



AGRICULTURAL WATER USE AND DEVELOPMENT PLAN UPDATE



**STATE OF HAWAII
DEPARTMENT OF
AGRICULTURE**

December 2019

EXHIBIT "I-61"

Table ES-1
Hawai'i Agricultural Water Systems Reviewed for the
AWUDP Update and 2004 AWUDP

AWUDP Update	2004 AWUDP
Kaua'i <ul style="list-style-type: none"> - Kaloko and Pu'u Ka Ele Ditches - Stone Dam and Kalihiwai Irrigation Subsystems - Anahola Ditch - Upper and Lower Lihu'e Ditches and portion of Waiahi-'Ili'ili'ula Ditch - Upper and Lower Ha'ikū Ditches - Wai'aha-Ku'ia Aqueduct, por. Waiahi-'Ili'ili'ula Ditch, and Kōloa-Wilcox Ditch - Olokele Ditch 	Kaua'i <ul style="list-style-type: none"> - East Kaua'i Irrigation System - Kekaha Ditch Irrigation System - Kōke'e Ditch Irrigation System - Kaua'i Coffee Irrigation System
O'ahu <ul style="list-style-type: none"> - O'ahu Ditch (Wahiawā, Helemano, Tanaka, and Ito Ditches) - 'Ōpae'ula, and Kamananui Ditches - Kahuku Irrigation System - Galbraith Lands Irrigation System 	O'ahu <ul style="list-style-type: none"> - Waiāhole Ditch Irrigation System - Waimānalo Irrigation System
	Molokai <ul style="list-style-type: none"> - Moloka'i Irrigation System
	Maui <ul style="list-style-type: none"> - Maui Land and Pineapple/Pioneer Mill Irrigation System - East Maui Irrigation System - West Maui Irrigation System - Upcountry Maui Irrigation System
Hawai'i <ul style="list-style-type: none"> - Ka'ū Agribusiness Irrigation System - Kohala Ditch - Kehena Ditch 	Hawai'i <ul style="list-style-type: none"> - Lower Hāmākua Ditch Irrigation System - Waimea Irrigation System

2014 Farmer Survey

The cost of water, other farm inputs, and availability of labor all affect the economic viability of Hawai'i's agriculture industry, especially when competing with cheaper imports and foreign commodities in state and offshore markets. The underlying sentiment expressed by system managers and farmers during the development of this AWUDP is the importance of keeping water systems and flow at current levels to maintain or increase agricultural production.

Several agricultural areas are restricted from fully utilizing the available land area due to lack of water or prohibitive water costs. During the development of this plan, farmers suggested several areas where additional water resources could potentially increase diversified agriculture and use of irrigated pastures. These areas are within the North and South Kohala regions of Hawai'i and the lower and upper Kula areas of Maui. The development plan recommends funding for initial studies of these potential systems to determine feasibility, development cost, stakeholders, and management.

Recommended Water Demand Rates

Planning for agricultural water demand is key to reserving enough water to sustain and grow the agricultural industry. For planning purposes this AWUDP Update reevaluates the water demand rate. The 2004 AWUDP found the water demand rate to be 3,400 gallons per day per acre, based on an analysis of actual metered water demand from one growing area. This AWUDP Update expands on this analysis by evaluating water demand from 113 farms growing different crops in various growing regions throughout the state; water demand rates from farms in Kunia, O'ahu; and published historical demand rates. Based on this evaluation, the planning-level agricultural water demand rates at the farm-level water meter are as follows:

- 3,900 gpd/acre for diversified agriculture, for usable acreage that is 50 percent planted (average condition);
- 7,800 gpd/acre for diversified agriculture, for usable acreage that is 100 percent planted;
- 8,100 gpd/acre for diversified agriculture, for usable acreage that is 50 percent planted, under drought conditions or in dry areas;
- 16,200 gpd/acre for diversified agriculture for usable acreage that is 100 percent planted, under drought or dry conditions; and
- 8,000 gpd/acre or more for irrigated pastures (usable acreage that is 100 percent planted).

These water demand rates are for statewide planning for agricultural water demand. If a specific site is being studied, a site-specific water demand analysis should be completed.

