
Chapter 2

Technical Approach

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2 TECHNICAL APPROACH

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

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

2.1 STAKEHOLDER AND PUBLIC INVOLVEMENT

2.1.1 Stakeholder Advisory Group

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

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

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

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

The third stakeholder meeting was held in May 2023 to review and discuss the draft WUDP update. Discussion topics included full build-out and future demands and how they impact DOW’s

infrastructure, climate change, agricultural and surface water issues, and the upcoming public meetings.

2.1.2 Public Involvement

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

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

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

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

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

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

2.2 WATER RESOURCES PLANNING METHODOLOGY

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

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

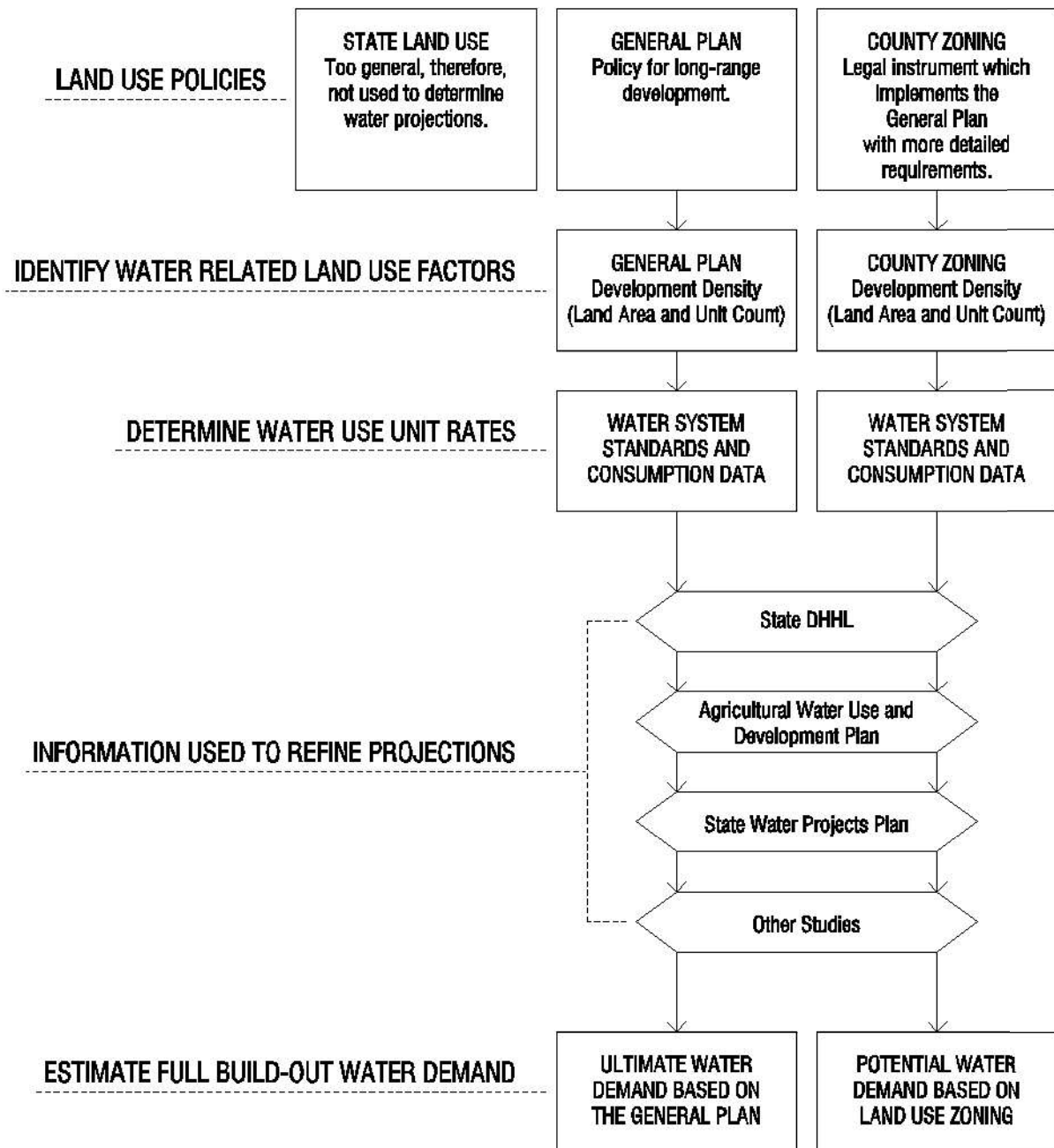


Figure 2-2 20-Year Water Demand Projection Methodology

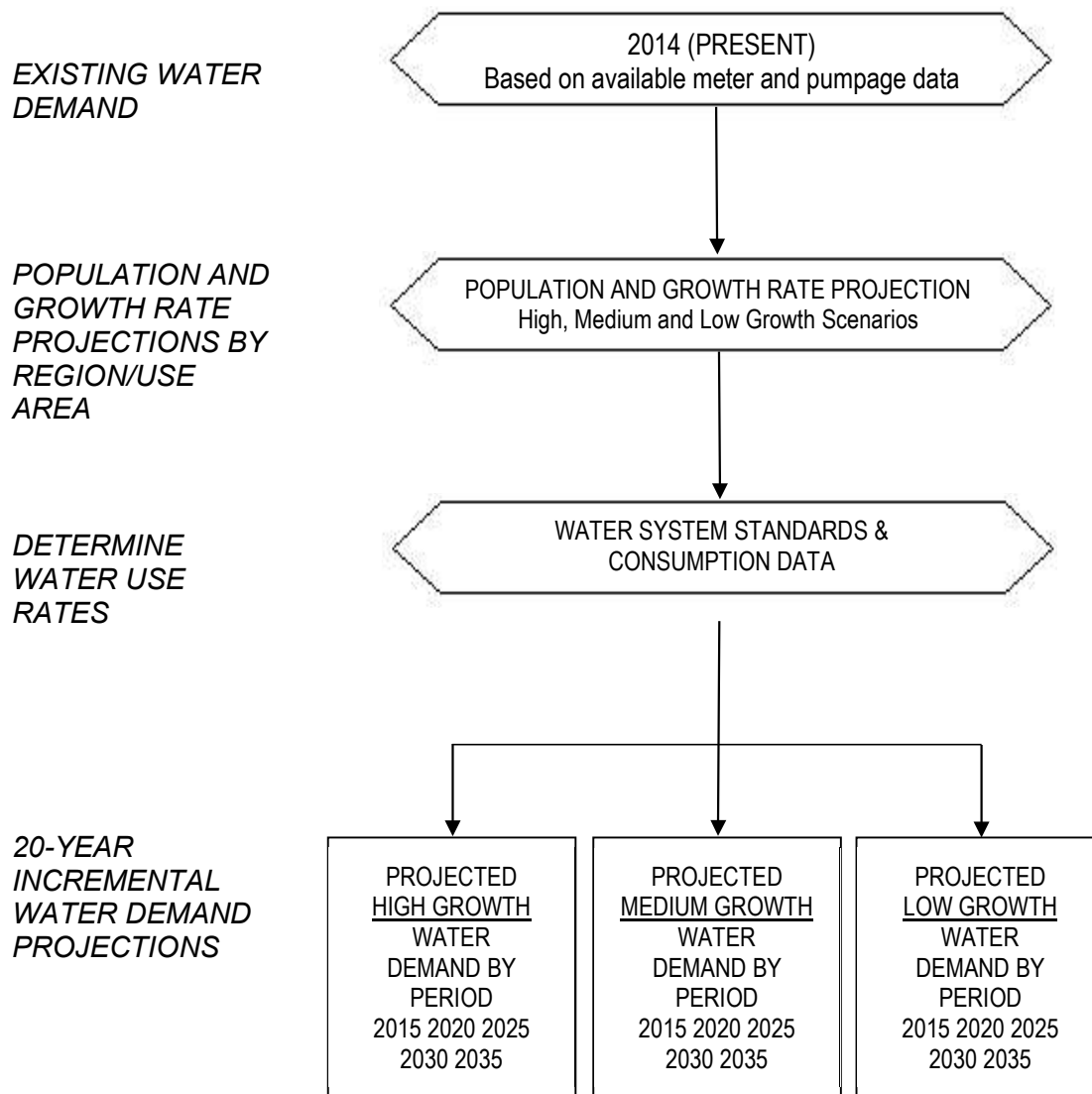
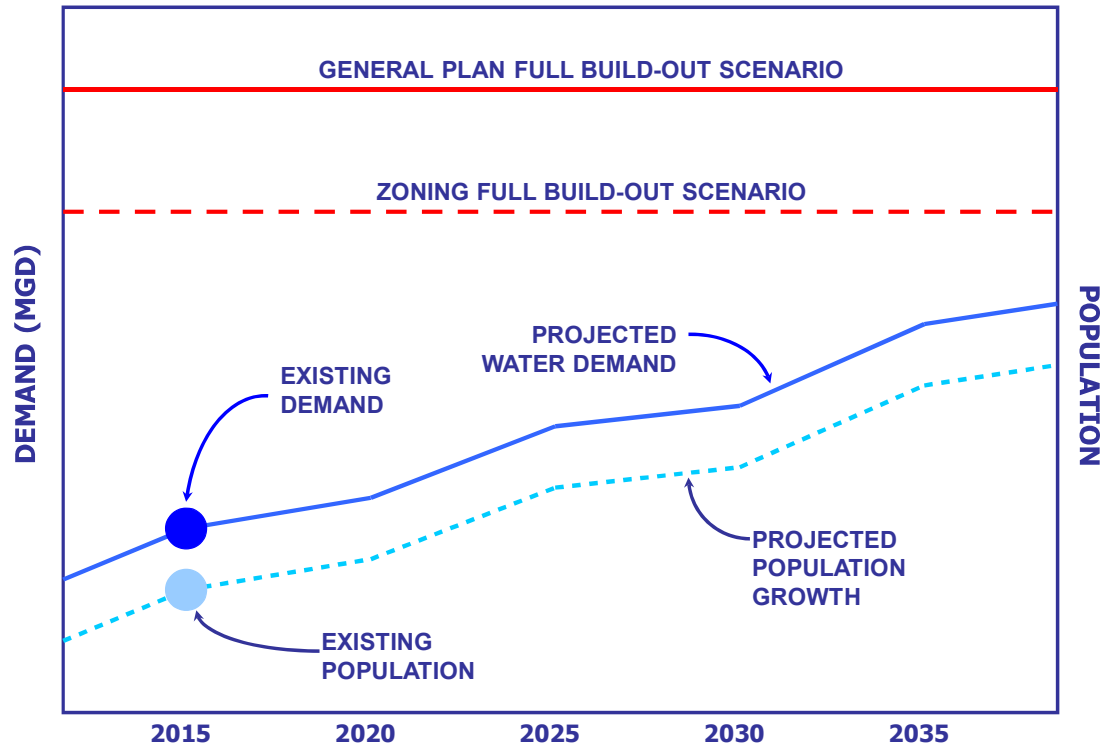


