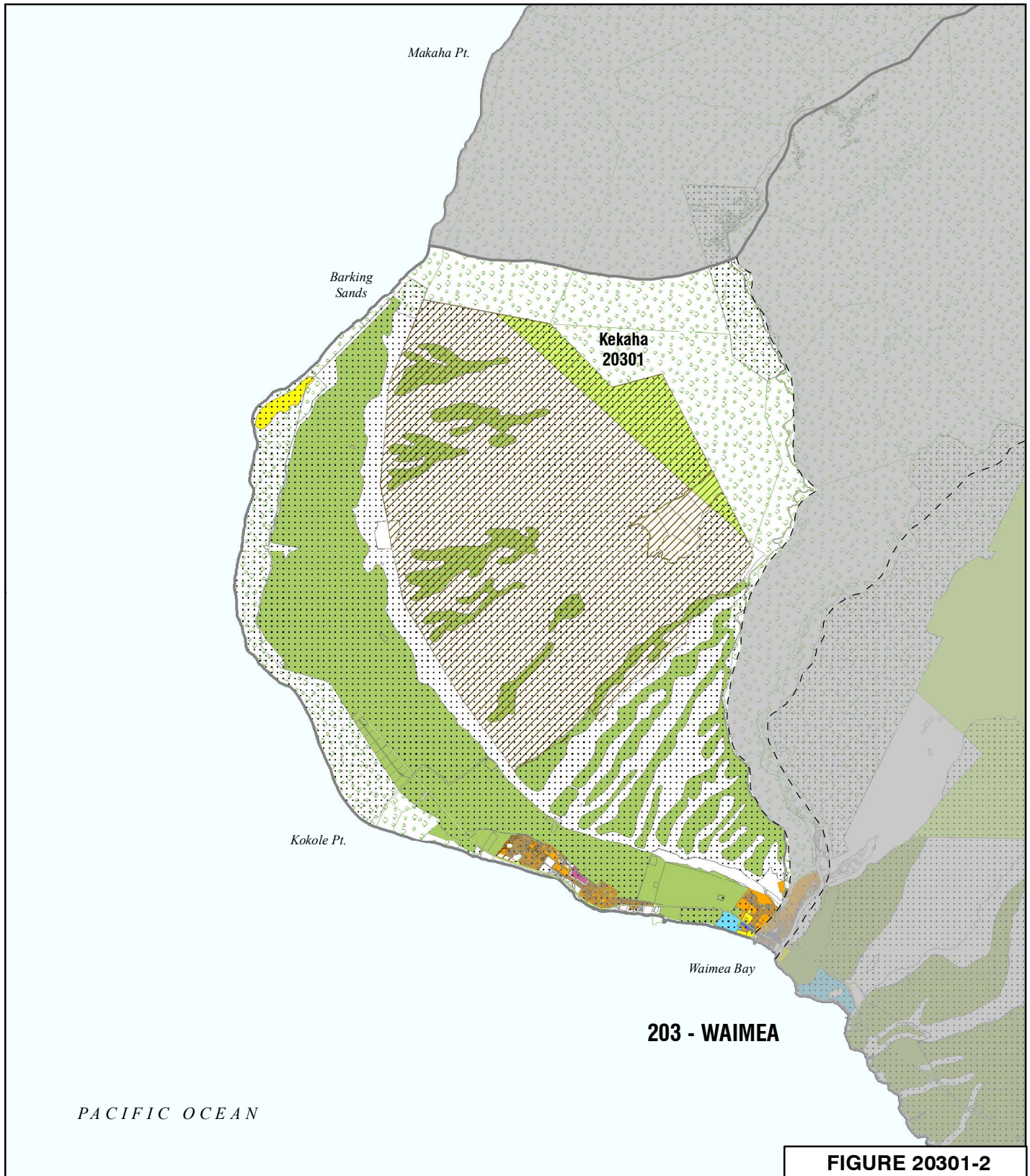
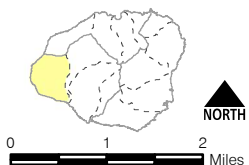


FIGURE 20301-2

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. Ka’awaloa Stream, Nahomalu Stream, Ka’ula’ula Stream, and Hā’ele’ele 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 Kōke’e Ditch above the Pu’u 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 Koai’e 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 Hawai‘i 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, Kawaikōi 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)