Forecast

This AWUDP Update develops new forecasts for water demand. As most of the existing agricultural water systems are or will soon be over a hundred years old, future water delivery will be significantly influenced by these systems' condition and ability to provide water. To address the vulnerability and reliance on these systems, forecasts are based on capital investment into the agricultural water systems for maintenance and improvement. Therefore, the forecast has three scenarios: 1) no-action, 2) continued maintenance, and 3) increased capital investment. The water demand at the planning horizon is as follows.

- **No-action scenario.** The no-action scenario assumes that no resources are used to maintain or upgrade the system. Water flow in the system will shut down due to a failure in the water system. At the planning horizon, the forecast water demand will be zero (0) million gallons per day, and agricultural production will significantly decrease.
- **Continued maintenance.** The continued maintenance scenario assumes that resources are available to maintain the current system and will be able to meet the forecast agricultural farm value growth rate. The forecast agricultural farm value growth rate is based on historical trend analysis and is less than one percent (1%) per year. Therefore, the forecast water demand in this scenario is estimated to be 734 million gallons per day by 2035.
- **Increased capital investment.** The increased capital investment scenario, or high forecast, assumes greater agricultural production to assist the state in achieving policies such as sustainability, self-sufficiency, and import replacement. In addition, water systems need to be resilient to the impacts of climate change, as espoused in the smart and resilient city concepts. The forecast water demand in this scenario is estimated to be 1,170 million gallons per day by 2035.

Development Plan

The development plan includes proposed maintenance and capital improvement projects for continued use of the studied irrigation systems (continued maintenance scenario). To maintain the current systems and conduct initial studies for expanded water systems, the cost is estimated to be 167.5 million dollars (2018 dollars) for the first five years.

The development plan also includes potential long-range strategies for system management. Details for long-term investment will not be determined until initial maintenance and capital improvement projects are completed.

Conclusion

Agriculture is an essential component for the state to achieve its goals of sustainability and a diversified economy. The agricultural industry relies on these water systems to deliver inexpensive water to meet and expand agricultural production in normal and drought conditions. By supporting, maintaining, improving, and expanding these water systems, farmers have the potential to maximize the use of agricultural lands and produce agricultural commodities to meet state and export market demands.

4,400 feet of ditch segments and tunnels, focusing on clearing overgrowth, replanting of non-invasive species, and rehabilitation/reconstruction.

Table 16
Kalihiwai Irrigation Subsystem
Proposed Capital Improvement Projects

Project Description	ESTIMATED COST (2018 dollars)
	Short-term
Re-establish upper intake	\$110,000
Clear ditch sections from overgrowth and rehabilitate ditches and tunnels	\$110,000
Establish Kīlauea Agricultural Park water source	To be determined

3.1.2 ANAHOLA DITCH

Ownership and service area information for the Anahola Irrigation System is presented in Table 17. General system information is presented in Table 18. The Anahola Ditch was constructed in the early 1900s by the Makee Sugar Company. By 1933, Līhu'e Plantation had become the sole owner of Makee Sugar Company and Anahola Irrigation System. At that time, the ditch diverted water from two locations in Anahola Stream. In 2000, Līhu'e Plantation ended sugar operations, and certain properties were transferred to the State of Hawai'i. The remaining properties were sold to private owners.

Management and control of the state-owned portion was given to the State of Hawai'i, Department of Hawaiian Home Lands (DHHL). The ditch alignment sits on both state- and privately owned lands. Due to the different owners, the ditch system was discontinued at the boundary between the two.

Historical USGS records show that average flow during low stream flow months is 3.9 MGD. During high-flow months, the average flow is 6.5 MGD.

For the lower Anahola Ditch, USGS records show an average flow ranging from 0.8 MGD to 2.1 MGD between the low- and high-flow months. Rainfall stations in the Anahola region are currently inactive, with no records after 2000. The station at Kaneha Reservoir had an elevation of 845 feet and a mean annual rainfall of 96.49 inches.

Table 19 presents the land use areas within the DHHL service area, and Table 20 presents the land use areas within the private system. The system maps are shown on Maps 17 to 21:

- Map 17 - Alignments and System Components;
- Map 18 - 2014-2015 Land Use;
- Map 19 - ALISH 1977;
- Map 20 - Land Capability Non-Irrigated Conditions; and
- Map 21 - Land Capability Irrigated Conditions.

