805 SOUTHEAST MAUNA LOA AQUIFER SECTOR AREA

805.1 SECTOR AREA PROFILE

805.1.1 General

The Southeast Mauna Loa Aquifer Sector Area (ASEA) includes the Olaa [80501], Kapapala [80502], Naalehu [80503] and Ka Lae [80504] Aquifer System Areas (ASYA). It covers the south central portion of the island, primarily in the Kau District, and the northwest section of the Puna District. The boundaries extend from the summit of Mauna Loa to Mountain View in the east, along Hawaii Belt Highway to Punaluu, and along the southeastern coastline to Ka Lae.

Coastal areas have an average rainfall of 20 to 50 inches per year, while the areas approaching the summit of Mauna Loa average as little as 15 inches per year. A pocket of heavier average rainfall of 158 inches per year occurs at approximately 3,000 feet elevation between Naalehu and Pahala. Annual rainfall in the Mountain View area averages up to 196 inches. The Olaa ASYA has the highest SY of the four aquifer system areas at 124 mgd, followed by the Naalehu ASYA at 117 mgd, the Ka Lae ASYA at 31 mgd, and the Kapapala ASYA at 19 mgd. The total sustainable yield of the sector area is 291 mgd.

805.1.2 Economy and Population

805.1.2.1 Economy

Agriculture remains the anchor of Kau's economy. A variety of different products are grown primarily in the strip from Naalehu to Wood Valley, including macadamia nuts, coffee, orchids, and vegetables. The macadamia nut industry is one of the most prominent in the district, boasting Mac Farms of Hawaii in Naalehu, the world's largest macadamia nut tree orchard.

Cattle ranching is also significant, with large tracts of land utilized by several ranches, including the 1,595-acre Kahuku Ranch north of Puueo.

The main tourist destination is the Sea Mountain Resort and Golf Course Complex. Accommodations on the resort are limited to the 56-unit Colony One at Sea Mountain. Other accommodations are scarce, with bed-and-breakfast operations and the 12-unit Shirakawa Hotel in Waiohinu as the only options.

805.1.2.2 Population

Most of the population contributing to the demands from the sector area is within the Kau District. Much of the increase in population can be attributed to the growth in small communities.

Table 805-1: Historical Population

1980	1990	2000	1980-90 % Change	1990-2000 % Change
3,044	4,048	5,554	33.0	37.2

Data Source: 2000 U.S. Census
Data redistributed and evaluated for Southeast Mauna Loa Aquifer Sector Area

Table 805-2: Population Projection

Growth Rate	2000	2005	2010	2015	2020	2000-10 % Change	2010-20 % Change
A – Low	5,554	6,222	6,935	7,721	8,613	24.9	24.2
B – Medium	5,554	6,242	6,997	7,835	8,786	26.0	25.6
C – High	5,554	6,502	7,435	8,451	9,577	33.9	28.8

Data Source: County General Plan, February 2005
Data redistributed and evaluated for Southeast Mauna Loa Aquifer Sector Area

805.1.3 Land Use

805.1.3.1 Hawaii County General Plan

The Hawaii County General Plan Land Use Pattern Allocation Guide Map (LUPAG) for the Southeast Mauna Loa ASEA is shown on **Figure 805-1**. The estimated land use allocation acreage for each LUPAG designation within the sector area is listed in **Table 805-3**.

Olaa
80501

Kapapala
80502

Naalehu
80503

Kalae
80504

Ninole Cove

Honuapo Bay

Waikapuna Bay

Kaaluallu Bay

Ka Lae Pt.

Hawaii County
Department of Water Supply

DWS UPDATE TO THE WATER USE AND DEVELOPMENT PLAN

Job No. 2003-818

LEGEND:

- Developed Properties
- Hawaiian Home Lands

Land Use Pattern Allocation Guide

- Extensive Agriculture
- Important Agricultural Land
- Orchard
- High Density Urban
- Medium Density Urban
- Low Density Urban
- Industrial
- Urban Expansion
- Resort
- Resort Node
- Rural
- Conservation
- Open
- University Use
- Pond
- Break Water

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Miles

INDEX MAP - Island of Hawaii

FIGURE 805-1

AQUIFER SECTOR
S.E. MAUNA LOA - 805

Aquifer Systems
Olaa - 80501
Kapapala - 80502
Naalehu - 80503
Kalae - 80504

2005 Revised General Plan Land Use Pattern Allocation Guide

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Consulting Engineers
1388 Kapiolani Boulevard, Honolulu, Hawaii 96814

Table 805-3: LUPAG Map Estimated Land Use Allocation Acreage – Southeast Mauna Loa Aquifer Sector Area

LAND USE PATTERN	ACREAGE	% of TOTAL
High Density Urban	0	0
Medium Density Urban	416	0.1
Low Density Urban	1,247	0.3
Industrial	74	0.0
Important Agricultural Land	49,788	11.2
Extensive Agriculture	109,885	24.8
Orchard	0	0
Rural	3,843	0.9
Resort/Resort Node	29	0.0
Open	2,596	0.6
Pond	0	0
Conservation	274,153	62.0
Urban Expansion	325	0.1
University Use	0	0
TOTAL	442,356	100.0

The water utility courses of action for Kau in the Hawaii County General Plan relevant to the Southeast Mauna Loa ASEA are as follows:

- ***(a)*** *Provide additional water system improvement for the currently serviced areas of Naalehu, Waiohinu, and Pahala.*
- ***(b)*** *Pursue groundwater source investigation, exploration and well development at Ocean View, Pahala, and Waiohinu.*
- ***(c)*** *Continue to evaluate growth conditions to coordinate improvements as required to the existing water system.*
- ***(d)*** *Investigate alternative means to finance the extension of water systems to subdivisions that rely on catchment.*

805.1.3.2 Hawaii County Zoning

Hawaii County Zoning for the Southeast Mauna Loa ASEA is shown on **Figure 805-2**. The estimated land use allocation acreage for each zoning class within the sector area is listed in **Table 805-4**.

Table 805-4: County Zoning Estimated Class Allocation Acreage – Southeast Mauna Loa Aquifer Sector Area

ZONING CLASS	ACREAGE	% of TOTAL
Single Family Residential	814	0.2
Multi-Family Residential (including duplex)	105	0.0
Residential-Commercial Mixed Use	0	0
Resort	40	0.0
Commercial	65	0.0
Industrial	55	0.0
Industrial-Commercial Mixed	0	0
Family Agriculture	0	0
Residential Agriculture	0	0
Agriculture	181,764	41.1
Open	132,804	30.0
Project District	0	0
Forest Reserve	125,143	28.3
(pond)	2	0.0
(road)	1,562	0.4
TOTAL	442,354	100.0

805.2 EXISTING WATER RESOURCES

805.2.1 Ground Water

The Southeast Mauna Loa ASEA has a sustainable yield of 291 mgd. According to the CWRM database, there are 50 production wells in the sector area, including 6 municipal, 38 irrigation, and 6 industrial. There are also 11 wells drilled and categorized as "unused." Refer to **Appendix B** for this database. **Figure 805-3** shows the well locations. In the Pahala and Naalehu areas, many of the wells are tunnels dug into the hillsides to develop perched groundwater sources for fluming sugar cane to the old sugar mill.