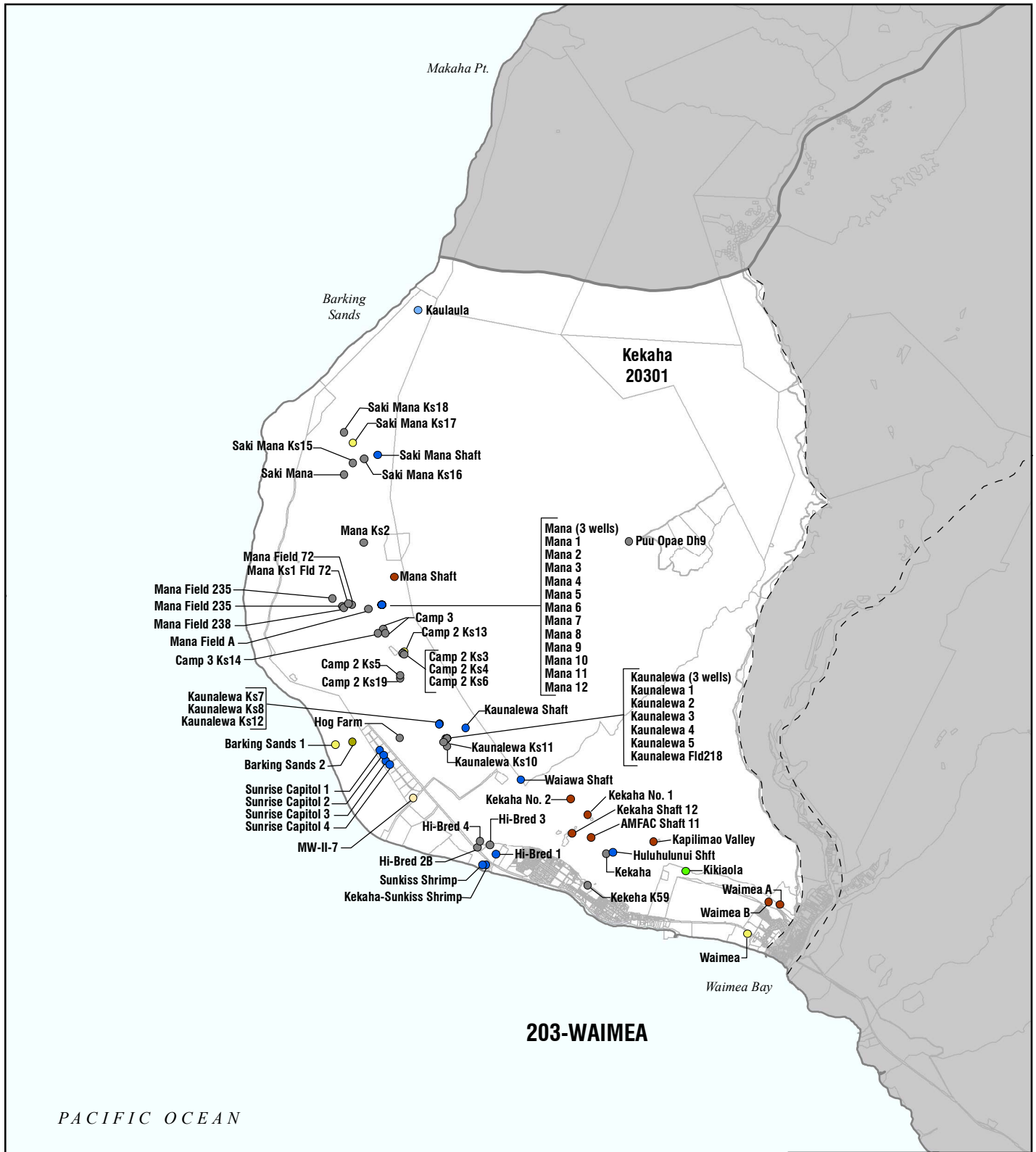
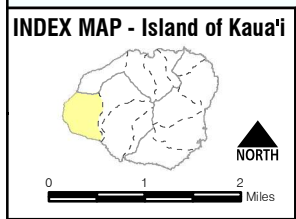


FIGURE 20301-3



LEGEND:	
— Aquifer Sector Areas	Well Use Types
- - - Aquifer System Areas	● Abandoned
□ TMK	● Agriculture
	● Domestic
	● Industrial
	● Irrigation
	● Military
	● Municipal
	● Observation
	● Other
	● Unused