Table 17
Anahola Irrigation System
System Ownership and Service Area

Description	Information
Owners	State of Hawai'i, DHHL
	Private owner
Source	Anahola Stream
Estimated Current Water Use (annual average)	610,000 gpd ⁽¹⁾ During plantation sugar cane era – estimated at 9 MGD
Estimated Service Area	DHHL – 2,345 acres
	Private owner – 3,725 acres
Farms Area Served	DHHL - 560 acres
Potential Farming	Private owner – unverified
Important Agricultural Lands	None

Note: 1) Commission on Water Resource Management

Table 18
Anahola Irrigation System
General System Information

Description	Information	
System Length (feet) / status	4,950 (Active) 36,499 (Inactive) 60,247 (Unverified)	
Reservoirs	DHHL – See Table 21 Private owner – See Table 22	
Intake	Upper Anahola Intake	Lower Anahola Intake
Source	Anahola Stream	Anahola Stream
Hydrologic Unit	Anahola	Anahola
Intake Status	Active	Inactive
Visual inspection undertaken	Yes	
Irrigation system condition	Upper Anahola Ditch – See Tables 23 and 24 Lower Anahola Ditch - Poor Private owner system not surveyed	
Rehabilitation Potential	Upper Anahola Ditch – Good Lower Anahola Ditch – Poor Private owner – To be determined by owner	
Rehabilitation Cost / CIP	DHHL Portion - See Table 25 Private owner – To be determined by owner	

Table 19
Anahola Irrigation System
Land Uses within the Service Area
 DHHL Portion

Cultivation	Area (acres)
Field Crops	0
Other Crops	248.2
Grazing	309.2

Table 20
Anahola Irrigation System
Land Uses within the Service Area
 Private Landowner Portion

Cultivation	Area (acres)
Field Crops	106.9
Other Crops	160.9
Grazing	1,729.9

Table 21
Anahola Irrigation System
Reservoir Capacity
 DHHL Portion

Reservoir	DLNR⁽¹⁾ Capacity		Capacity⁽²⁾		Current Status
	Acre-feet	MG	Acre-feet	MG	
Kaneha	420.0	136.9	--	--	Active
Kanehu #1	105.0	34.2	79.8	26.0	Active
Kanehu #2	146.0	47.6	46.0	15.0	Inactive
Kanehu #3	--	--	--	--	Active
Upper Anahola	110.0	35.8	82.9	27.0	Active
Lower Anahola	115.0	37.5	153.4	50.0	Active

Notes: 1) DLNR, Dam inventory online database <http://dams.hawaii.gov>

2) Nishida Souza, Jean, et.al. "Kealia Agricultural Water System Study on State Owned Lands," 1996. As referenced in LYON (2014).

Table 22
Anahola Irrigation System
Reservoir Capacity
 Private Landowner Portion

Reservoir	Capacity ⁽¹⁾		Current Status
	Acre-feet	MG	
Hala'ula	Unverified		Active
Mimino	70	22.8	Active

Notes: 1) DLNR, Dam inventory online data base. <http://dams.hawaii.gov>

Assessment of Needs. This assessment of needs only pertains to the DHHL portion of the system, based on a survey conducted in 2015. The condition assessment of the privately owned system was not completed, and the CIP was not developed.

In 2015, only the Upper Anahola Ditch diversion was active, flowing into the Kaneha Reservoir. The condition survey of the DHHL portion rated the intake for the Upper Anahola Ditch to be in fair condition (Exhibit 12). The remainder of the Upper Ditch is disconnected due to split ownership and is in poor condition (Exhibit 13).

The Lower Anahola intake and transmission ditch from Anahola Stream is in even worse condition and may not be feasible for rehabilitation (Exhibits 14 and 15). The single intake on the Upper Anahola Ditch may provide adequate water supply for DHHL needs at this time. A summary of the system's condition is presented in Tables 23 and 24.