The *1994 Kau River Basin Study* indicates that the yield of all tunnel sources is in the order of 7 to 8 mgd. Several springs and tunnels are mentioned as potential water sources. Ninole Springs is the second largest basal spring on the island, having an estimated past discharge of 20 to 25 mgd. Kawaa springs was estimated to have a discharge of 10 mgd, however, there are no indications that either has been developed as a water source. The output of the springs and tunnel sources are significantly less during the dry season.

805.2.2 Surface Water

There are no streams classified as perennial in the Southeast Mauna Loa ASEA.

Olaa
80501

Kapapala
80502

Naalehu
80503

Kalae
80504

Ninole Cove

Honuapo Bay

Waikapuna Bay

Kaalualu Bay

Ka Lae Pt.

PACIFIC OCEAN

Hawaii County

Department of Water Supply

DWS UPDATE TO THE WATER USE AND DEVELOPMENT PLAN

Job No. 2003-818

LEGEND:

- Hawaiian Home Lands
- Developed Parcels

Zoning Designations:

A-1a+	Agricultural - 1 thru 10 acres
A-20a	Agricultural - 20 acres
A-35a	Agricultural - 35 acres
A-40a	Agricultural - 40 acres
A-80a	Agricultural - 80 acres
A-200+	Agricultural - 200 thru 255 acres
A-500a	Agricultural - 500 acres
A-600a	Agricultural - 600 acres
A-800a	Agricultural - 800 acres
A-900a	Agricultural - 900 acres
APD	Agricultural Project Districts
CDH	Downtown Hilo Commercial District
CG	Commercial, General
CN	Commercial, Neighborhood
CV	Commercial, Village
FA	Family Agricultural
FR	Forest Reserse
MCX	Industrial - Commercial
MG	Industrial, General
ML	Industrial, Limited
O	Open
PD	Project Districts
RA	Residentail and Agricultural
RCX	Residential - Commercial Mixed Use
RD	Residential Double-Family
RM-7.5+	Res. Multi-Family - 7500-8000 sf
RM-14.5+	Res. Multi-Family - 14,500-20,000 sf
RS-7.5+	Res. Single Family - 7500-10,000 sf
RS-15+	Res. Single Family - 15,000-20,000 sf
V	Hotel/Resort

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Miles

INDEX MAP - Island of Hawaii

FIGURE 805-2

AQUIFER SECTOR
S.E. MAUNA LOA - 805

Aquifer Systems

Olaa - 80501
Kapapala - 80502
Naalehu - 80503
Kalae - 80504

County Zoning

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Figure 805-3: Well and Tunnel Location

MAP CURRENTLY NOT AVAILABLE ON-LINE

Figure 805-4: Streams & Diversions

MAP CURRENTLY NOT AVAILABLE ON-LINE

There are 9 declared stream diversions in CRWM database listed in **Table 805-5** and shown on **Figure 805-4**. Flow data is not available for these diversions.

Table 805-5: Stream Diversions – Southeast Mauna Loa Aquifer Sector Area

FILE REFERENCE	TMK	STREAM NAME	
KAU INSTREAM	9-5-014:007	Honuapo Pond	Spring diversion, hand carry Honuapo Spring Pond and rights claim.
KAU INSTREAM	9-5-016:006	Kawa Springs	Spring diversion, hand carry from Kaalaiki Pond and rights claim.
KAU INSTREAM	9-5-019:012	Ninole Fishpond	Spring diversion, hand carry from Kauwale Pond. Diversion at spring-fed smaller (northern) portion of fishpond. Rights claim.
KAU INSTREAM	9-5-019:012	Ninole Fishpond	Spring diversion, hand carry from Puhau Pond. Diversion at spring-fed main (makai) portion of fishpond. Rights claim.
KAU INSTREAM	9-6-001:003	Kauwila Pond	Spring diversion, hand carry from Kauwila Pond and rights claim.
KAWAIHAE RANCH	9-7-001:001	Haao Spring	Spring diversion, use of overflow from County Haao Spring when available.
KAPAPALA USERS	9-7-001:006	Alili Spring	Stream diversion, hand carry from Alili Kapapala Spring and rights claim.
KAWAIHAE RANCH	9-7-001:020	Mountain House Spring	Spring diversion, use of overflow from County Mountain House Spring.
KAU INSTREAM	9-3-001:003	Palehemo Pond	Spring diversion, hand carry from Palehemo Stream and rights claim.

The Kau Flume System transports perched groundwater from the two Noguchi Tunnels to the Keaiwa Reservoir north of Pahala. A 2000 study completed by the US Army Corps of Engineers estimated the yield of the tunnels between 0.2 and 0.6 mgd, depending on rainfall. At the time of the study, two additional inflows along the flume were not functioning, and the system was in need of major repairs.

805.2.3 Reclaimed Wastewater

There is one wastewater reclamation facility (WWRF) in the study area. **Table 805-6** lists the WWRF, reclaimed water classification, facility treatment capacity, current reuse amount, and current application.

Table 805-6: Wastewater Reclamation Facilities – Southeast Mauna Loa Aquifer Sector Area

Wastewater Reclamation Facility	Reclaimed Water Classification	WWRF Capacity (MGD)	Current Reuse Amount (MGD)	Irrigation Application
Punaluu Water & Sewer	R-2	0.125	0.012	Sea Mountain Golf Course