Figure 2-3 Theoretical Projected Demand



2.2.1 Water Use Rates

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

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

Table 2-1 Domestic Consumption Guidelines

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

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

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

2.2.2 Full Build-Out Water Demand Projections

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

2.2.2.1 State Land Use

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

2.2.2.2 Kaua‘i County General Plan

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

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

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

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

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

Table 2-2 Estimated Residential Community Densities

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

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

Table 2-3 Estimated Resort Densities

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

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

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

Table 2-4 Water Use Rates for General Plan

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

* Agriculture irrigation use calculated separately as described in Section 2.2.2.5.4.

** This rate is based on 350 gallons per hotel room and two hotel rooms per unit.

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

2.2.2.3 Kaua‘i County Development Plans

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

2.2.2.4 Kaua‘i County Zoning

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

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

Table 2-5 Water Use Rates for Zoning

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

* Agriculture irrigation use calculated separately as described in Section 2.2.2.5.4.

** This rate is based on 350 gallons per hotel room and two hotel rooms per unit.

2.2.2.5 Refine Land Use Based Projection

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

2.2.2.5.1 State Water Projects Plan

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

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

Table 2-6 SWPP Water Development Strategy Options

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

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

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

2.2.2.5.2 State Department of Hawaiian Home Lands

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

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

Water Reservations

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

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

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

Thus far, CWRM has made a total of six reservations (four groundwater and two surface water) for the island of Kauaʻi under this authority, and all are for DHHL and are presented in **Table 2-7**. In

general, the reservation actions by CWRM were supported by findings regarding future DHHL water use in the 2017 SWPP.