In addition, DHHL commissioned two studies on the Anahola Ditch system. In 1996, DHHL completed a limited survey: *Keālia Agricultural Water System Study on State Owned Lands*.¹⁰ The 1996 study included the management and operation of the four regulated dams: 1) Keālia Field 1, 2) Keālia Field 2, 3) Upper Anahola, and 4) Lower Anahola. The second study, *Limited Archaeological & Historical Survey, Anahola Reservoirs Improvement Project*, was performed by Lyon in 2014. The study recommended that the Keālia

¹⁰ Nishida Souza, Jean, et.al. *Kealia Agricultural Water System Study on State Owned Lands*, 1996. As referenced in Lyon (2014).

Field #2 Reservoir and the Lower Anahola Reservoir be decommissioned. The study also recommended the following improvements to the reservoirs:

- Keālia Field #1 Reservoir
 - Reduce lower reservoir capacity to less than 16 MG;
 - Reconstruct existing outlet, including the inlet structure, tunnel, and outlet structure;
 - Partially reconstruct reservoir embankment to provide structural integrity, including adding a rip-rap rock facing on upstream and downstream slopes of the embankment, as well as to the spillway, to prevent erosion;
 - Construct a rip-rap splash pad for the outlet structure; and
 - Construct a maintenance road on the downstream toe of the embankment for ease of access.

Table 23
Anahola Irrigation System
Distribution System Components

Distribution System	Length (feet)	Comments
Ditches		
Active	45	
Inactive	50,556	Majority of the ditches are in poor condition
Unverified	60,437	Private property
Tunnels		
Active	7,863	DHHL property
Inactive	2,919	Majority of the inactive components are on private property
Unverified	11,965	Private property
Flumes		
Active	0	
Inactive	418	Poor condition
Unverified	0	

Table 23 (continued)
Anahola Irrigation System
Distribution System Components

Distribution System	Length (feet)	Comments
Pipelines		
Active	0	
Inactive	0	
Unverified	1,276	Private property
Siphons		
Active	0	
Inactive	0	
Unverified	1,148	Private property

Table 24
Anahola Irrigation System
Distribution System Condition
 DHHL and Active Only

Item	Length (feet)
Ditches	
Good Condition	45
Fair Condition	0
Poor Condition	0
Tunnels	
Good Condition	7,863
Fair Condition	0
Poor Condition	0



Exhibit 12. Upper Anahola Intake – Fair Condition



Exhibit 13. Upper Anahola Ditch - Poor Condition



Exhibit 14. Lower Anahola Ditch – Tunnel with root intrusion



Exhibit 15. Lower Anahola Ditch - Fair Condition



Exhibit 16. DHHL Anahola Regional Plan

- Upper Anahola Reservoir;
 - Reduce lower capacity to less than 16 MG;
 - Reconstruct existing outlet, including the inlet structure, tunnel, and outlet structure;
 - Partially reconstruct reservoir embankment to provide structural integrity, including a rip-rap rock facing on upstream and downstream slopes of the embankment, as well as to the spillway, to prevent erosion;
 - Construct a rip-rap splash pad for the outlet structure; and
 - Construct a maintenance road on the downstream toe of the embankment for ease of access.

In 2010, DHHL prepared a Regional Plan for 4,228 acres in Anahola and Kamalomalo'o, finding that most lands in Anahola remain undeveloped. The DHHL Regional Plan is based on the concept of "homestead communities." DHHL defines a homestead community as a *Hawaiian community being developed into perpetuity*. Based on the 2010 Plan, DHHL envisions the

Anahola area housing a mixture of cultural, homestead, agriculture, pastoral (grazing), income-generating, and public land uses. Exhibit 16 presents that DHHL plan for the Anahola area.

The 2010 Regional Plan provides the following specific agricultural land uses and acreage:

- Subsistence Agriculture - 103 new 2-acre lots on 292 acres;
- Pastoral (grazing) - (14) 10-acre lots on 148 acres; and
- General Agriculture - 1,108 acres.

The “General Agriculture” areas provide farmers with acreage to develop commercially viable farming operations. These areas are typically flat to gentle rolling hills with good soil. The “Subsistence Agriculture” areas allocate acreage to families who want to supplement their food supply or incomes with farming.

The area has moderate rainfall, and DHHL has plans to develop a water system within the Anahola Agricultural Subdivision. DHHL would like to redevelop the existing irrigation ditch system to provide water to the General Agriculture areas, with the potential to develop hydroelectric power generation plant(s).