805.3 EXISTING WATER USE

805.3.1 General

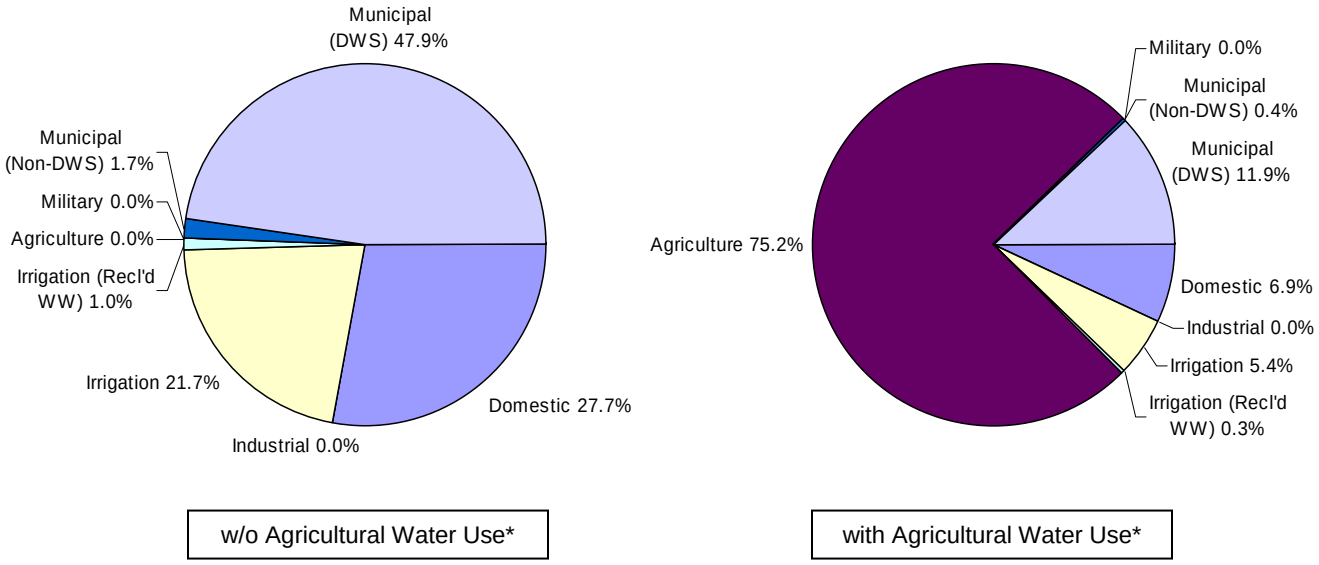
The total estimated average water use within the Southeast Mauna Loa ASEA based on DWS meter data and CWRM pumpage data from November 2004 through October 2005, available GIS information, DOH records, and estimated reclaimed wastewater usage is listed in **Table 805-7**. **Table 805-7** and **Figure 805-5** summarize water use in accordance with CWRM categories and indicate the quantities supplied excluding agricultural demands, and the quantities supplied including worst case agricultural demands (as described in Chapter 2) by the DWS system, non-DWS systems, and reclaimed wastewater.

Table 805-7: Existing Water Use by Categories – Southeast Mauna Loa Aquifer Sector Area

CWRM Water Use Category	Water Use (MGD)	Percent of Total without Ag*	Percent of Total with Ag*
Domestic	0.33	27.7	6.9
Industrial	0.00	0.0	0.0
Irrigation	0.26	21.7	5.4
Reclaimed WW	0.01	1.0	0.3
Agriculture	3.58	0.0	75.2
Military	0.00	0.0	0.0
Municipal			
DWS System	0.57	47.9	11.9
Private Public WS	0.02	1.7	0.4
Total without Ag*	1.18	100.0	
Total with Ag*	4.77		100.0

* Demand scenarios without and with agricultural demands represent the potential minimum and maximum agricultural demand, respectively, with the expectation that the actual demand will fall somewhere in between.

Figure 805-5: Existing Water Use by Categories – Southeast Mauna Loa Aquifer Sector Area



* Demand scenarios without and with agricultural demands represent the potential minimum and maximum agricultural demand, respectively, with the expectation that the actual demand will fall somewhere in between.

Figure 805-6 generally shows the service area for the various water systems and indicates the extent of the DWS water system.

805.3.2 Domestic Use

Domestic use or water use by individual households is assumed to be supplied by private individual rainwater catchment systems. Based on available GIS data, there are 820 such units serving approximately 2,250 people, which is approximately one-third of the sector's population. The estimated demand is 0.33 mgd.

805.3.3 Industrial Use

There are three tunnels and one shaft classified as "Industrial" in the CWRM database. None have reported pumpage.

805.3.4 Irrigation Use

The Sea Mountain Resort in Punaluu utilizes two sources for its golf course. 0.257 mgd is supplied by the private Punaluu Water System described below in Section 805.3.7.4, augmented with 0.012 mgd of reclaimed wastewater from the Punaluu Sewage Treatment Plant.

The Discovery Harbor Golf Course is located within the service area of the DWS Naalehu-Waiohinu Water System; however, usage is not known. There are no known irrigation uses dedicated other landscaping activities in the sector area.

Many of the wells in the CWRM database classified as "Irrigation" are tunnels or shafts that were used by the sugar plantation to transport sugar by flume to the sugar mill.

805.3.5 Agricultural Use

Over 20 percent of the metered water drawn from the DWS water system is from accounts classified as "Agricultural;" however, this amounts to only 0.12 mgd.

The *Kau River Basin Study* indicates that some of the water from the Noguchi Tunnels, described previously, is diverted for agricultural uses in Wood Valley. The rest of the water flows to the Keaiwa Reservoir, which supplies the Keaiwa Agricultural Park. The study suggests that there is a significant amount of water currently used for agricultural purposes, however current flow data is not readily available.

805.3.6 Military Use

There is no military use in the Southeast Mauna Loa ASEA.

805.3.7 Municipal Use

Municipal use can be subcategorized into the other water use categories, namely Domestic, Industrial, Irrigation, Agriculture, and Military, if detailed information is available.

805.3.7.1 County Water Systems

The DWS has 2 water systems in the Southeast Mauna Loa ASEA.

The Pahala Water System relies on the Alili Tunnel for its supply and supplements it with water from the Pahala Well during dry weather. The system has a relatively compact service area in Pahala Village. The Pahala Deep Well No. 2 was drilled in 2003, but it is currently sealed and there is no evidence of usage.

The Waiohinu-Naalehu Water System was assumed by DWS after the closure of the sugar plantation. The system primarily depends on the New Mountain House Tunnel Spring and Haao Spring for its supply. The Naalehu Well supplements the tunnel and spring sources during dry weather. The service area is widespread, covering the communities of Waiohinu, Naalehu and South Point, spanning six service zones through two booster pump stations and nine storage tanks.

DWS water use is subcategorized in **Table 805-8** to the extent possible based on available meter data and is depicted in **Figure 805-7**. "Other Municipal" includes facilities such as schools, and

Olaa
80501

Kapapala
80502

Naalehu
80503

Kalae
80504

Pahala

Punaluu

Ninole Cove

Waiohinu-Naalehu

Honuapo Bay

Waikapuna Bay

Kaalualu Bay

Ka Lae Pt.