Table 2-7 DHHL Water Reservations

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

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

2.2.2.5.3 Agricultural Water Use and Development Plan

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

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

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

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

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

2.2.2.5.4 County of Kauaʻi Important Agricultural Lands Study

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

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

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

Table 2-8 Designated Important Agricultural Lands

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

It is not reasonable to assume that all lands designated or zoned as Agricultural will be fully irrigated at all times. Therefore, this WUDP compares only agricultural lands that met all eight criteria to the

diversified water use rate of 3,400 gallons per acre per day (gpad) estimated in the 2004 AWUDP and to declared surface water use. In the analysis, declared surface water use is viewed as an existing water source, or estimate of the amount of surface water that may be used, rather than an existing water demand. The comparison shows what percentage of these lands can be irrigated at a rate of 3,400 gpad, and conversely, what irrigation rate could be applied to all the lands that meet the eight IAL criteria. Agricultural water demand rates and agricultural water demand forecasts are anticipated to be provided by the AWUDP update. In the meantime, with limited available information, the results of this IAL analysis portray the general scenario of potential agricultural demands compared to surface water.

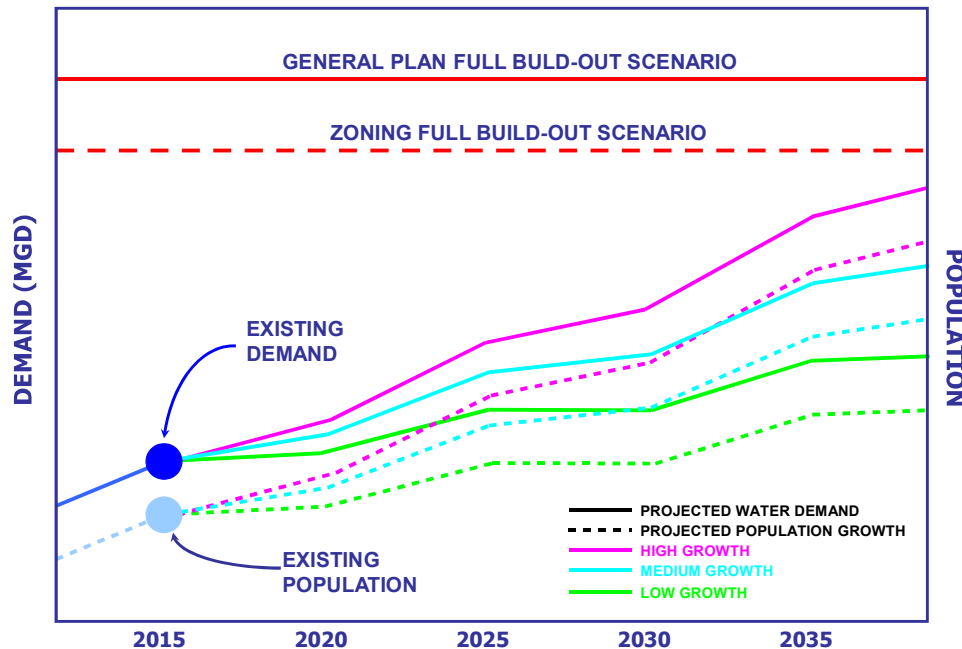
A challenge with developing surface water is transmission. Farmers generally grow what is feasible for the area; therefore, it is anticipated that agricultural water use will follow the availability of irrigation water.

2.2.3 Water Demand Projections to the Year 2035

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

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

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



2.2.3.1 Population and Growth Rate Projections

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

2.2.3.2 Agriculture Water Demand Projections

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

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

include using agricultural water received from public water systems or using potable water in lieu of surface water.