WELL LOCATION

Aquifer Sector: WAIMEA - 203
 Aquifer System: KEKAHA - 20301

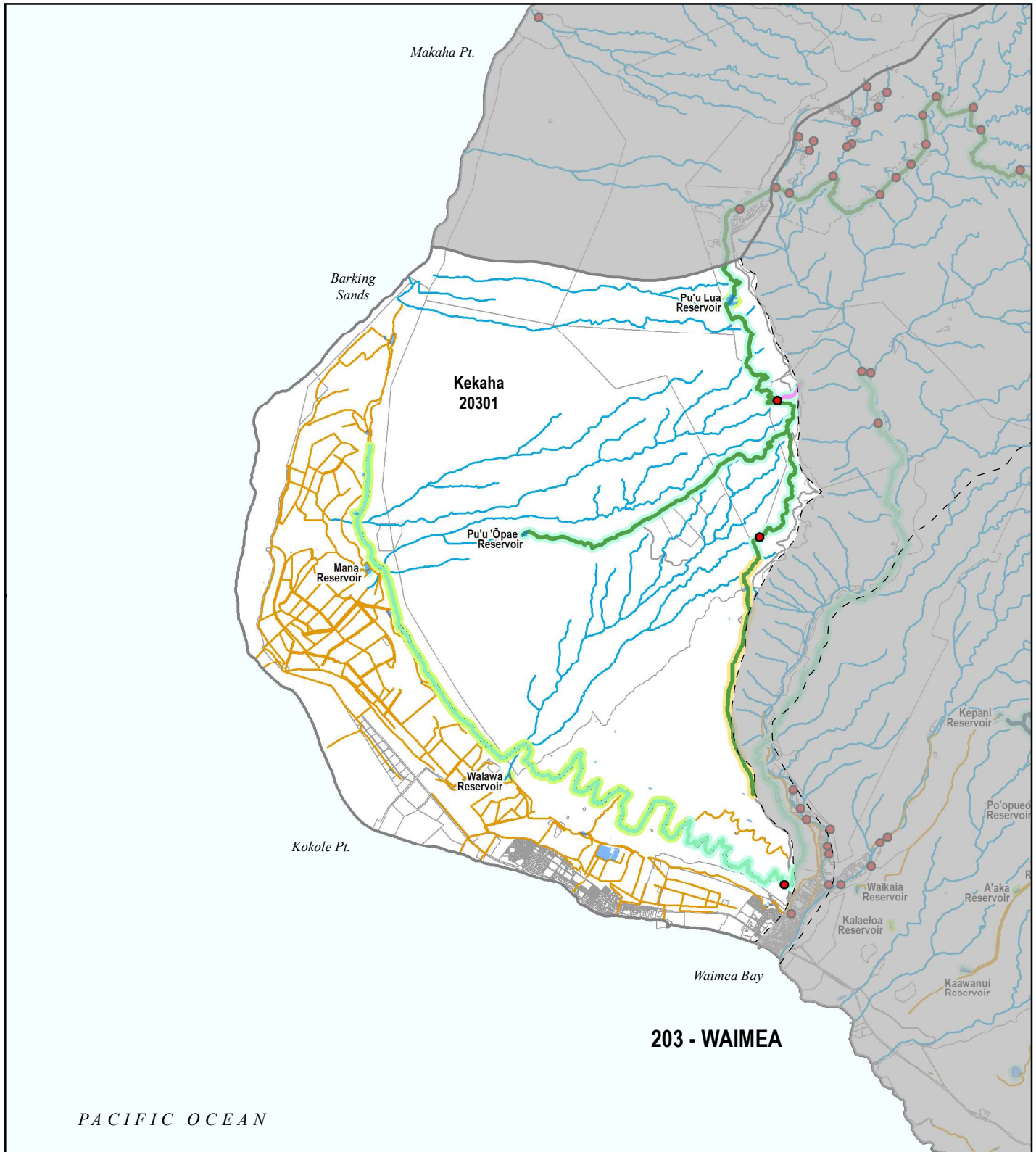
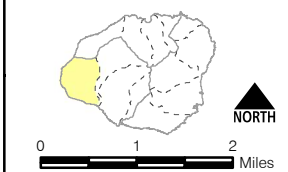


FIGURE 20301-4

STREAMS & DIVERSIONS

Aquifer Sector: WAIMEA - 203
 Aquifer System:
 KEKAHA - 20301

INDEX MAP - Island of Kaua'i



LEGEND:

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

Irrigation Systems

- Kekaha Ditch
- Kōke'e Ditch
- Waimea Canyon Comfort Station

Status

- Active
- Inactive
- Unknown
- Abandoned

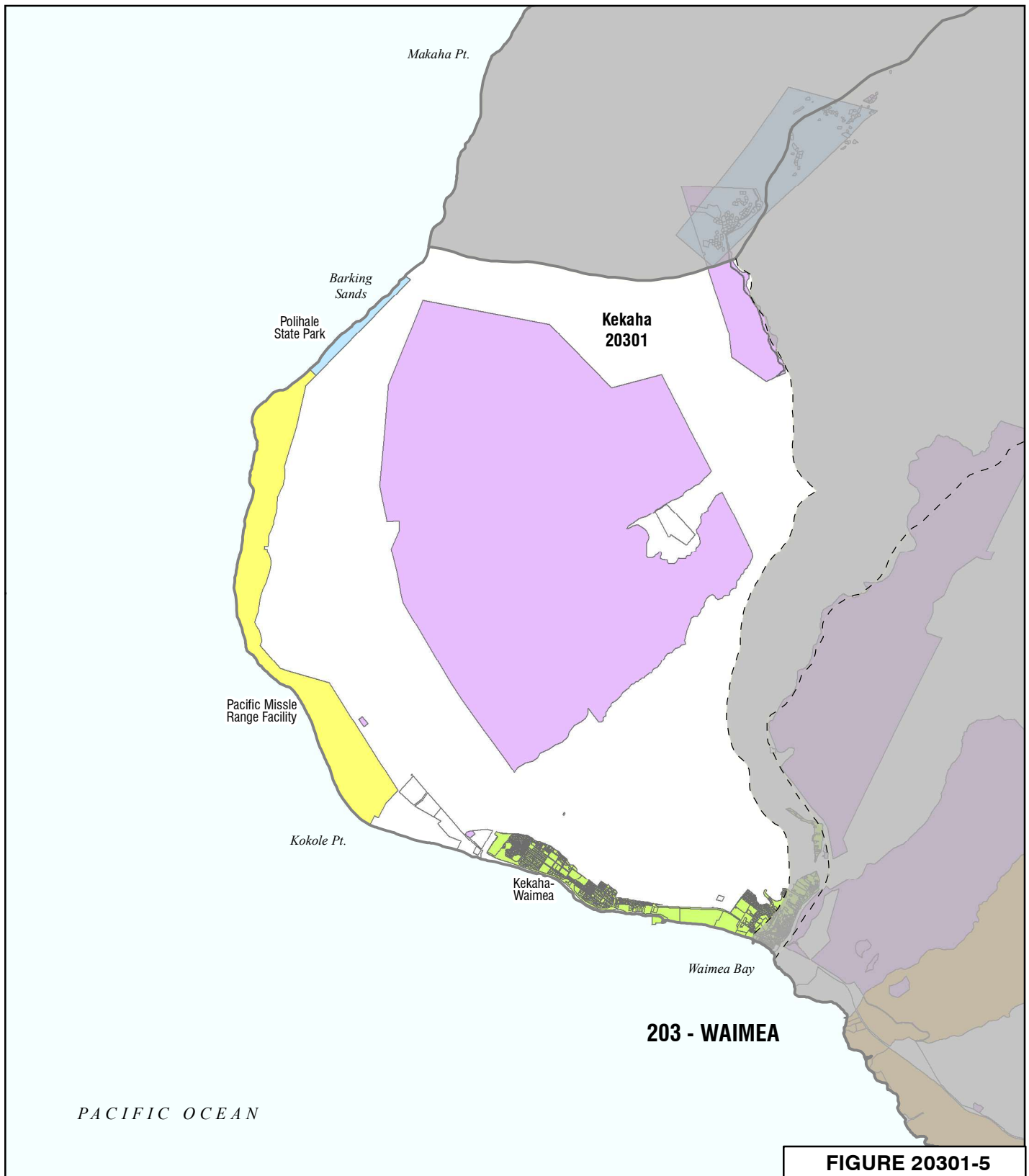
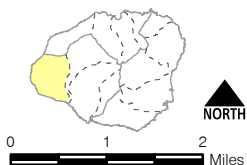