Proposed Capital Improvement Projects. Based on the condition assessment of system components and information gathered, a CIP is proposed. Because the original system has been severed, a new pipeline and distribution system should be built to reconnect the tunnel near Kaneha Reservoir to the upper Anahola Reservoir. The proposed CIP program and costs are presented in Table 25 and include the following:

- Rehabilitation/reconstruction of the upper Anahola Stream intake, as well as the tunnel from intake to a new distribution connection point near Kaneha Reservoir;
- Design and construction of a new distribution system from the new connection point near Kaneha Reservoir to the upper Anahola Reservoir. The new distribution system will provide water throughout the DHHL land area for grazing and crop irrigation and should connect to the Kanehu reservoirs. The system will be approximately 7,700 feet in length;

- Planning, design, and construction to rehabilitate upper and lower Anahola reservoirs;
- Planning and design for additional storage, as the existing reservoir capacities were significantly reduced to meet dam and reservoir regulations; and
- Provide funds to study the feasibility of reopening the lower Anahola Ditch irrigation system. This system has the potential to provide a significant amount of water for agricultural uses but is in poor condition.

Table 25
Anahola Irrigation System
Proposed Capital Improvement Projects
 DHHL Portion Only

Project Description	Estimated Cost (2018 dollars)
	Short-term
Redevelop Upper Anahola Intake and intake tunnel	\$550,000
Design and construct new distribution pipeline from intake tunnel to Upper Anahola Reservoir	\$8,250,000
Plan, design, and construct rehabilitation of Upper and Lower Anahola Reservoirs	\$3,300,000
Plan and create preliminary design for additional storage capacity	\$1,100,000
Additional design/construction	To be determined
Study feasibility to open lower Anahola Irrigation system	\$400,000

3.1.1.3 UPPER AND LOWER LĪHU'E DITCH

Ownership and service area information for the Upper and Lower Līhu'e Ditch Irrigation System is presented in Table 26. General system information is presented in Table 27.

Table 104
Kōke'e Ditch Irrigation System
2004 Capital Improvement Projects

No	Item	Improvements	Status (2014)
1	Kawaikōi Flume	Demolish flume; install wooden trestle, 48-inch semi-circular corrugated metal pipe (CMP), HDPE lining; conduct structural study	Completed
2	Pu'u Lua Reservoir	Site work; install HDPE lining on dam, pipe burst/24-inches HDPE, discharge pipe; install 24-inch globe valve, flow meter, and appurtenances	In progress with DLNR
3	Pu'u Moe Ditch Divide	Site work; install new divide, Parshall flumes, flow meters, and appurtenances	Pending due to settlement

4.2.3 EAST KAUA'I IRRIGATION SYSTEM

The East Kaua'i Irrigation System (EKIS) services approximately 5,920 acres of agricultural lands. The water source for the EKIS is the Wailua sub-aquifer of the Līhu'e aquifer.

Historical USGS records for water flow in the system are shown on Table 105. The Kapahi rainfall station has an elevation of 520 feet, with a mean annual rainfall of 89.06 inches. The system maps are shown on Maps 114 to 118, as follows:

- Map 114 - Alignments and System Components;
- Map 115 - Statewide Agricultural Land Use Baseline 2015 (Melrose et al.);
- Map 116 - ALISH 1977;
- Map 117 - Land Capability Non-Irrigated Conditions; and
- Map 118 - Land Capability Irrigated Conditions.

Table 105
East Kaua'i Irrigation System
Historical Flow Data

Gage Location	Estimated Mean Monthly Discharge (Low) (MGD)	Estimated Mean Monthly Discharge (High) (MGD)
Hanamalu	9.7	23.9
Stable Storm	2.6	9.0
Kapani	2.9	5.4
Makaleha	2.1	5.4
Wailua	6.0	14.2
'A'ahoaka	0.6	1.1

The EKIS has undergone significant changes since the 2004 AWUDP, especially in water storage capacity reduction. Since 2004, the following changes to storage capacity have occurred:

- The Wailua Reservoir has been reduced in volume to meet new dam safety regulations;
- In 2013, the Hanamā'ulu Reservoir 21 storage capacity was reduced to have the reservoir deregulated; and
- The storage capacity of the Lower 'A'ahoaka Reservoir has been impaired by invasive species encroachment.