PACIFIC OCEAN

Hawaii County

Department of Water Supply

DWS UPDATE TO THE WATER USE AND DEVELOPMENT PLAN

Job No. 2003-818

LEGEND:

- DWS Water System Service Area
- Possible Catchment Area (Building Value > $10000)
- Private Water System Service Area
- Aquifer Systems
- DWS Water System

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INDEX MAP - Island of Hawaii

FIGURE 805-6

AQUIFER SECTOR
S.E. MAUNA LOA - 805

Aquifer Systems

Olaa - 80501
Kapapala - 80502
Naalehu - 80503
Kalae - 80504

Water System and Service Area

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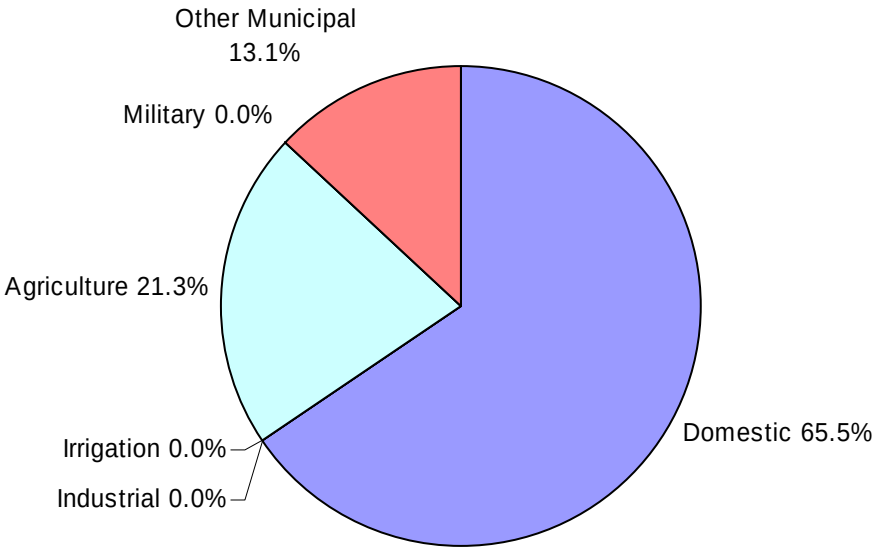
various commercial, government, medical and nonprofit entities which have mixed water use and cannot be specifically allocated to the other categories.

Table 805-8: DWS Existing Water Use by Categories – Southeast Mauna Loa Aquifer Sector Area

CWRM Water Use Category	DWS Purveyed Water Use (MGD)	Percent of Total
Domestic	0.37	65.5
Industrial	0.00	0.0
Irrigation	0.00	0.0
Agriculture	0.12	21.3
Military	0.00	0.0
Other Municipal	0.07	13.1
Total	0.57	100.0

Figure 805-7: DWS Existing Water Use by Categories – Southeast Mauna Loa Aquifer Sector Area



805.3.7.2 State Water Systems

There are no State water systems in the Southeast Mauna Loa ASEA regulated by the DOH.

805.3.7.3 Federal Water Systems

There are no Federal water systems in the Southeast Mauna Loa ASEA regulated by the DOH.

805.3.7.4 Private Public Water Systems

The Punaluu Water & Sanitation Company owns the Punaluu water system, which serves the Sea Mountain Resort and surrounding area. Water is supplied by two Ninole wells and disinfected with chlorine gas prior to distribution. Storage is provided by the 1.0 MG reservoir north of Hawaii Belt Road. The service area includes the nursery taps, administration office, tennis courts, Colony 1 Condos, golf club house, Punaluu Beach Park, Punaluu Village Restaurant, and the Kalana Estates subdivision north of the highway. According to DOH records, domestic usage is 0.02 mgd.

805.3.8 Water Use by Resource

805.3.8.1 Ground Water

Table 805-9 summarizes the current production, potential production (16 and 24-hour operation), sustainable yield (SY), and percentage of SY for the various productions calculated. Current production is represented by the highest 12-month moving average (MAV) or the highest annual average yield calculated from the actual pumpage data. Potential well production is based on installed pump capacities, and calculated for both 16 hours of operation a day and 24 hours of operation a day. Data is based on pumpage data reported to CWRM.

Table 805-9: Sustainable Yield – Southeast Mauna Loa Aquifer Sector Area

Sys Code	System Area	High 12-Month MAV (MGD)	Potential 16 -Hour Production (MGD)	Potential 24-Hour Production (MGD)	SY (MGD)	High 12-Month MAV SY (%)	Potential 16-Hour Production SY (%)	Potential 24-Hour Production SY (%)
		0.22	**5.17**	**7.75**	**291**	**0.08**	**1.78**	**2.66**
80501	Olaa	0.00	0.00	0.00	124	0.00	0.00	0.00
80502	Kapapala	0.00	0.00	0.00	19	0.00	0.00	0.00
80503	Naalehu	0.22	5.17	7.75	117	0.19	4.42	6.62
80504	Ka Lae	0.00	0.00	0.00	31	0.00	0.00	0.00

DWS utilizes two spring and one tunnel source as described previously. Usage between November 2004 and October 2005 was 0.62 mgd.

805.3.8.2 Surface Water

Flow data is not available for any of the spring and stream diversions listed previously in **Table 805-5**. As described previously, water usage from the Noguchi Tunnels is not readily available.

805.3.8.3 Rainwater Catchment

Water consumption calculated for developed parcels that are not supplied by groundwater or surface water is assumed to be supplied by rainwater catchment. The water use previously categorized as Domestic Use in **Table 805-7** is assumed to be supplied by individual catchment systems.

805.3.8.4 Reclaimed Wastewater

Reclaimed wastewater from the wastewater treatment plant within the Southeast Mauna Loa ASEA is used for golf course irrigation. Refer to **Table 805-6** presented earlier.

805.4 FUTURE WATER NEEDS

805.4.1 General

Table 805-10 summarizes the LUPAG, Zoning and 5-year incremental water demand projection scenarios for the total aquifer sector area and the individual aquifer system areas. The sustainable yield (SY) is presented to draw comparisons.

Table 805-10: Summary of Demand Projections

Without Agricultural Demand*	SY (mgd)	LUPAG (mgd)	Zoning (mgd)	Growth Rate B Demand Projections (mgd)				
				2005	2010	2015	2020	2025
Total S.E. Mauna Loa ASEA	291	13.7	3.7	1.2	1.3	1.5	1.6	1.8
80501 – Olaa ASYA	124	1.5	0.4	0.3	0.3	0.4	0.5	0.5
80502 – Kapapala ASYA	19	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80503 – Naalehu ASYA	117	10.8	2.9	0.7	0.8	0.8	0.9	1.0
80504 – Ka Lae ASYA	31	1.4	0.4	0.2	0.2	0.2	0.3	0.3
With Agricultural Demand*	**SY (mgd)**	**LUPAG (mgd)**	**Zoning (mgd)**	**Growth Rate B Demand Projections (mgd)**				
				2005	**2010**	**2015**	**2020**	**2025**
Total S.E. Mauna Loa ASEA	291	159.3	147.6	4.8	5.3	5.8	6.4	7.1
80501 – Olaa ASYA	124	22.1	20.3	0.8	0.9	1.1	1.3	1.5
80502 – Kapapala ASYA	19	1.0	1.0	0.0	0.0	0.0	0.0	0.0
80503 – Naalehu ASYA	117	113.3	105.1	3.2	3.6	3.9	4.2	4.6
80504 – Ka Lae ASYA	31	22.9	21.3	0.7	0.8	0.8	0.9	1.0

* Demand scenarios without and with agricultural demands represent the potential minimum and maximum agricultural demand, respectively, with the expectation that the actual demand will fall somewhere in between.