FIGURE 20301-5

**WATER SYSTEM
& SERVICE AREA**

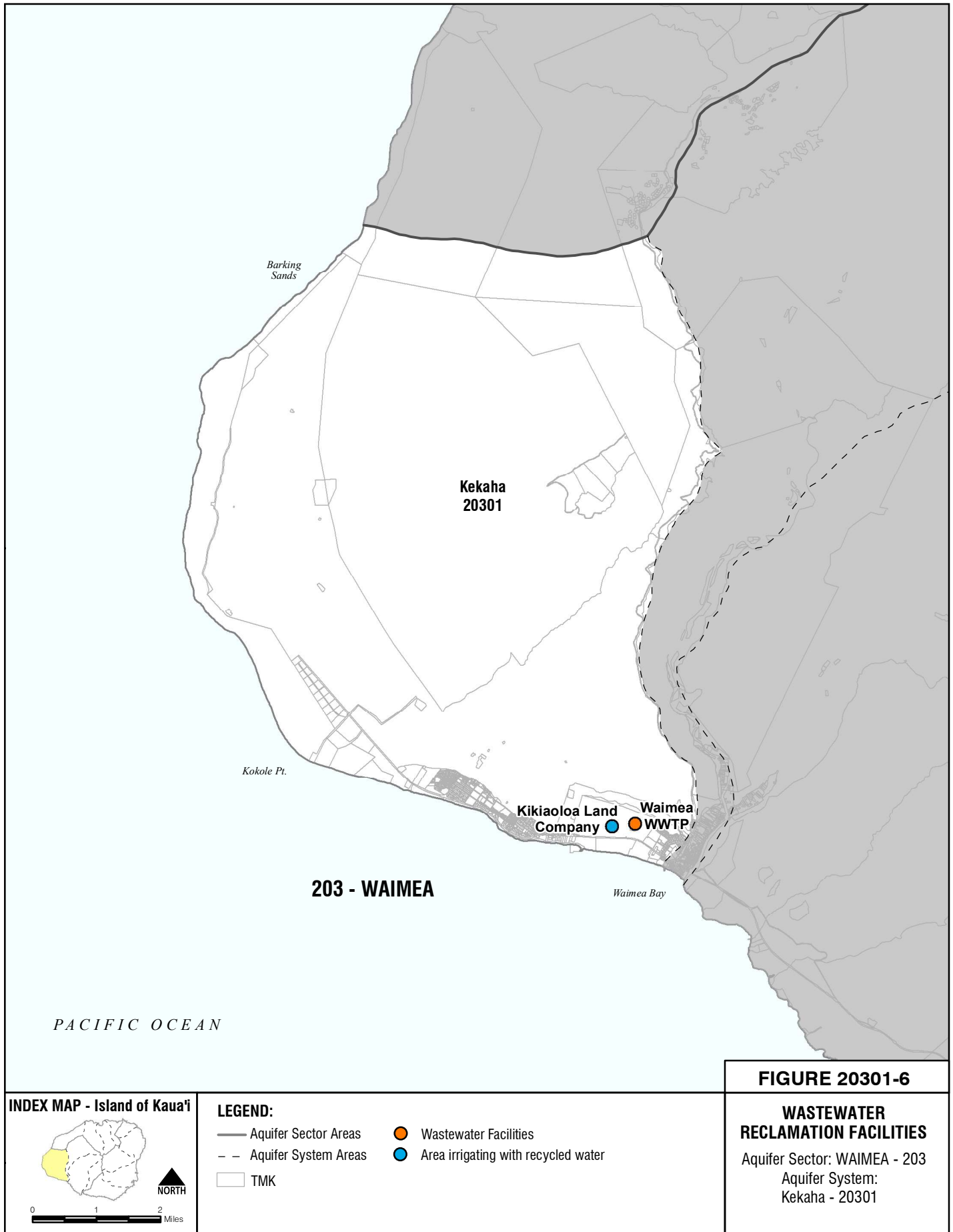
Aquifer Sector: WAIMEA - 203
 Aquifer System:
 KEKAHA - 20301

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)