In addition, although not within EKIS, the Lower Kapahi Reservoir has been decommissioned, and the Twin Reservoirs are slated to be decommissioned. The status of the CIP listed in the 2004 AWUDP is presented in Table 106.

Table 106
East Kaua'i Irrigation System
2004 Capital Improvement Projects

No.	Item	Improvement	Status (2014)
1	Lateral 8	Demolish 100 linear feet (LF) of 30-inch CMP; install 100 LF of new 30-inch CMP; improve ditch bank; and repair lateral eight (8) siphon inlet	Completed
2	Hanamā'ulu Flume	Demolish wooden flume and salvage; excavate unclassified backfill and buried wooden trestle; backfill earthen ditch; install new reinforced concrete flume; install concrete flume	Completed
3	Twin Reservoirs	Demolish catwalks; install new wooden catwalks and concrete platform; creosote treatment for lumber; install new control gates	Reservoir to be decommissioned
4	Upper Kapahi Reservoir	Demolish catwalk; install new wooden catwalk and concrete platform; creosote treatment for lumber; install new control gate	Completed
5	Wailua Reservoir	Demolish catwalk; install new wooden catwalk and concrete platform; creosote treatment for lumber; install new control gate; retrofit intake gate structure to main transmission line	Completed ⁽¹⁾
6	Hanamā'ulu Reservoir 21	Install new control valve	Completed
7	Control Gates	Retrofit approximately 15 control, bypass, and release gates	Pending
8	Diversion Works	Renovate diversion works and inlet gates for intakes on Kapa'a Stream, Wailua Ditch, Stable Storm Ditch, Hanamā'ulu Ditch	Kapa'a and Wailua completed. Hanamā'ulu not completed
9	Stable Storm Ditch	Re-route portion of Stable Storm Ditch onto state land with pipeline; construct lined reservoir	Long-term project

Note: 1) The Wailua reservoir capacity has been reduced due to compliance issues.

A notable project in the EKIS service area (circa 2015) is the harvesting of “wild” albizia trees by the biofuel company Green Energy of Kauaʻi. The energy company plans to start power production with Albizia chips while the approved forestry trees for long-term biofuel needs are planted and reaching maturity.

The improvements to the 'A'ahoaka Reservoir have been completed since 2004. EKIS is another century-old system that requires repair, renovation, and upgrading to sustain or increase water flow. EKIS currently supplies water to the existing users and has potential to expand the number of acres cultivated. To provide for the potential increase in agriculture, a greater water supply must be coupled with long-term stable water flow to the agricultural lands. Therefore, EKIS has proposed the following projects to maintain existing water flow and increase it for an additional 300-plus acres. A summary of the proposed CIP is presented in Table 107.

- Overall System
 - Renovation/retrofit of control gates at various locations.
 - Planning and design to rebuild Kapahi diversion and intake structure.
 - Renovation of the Kapahi diversion and intake structure.
 - Planning and design for renovation and rebuilding of diversions at various locations.
 - Renovation of diversions at various locations.
 - Planning, design, and construction to renovate and replace control gates at various locations.
 - Reconnaissance survey to provide bathymetry data and storage capacity in reservoirs.

- Kapa'a Section
 - The access road for the main transmission line, Wailua Ditch to North Fork, needs to renovate approximately two (2) miles with 50-foot roadways, including swales and shoulders. Vegetation needs to be cleared on either side of the roadway, approximately 25 feet deep, to prevent incursion, remove blockage from falling trees and branches, and allow the road to dry after rainfall.
 - Flume 2 needs to be replaced.
 - The access road for the main transmission line (to North Fork) requires clearing and reconstruction for about one (1) mile. The access road dimensions are the same as the above.
 - The control gates on the North Fork, catwalk, and weir need to be rebuilt.
- Kālepa Section
 - Lower and Upper 'A'ahoaka Reservoirs require significant invasive species removal, typically the overgrowth of eucalyptus (paper bark) and hau.
- Lateral 8B (off from Wainau Road) has root intrusion through the ditch walls, as well as into the tunnel. The ditch measures four (4) feet wide by five (5) feet high, and approximately 80 feet of ditch requires repair. The root intrusion into Tunnel 2 is about 80 feet into the tunnel. Tunnel 2 is approximately 200 feet long.
- Stable Storm. Planning and design for reconstruction of the intake and for replacement and rerouting of distribution line onto state land. The intake will provide a backup for the existing water demand and a long-term supply for the future increase in cultivated area.
- Distribution system. A long-term project to construct a pipeline from Upper Kapahi Reservoir to Hauiki Road and lateral 9 to Upper Kapahi.