For all aquifer system areas, full build-out and 2025 projection water demands excluding agricultural demands are a small fraction the SY. Therefore, analysis of the three demand scenarios does not need to be broken down by aquifer system areas and thus will be presented for the aquifer sector area only.

805.4.2 Full Build-Out Water Demand Projections

The full build-out water demand projections based on the General Plan and County Zoning for the Southeast Mauna Loa ASEA are listed in **Tables 805-11** and **805-12**, and reflect refinement as discussed below. Each land use class is associated with the most appropriate CWRM water use category.

Table 805-11: Hawaii County General Plan Full Build-Out Water Demand Projection – Southeast Mauna Loa Aquifer Sector Area

LUPAG Class	CWRM Category	Water Demand (mgd)
Urban	Domestic/Irrigation/Municipal	8.8
Urban Expansion	Domestic/Irrigation/Municipal	1.7
Resort	Irrigation/Municipal	0.5
Industrial	Industrial	0.3
Agriculture	Agriculture	145.6
University	Irrigation/Municipal	0.0
Rural	Irrigation/Municipal	1.5
DHHL	Irrigation/Municipal	0.8
TOTAL w/o Ag*		13.7
TOTAL w/ Ag*		159.3

* Demand scenarios without and with agricultural demands represent the potential minimum and maximum agricultural demand, respectively, with the expectation that the actual demand will fall somewhere in between.

Table 805-12: County Zoning Full Build-Out Water Demand Projection – Southeast Mauna Loa Aquifer Sector Area

Zoning Class	CWRM Category	Water Demand (mgd)
Residential	Domestic/Irrigation/Municipal	2.0
Resort	Irrigation/Municipal	0.5
Commercial	Municipal	0.2
Industrial	Industrial	0.2
Agriculture	Agriculture	144.0
DHHL	Irrigation/Municipal	0.8
TOTAL w/o Ag*		3.7
TOTAL w/ Ag*		147.6

* Demand scenarios without and with agricultural demands represent the potential minimum and maximum agricultural demand, respectively, with the expectation that the actual demand will fall somewhere in between.

805.4.2.1 Refine Land Use Based Projection

805.4.2.1.1 State Water Projects Plan

The total projected demand to the year 2020 for 7 State Water Projects within the Southeast Mauna Loa ASEA is 0.05 mgd, using 0.04 mgd potable, and 0.01 nonpotable using potable sources. These demands account for less than 1 percent of the projected total demand for the sector area. The project that will generate the most significant demand, with the exception of DHHL projects, which are covered separately, is listed in **Table 805-13**.

Table 805-13: Future State Water Projects to Generate Significant Demands

Project Name	Primary Use	State Department	2020 Demand (mgd)
Naalehu Elementary New 6 Classroom	Potable	DOE	0.01

805.4.2.1.2 State Department of Hawaiian Home Lands

There are four tracts in the Southeast Mauna Loa ASEA owned by the DHHL.

The Kamaoa-Puueo Tracts are located in the South Point area covering over 11,000 acres up to an elevation of about 1,200 feet. Estimated demand for the existing pastoral and farm, and proposed pastoral lots is 0.38 mgd. The Waiohinu Tract is a small 261-acre tract located on steep terrain north of Waiohinu. The demand for the proposed agricultural lots and a few commercial lots is 0.40 mgd. Both tracts would be supplied by the DWS Naalehu-Waiohinu Water System. *DHHL Special Report #2* indicates that an additional well source would be required to assure reliable and consistent supply.

The Discover Harbor tract was recently acquired by DHHL. It consists of 40 lots within the Discovery Harbor subdivision northeast of Puueo. The lots are already serviced by the DWS Naalehu-Waiohinu Water System with an estimated demand of 0.02 mgd.

The Olaa-Kurtistown tract consists of lots in the Kurtistown, Glenwood, and Volcano areas totaling 707 acres in the Puna District. The total water need 0.03 mgd. Service laterals to the DWS Olaa-Mt.View WS are already in place for the Kurtistown lots. *DHHL Special Report #2* proposes that the remaining lots will be served by rainwater catchment.

805.4.2.1.3 Agricultural Water Use and Development Plan

There is no information available in the AWUDP specific to activity within the Southeast Mauna Loa ASEA to further refine projections.

805.4.3 Water Use Unit Rates

Water use unit rates are based on the *Water System Standards* as discussed in Chapter 1.

805.4.4 5-Year Incremental Water Demand Projection to the Year 2025

The following section presents 5-year incremental water demand projections to the year 2025 for the Southeast Mauna Loa ASEA. The projected low, medium, and high growth rates are listed in **Table 805-14**, and are graphed in **Figure 805-8**. Potable and nonpotable water demands are also differentiated.

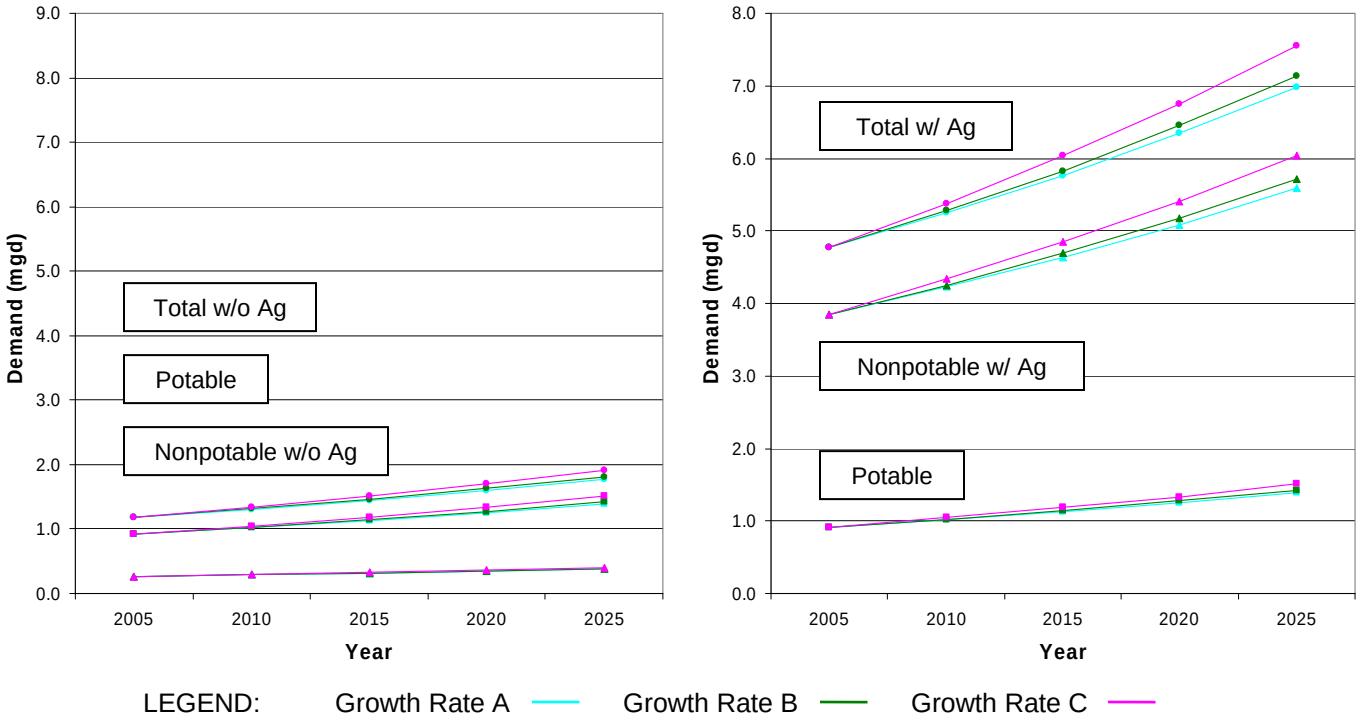
Figure 805-9 illustrates the magnitude of the sustainable yield, both LUPAG and Zoning full build-out water use, and water use projection through the year 2025 focusing on Medium Growth Rate B. **Figure 805-10** shows the breakdown of water demand projections by CWRM categories through the year 2025. **Table 805-15** summarizes these figures.