20301-3 EXISTING WATER USE

20301-3.1 General

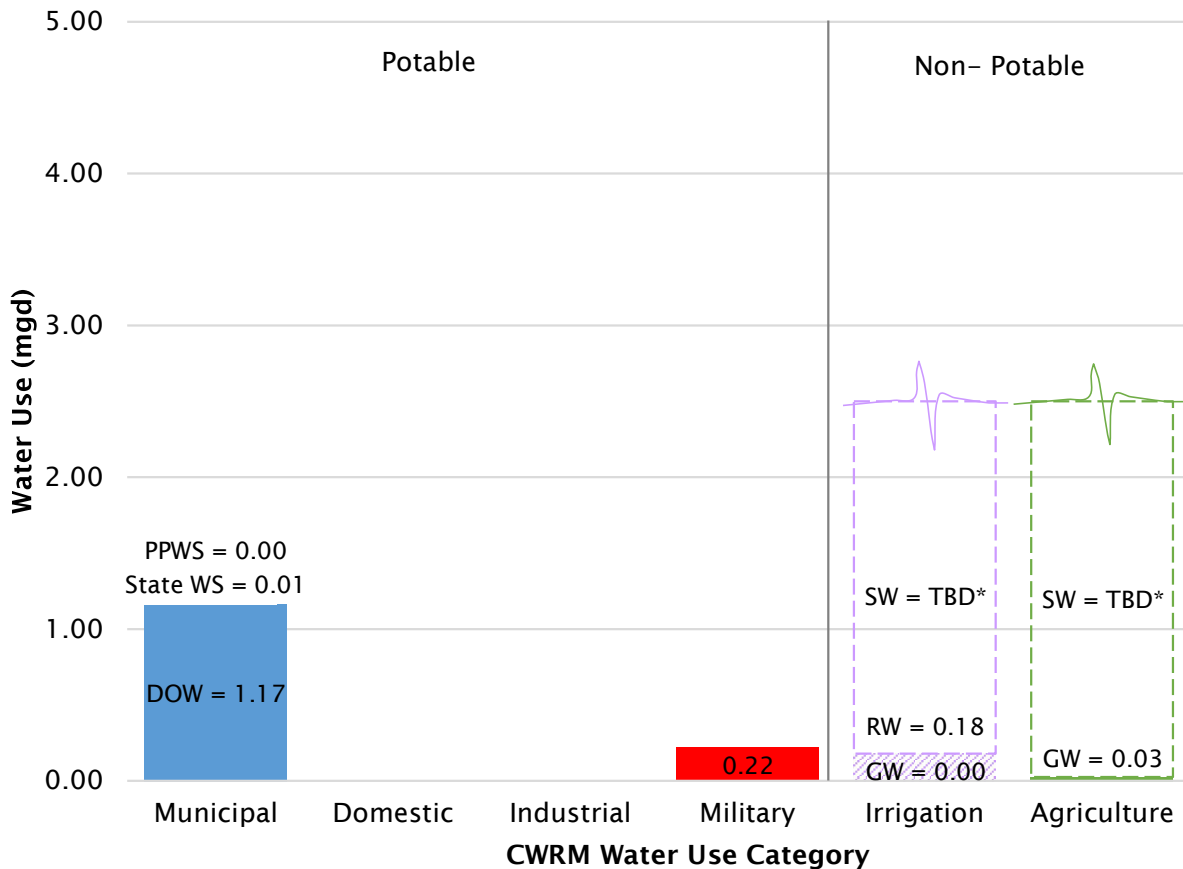
The following section presents the total estimated average water use within the Kekaha ASYA. The total estimated average water use was based on data from CWRM (well pumpage) and DOH (Sanitary Surveys for Public Water Systems and estimated recycled water usage) for the year of 2014. Well classification 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.

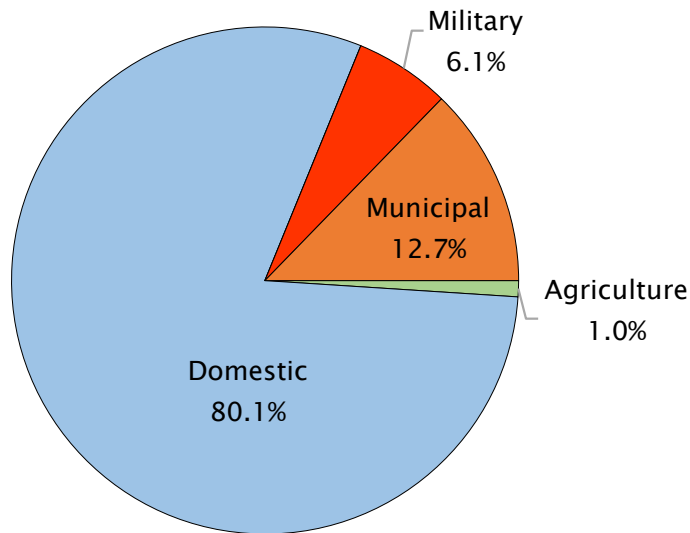
DOW Water Use by Category

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 Kōkeʻe 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 $\geq$ 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