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

2.3 RESOURCE AND FACILITY RECOMMENDATIONS

2.3.1 Water Source Adequacy

2.3.1.1 Full Build-Out

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

2.3.1.2 Twenty-Year Projection

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

2.3.2 Source Development Requirements

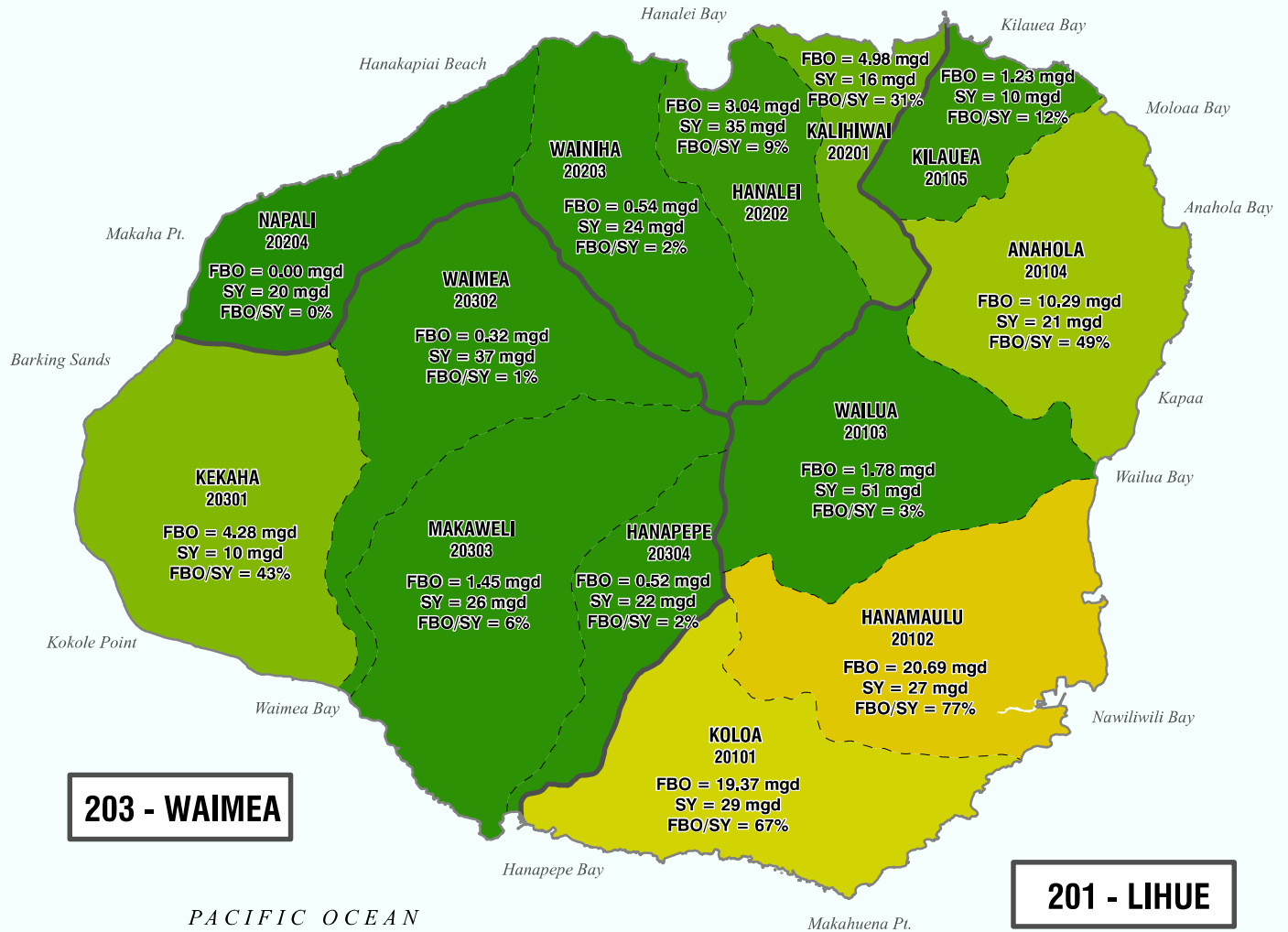
2.3.2.1 Planning Objectives

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

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

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

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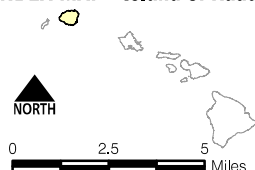


NOTE: The General Plan full build-out demand projections are conservative and are unlikely to be realized as it assumes that all land area is developed to the maximum density allowed. This includes the development of areas that are undevelopable (e.g. due to topography and roads/highways), and the redevelopment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

FIGURE 2-5

**GENERAL PLAN
FULL BUILD OUT
VS.
SUSTAINABLE YIELD**

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- - Aquifer System Areas
- 0-20% FBO/SY
- 21-40% FBO/SY
- 41-60% FBO/SY
- 61-80% FBO/SY
- 81-100% FBO/SY

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

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

2.3.2.2 Supply-Side Management

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

Conventional Water Resource Measures

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

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

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

Water Conservation

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

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

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

Alternative Water Resource Measures

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

2.3.2.3 Demand-Side Management

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

Development Density Control

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

2.4 DATA LIMITATIONS

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

2.4.1 Hawai'i Water Plan Update

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

2.4.2 CWRM Well and Pumpage Database

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

2.4.3 CWRM Stream Diversion Database

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