Table 805-14: Water Demand Projection – Southeast Mauna Loa Aquifer Sector Area

	Without Agricultural Demands* (mgd)					With Agricultural Demands* (mgd)				
GROWTH RATE A	**2005**	**2010**	**2015**	**2020**	**2025**	**2005**	**2010**	**2015**	**2020**	**2025**
Total	1.2	1.3	1.4	1.6	1.8	4.8	5.2	5.8	6.3	7.0
Potable	0.9	1.0	1.1	1.3	1.4	0.9	1.0	1.1	1.3	1.4
Nonpotable	0.3	0.3	0.3	0.3	0.4	3.9	4.2	4.6	5.1	5.6
GROWTH RATE B	**2005**	**2010**	**2015**	**2020**	**2025**	**2005**	**2010**	**2015**	**2020**	**2025**
Total	1.2	1.3	1.5	1.6	1.8	4.8	5.3	5.8	6.4	7.1
Potable	0.9	1.0	1.1	1.3	1.4	0.9	1.0	1.1	1.3	1.4
Nonpotable	0.3	0.3	0.3	0.4	0.4	3.9	4.3	4.7	5.2	5.7
GROWTH RATE C	**2005**	**2010**	**2015**	**2020**	**2025**	**2005**	**2010**	**2015**	**2020**	**2025**
Total	1.2	1.3	1.5	1.7	1.9	4.8	5.4	6.0	6.7	7.5
Potable	0.9	1.0	1.2	1.3	1.5	0.9	1.0	1.2	1.3	1.5
Nonpotable	0.3	0.3	0.3	0.4	0.4	3.9	4.3	4.9	5.4	6.0

* Demand scenarios without and with agricultural demands represent the potential minimum and maximum agricultural demand, respectively, with the expectation that the actual demand will fall somewhere in between.

Figure 805-8: Water Demand Projection Summary – Southeast Mauna Loa Aquifer Sector Area



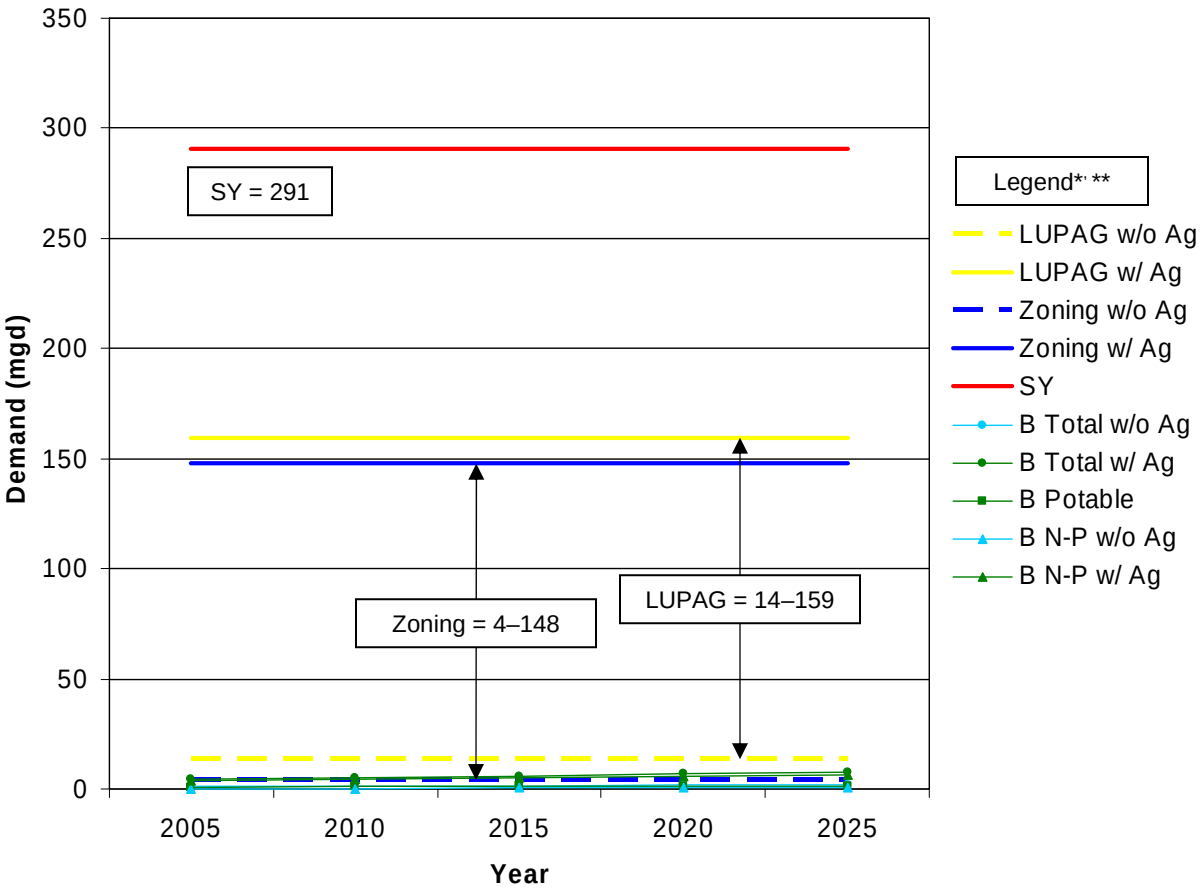
* Demand scenarios without and with agricultural demands represent the potential minimum and maximum agricultural demand, respectively, with the expectation that the actual demand will fall somewhere in between.