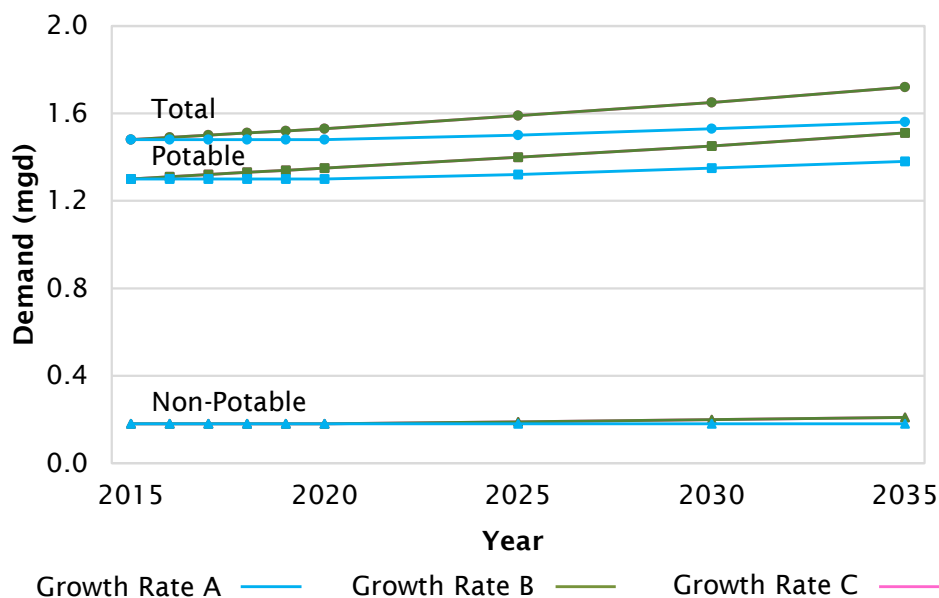


Figure 20301-10 shows the breakdown of water demand projections for a medium growth rate by CWRM categories through the year 2035. Table 20301-16 summarizes this figure.

Figure 20301-10: Medium Growth Rate B Water Demand Projection by Category – Kekaha ASYA