The new pipeline will improve the longevity of the system and potentially reduce repair costs.

Table 107
East Kaua'i Irrigation System
2018 Capital Improvement Projects

Project Description	ESTIMATED COST (2018 dollars)	
	Phase I	Phase II
Repair and renovate control gates and various diversions	\$110,000	
Reconstruct Kapahi Diversion	\$150,000	
Restore reservoir capacity		
Capacity analysis and bathymetric survey	\$230,000	
Design and construction		To be determined
Kapa'a access road and flume		
Design	\$2,000,000	
Construction		\$10,000,000
North Fork Access Road and miscellaneous improvements	\$6,500,000	
Reopen Lower 'A'ahoaka Reservoir, clearing and dredging	\$10,000,000	
Kālepa Section Lateral 8B		
Planning	\$120,000	
Design and construction		To be determined
Reopen Stable Storm Ditch		
Planning	\$130,000	
Design and construction		To be determined
Pipeline from Upper Kapahi Reservoir to Hauiki Road		To be determined

The 2004 AWUDP estimated the amount of unused agricultural lands in the 13 studied systems to be 35,588 acres, or approximately 40 percent of the total acreage of the 13 systems. This study shows that there are approximately 29,870 acres available for agriculture, however, some of the systems did not report available agricultural lands. Based on the GIS and the inventory studies, there is approximately 114,360 acres of the total service area not used for agriculture. However, these unused areas include unusable lands, such as roadways, gullies, etc. If a factor of 40 percent (similar to the 2004 AWUDP) is used, the estimated available land area is 45,744 acres.

Table 139
Agricultural Land Use by System, Kaua'i County

Irrigation System	Field Crops (acres)	Other Crops (acres)	Total Cultivated (acres)	Grazing (acres)	Total Active (acres)	Available Land (acres)
Kaloko	0	61	61	945	1,006	---
Stone Dam	0	8	8	51	59	---
Kalihiwai	184	189	373	10	383	245
Anahola	107	409	516	2,039	2,555	1,454
Upper and Lower Līhu'e	229	608	837	1,636	2,473	---
Upper and Lower Ha'ikū	205	591	797	2,142	2,939	---
Waiahi-Kuia Aq. and Kōloa-Wilcox	889	1,501	2,390	2,871	5,601	---
Olokele	7,472	934	8,406	1,385	9,791	---
East Kaua'i	---	---	1,530	4,380	5,910	---
Kaua'i Coffee	---	---	3,900	490	4,390	2,319
Kekaha	6,517	---	6,517	0	6,617	2,626
Kōke'e	---	---	---	1,192	1,192	992
TOTAL			25,335	17,141	42,916	7,636

Table 146
CIP Summary for Kaua'i County Irrigation Systems
 (2018 dollars)

System	2018-2023
Kalihiwai System	\$220,000
Anahola DHHL System	\$13,600,000
Kōloa-Wilcox Ditch (Lāwa'i (A&B) Portion)	\$1,350,000
East Kaua'i System	\$19,240,000
Kekaha/Kōke'e	\$11,000,000

Table 147
CIP Summary for O'ahu Irrigation Systems
 (2018 dollars)

Project	2018-2023
O'ahu Ditch (Wahiawā, O'ahu, Ito, and Helemano)	\$8,360,000
Kahuku Irrigation System	\$4,370,000
Galbraith Lands System	\$17,000,000
Waiāhole Irrigation System	\$5,730,000
Waimānalo	\$4,800,000

Table 148
CIP Summary for Maui County Irrigation Systems
 (2018 dollars)

Project	2018-2023
Upcountry Maui	\$200,000
Moloka'i	\$9,160,000
Planning and preliminary design for New Lower Kula Irrigation System	\$45,000,000