Table 805-15: Medium Growth Rate B Water Demand Projection by Category – Southeast Mauna Loa Aquifer Sector Area

Water Use Category	2005 (mgd)	2010 (mgd)	2015 (mgd)	2020 (mgd)	2025 (mgd)
Total without Ag*	1.2	1.3	1.5	1.6	1.8
Total with Ag*	4.8	5.3	5.8	6.4	7.1
Domestic	0.3	0.4	0.4	0.5	0.6
Industrial	0.0	0.0	0.0	0.0	0.0
Irrigation	0.3	0.3	0.3	0.4	0.4
Agriculture	3.6	4.0	4.4	4.8	5.3
Military	0.0	0.0	0.0	0.0	0.0
Municipal	0.6	0.6	0.7	0.8	0.9
Potable	0.9	1.0	1.1	1.3	1.4
Nonpotable w/o Ag*	0.3	0.3	0.3	0.4	0.4
Nonpotable w/ Ag*	3.9	4.3	4.7	5.2	5.7
DWS	0.6	0.6	0.7	0.8	0.8

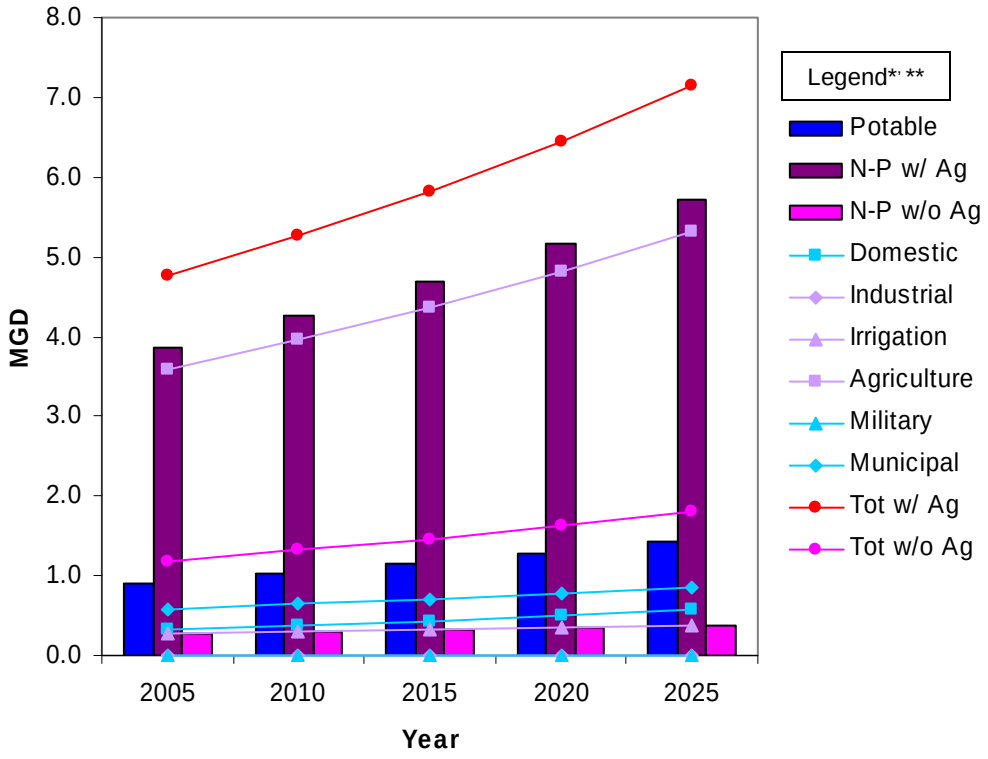
* Demand scenarios without and with agricultural demands represent the potential minimum and maximum agricultural demand, respectively, with the expectation that the actual demand will fall somewhere in between.

Figure 805-9: Medium Growth Rate B Water Demand Projections and Full Build-Out – Southeast Mauna Loa Aquifer Sector Area



* Demand scenarios without and with agricultural demands represent the potential minimum and maximum agricultural demand, respectively, with the expectation that the actual demand will fall somewhere in between.
** The LUPAG and Zoning scenarios represent demand from full build-out to the maximum density allowed and are not associated with a timeline. The B scenario represents the 5-year incremental demand based on Growth Rate B population projections, with "Potable" representing the potable component, "N-P" representing the nonpotable component and "Total" representing the sum of the two.

Figure 805-10: Medium Growth Rate B Water Demand Projection by Category – Southeast Mauna Loa Aquifer Sector Area

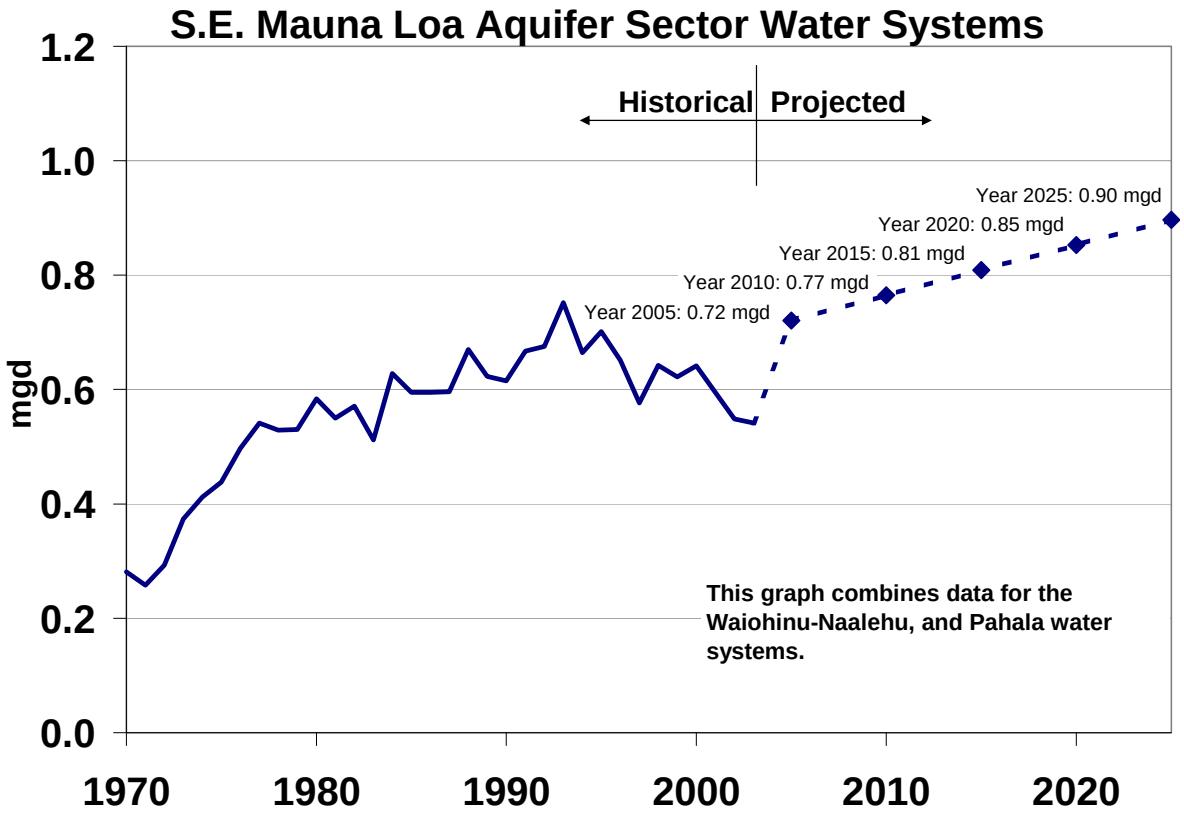


* Demand scenarios without and with agricultural demands represent the potential minimum and maximum agricultural demand, respectively, with the expectation that the actual demand will fall somewhere in between.
** "N-P" represents the nonpotable component of the demand.