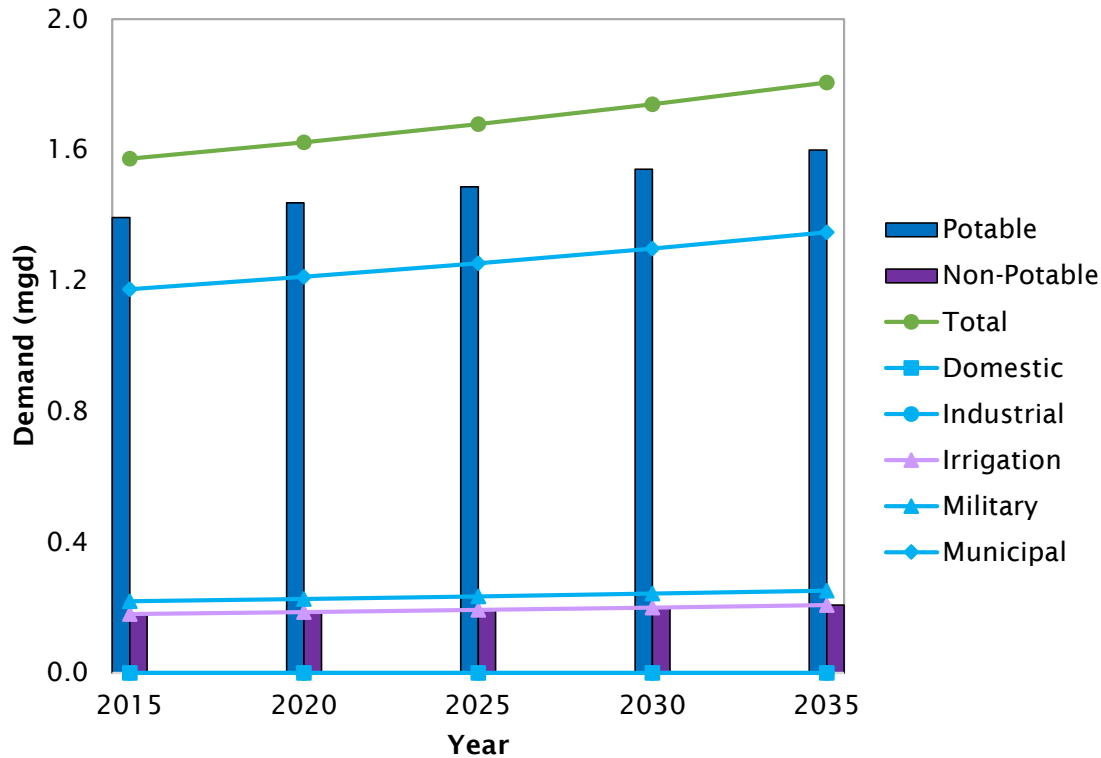


Table 20301-16: Medium Growth Rate B Water Demand Projection by Category – Kekaha ASYA

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

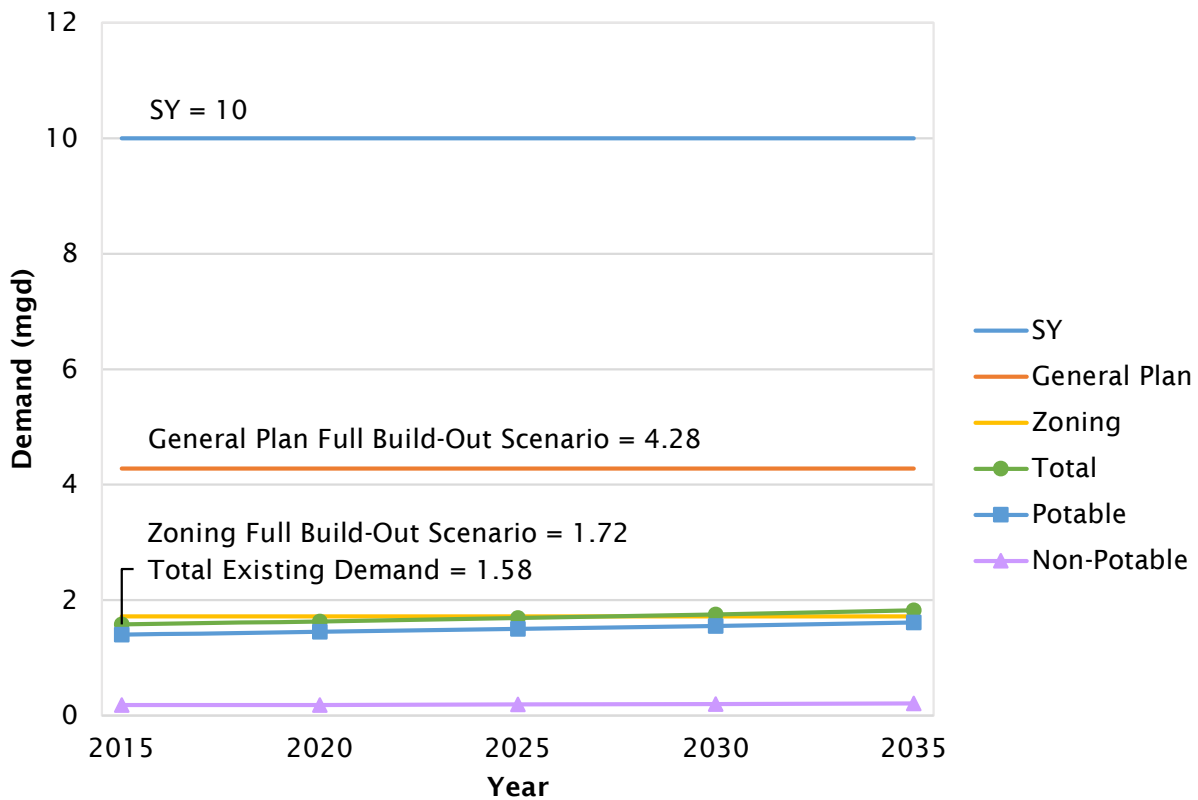
20301-4.3 Summary

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 Kōke'e 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 Kaua'i Island Utility Cooperative (KIUC) is exploring an energy project in West Kaua'i. 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 Pu'u 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 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 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.