805.4.5 DWS Historical Water Consumption Data Projections

DWS supplied water consumption was projected in 5-year increments to the year 2025 based on DWS historical water system consumption data from 1970 to 2003, as shown on **Figure 805-11**.

Figure 805-11: DWS Water Demand Projection – Southeast Mauna Loa Aquifer Sector Area



Historical data provided by RW Beck, Inc.

Projections based on historical DWS water consumption data are quite different than projections based on population growth rate. The actual 2005 consumption is considerably lower than the projection based on historical consumption. Also, the projected future growth rate of the population is much greater than the rate of increase of the historical consumption. DWS may need to supply potable water equivalent to as much as half of the total projected water supply for the sector area.

805.5 RESOURCE AND FACILITY RECOMMENDATIONS

805.5.1 Water Source Adequacy

805.5.1.1 Full Build-Out

Full development to the maximum density of the County General Plan and Zoning land uses within the Southeast Mauna Loa Aquifer Sector Area (ASEA) can be sustained by conventional water resources. If agricultural demands are excluded, LUPAG water demands amount to less than 5 percent of the sustainable yield (SY) of the sector area, and existing Zoning requires approximately 1 percent of the SY. If worst case agricultural demands are included, the LUPAG and Zoning demand scenarios would require 51 and 55 percent of the SY, respectively.

805.5.1.2 Twenty-Year Projection

20-year projected demands range between less than 1 and 3 percent of the SY of the sector area.

805.5.2 Source Development Requirements

805.5.2.1 Supply-Side Management

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

805.5.2.1.1 Conventional Water Resource Measures

805.5.2.1.1.1 Ground Water

The nature of the groundwater is very different between the four aquifer system areas that comprise the Southeast Mauna Loa ASEA. The Olaa and Kapapala Aquifer System Areas (ASYA), consist of high level perched and dike water at great depths. Development of this water would be extremely expensive. The Naalehu and Ka Lae ASYAs, both reaching the southern coast, contain basal water several miles inland. The Naalehu ASYA contains perched and dike-impounded high level water further inland.

Development of potable water wells should continue in the Naalehu ASYA, considering most of the proposed development will occur within this system. DWS has proposed a second well in Pahala and a well in Waiohinu to meet the needs of the two respective water systems.

Nonpotable wells may be developed to serve localized nonpotable uses as they arise.

The output of the spring and tunnel sources fluctuates throughout the year, and is greatly diminished during dry periods. Existing potable sources may continue to be used as long as Federal SDWA regulations are met, however new sources are not likely to be developed due to

the remoteness from proposed development areas. Nevertheless, a significant quantity of water remains available as an alternative to groundwater wells.

805.5.2.1.1.2 Surface Water

Surface water may continue as the primary resource to supply nonpotable needs. The challenge concerning surface water is the transmission, not the availability of sources.

805.5.2.1.1.3 Water Transfer

Water is currently being transferred between aquifer system areas within the Southeast Mauna Loa ASEA, from the Naalehu ASYA to the Ka Lae ASYA, through the DWS Waiohinu-Naalehu Water System. Refer to **Figure 805.6**. Potable water sources are readily available in the Naalehu ASYA; therefore, water transfer is expected to continue and likely increase with potential Hawaiian Home Lands developments in South Point.

Water transfer may also be considered to supply developments in the southern areas of the Southwest Mauna Loa ASEA (806). This issue will be examined in greater detail in Chapter 806.

805.5.2.1.2 Alternative Water Resource Enhancement Measures

805.5.2.1.2.1 Rainwater Catchment Systems

Most of the developed areas in the Naalehu ASYA and the eastern half of the Olaa ASYA receive enough rainfall to support catchment. Individual systems are unlikely to be used if a municipal water system is available, although a large-scale catchment system may be considered to supplement a municipal system. The majority of homes using individual catchments in the sector area are in the eastern portion of the Olaa ASYA outside the extent of the DWS Olaa-Mt. View Water System. Usage of catchments in these areas could potentially increase if growth proceeds as planned without extension of the municipal water system.

805.5.2.1.2.2 Wastewater Reclamation

Reclaimed wastewater is currently being used for irrigation of the golf course at the Punaluu Resort. Usage is not expected to increase without additional development of the resort. In general, reclaimed wastewater is not considered a significant alternative considering the small service populations contributing to wastewater flow, and the availability of other nonpotable sources.

805.5.2.1.2.3 Desalination

Because potable water is available inland, only coastal areas of the Ka Lae ASYA that where only brackish groundwater exists would be considered for desalination facilities. Potable water service already extends to the South Point and Discovery Harbor areas; furthermore, unit costs

would be extremely high considering the small service area. Desalination is unlikely to be implemented in favor of conventional alternatives, such as upgrading the existing source and transmission infrastructure.

805.5.2.2 Demand-Side Management

805.5.2.2.1 Development Density Control

Full build-out demands associated with LUPAG maximum density are nearly four times greater than that of Zoning. Additional sources will eventually be required, however, these demands are sustainable by conventional resources. Therefore, control of development density is not considered critical.

805.5.2.2.2 Water Conservation

The average water use per connection to the DWS water system is 400 gpd, and the average current potable water usage per capita from all sources is approximately 150 gpd, both of which are exactly island averages. Demand-side water conservation should continue, but measures do not need to be implemented.

The water not accounted for in the DWS Waiohinu-Naalehu Water System ranges between 20 and 40 percent, which is high. The total quantity of water unaccounted for amounts to less than 0.25 mgd, therefore supply-side conservation should be planned, but need not be a high priority.

805.5.3 Recommended Alternatives

Potable groundwater development should continue in the Naalehu ASYA to suit anticipated development. Consistent with the General Plan, groundwater source investigation and well development should proceed at Pahala and Waiohinu.

Surface water sources should be developed to meet anticipated nonpotable water demands. Existing irrigation systems should be evaluated to determine the extent of infrastructure improvements and additional source development required to attain optimal function. It is anticipated that the next phase of the update to the *AWUDP* will address these issues in greater detail, specifically considering the Kau Flume System.

Because the sustainable yield of the sector is large compared to the projected demands, and can be reasonably developed, the potential exists to transfer potable water to the neighboring Southwest Mauna Loa ASEA if potable water sources cannot be feasibly developed there.