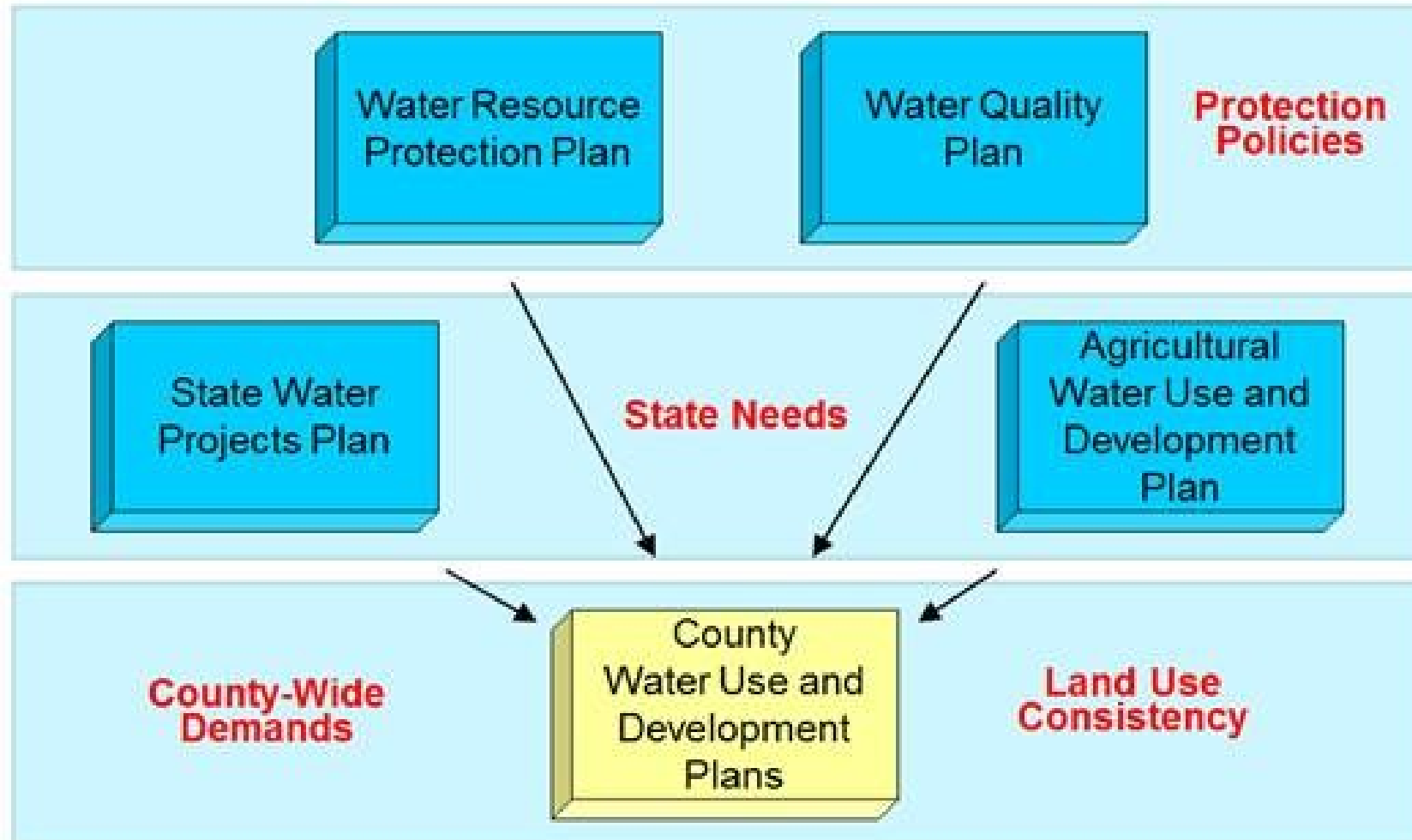




# Agricultural Water Use and Development Plan Update December 2019

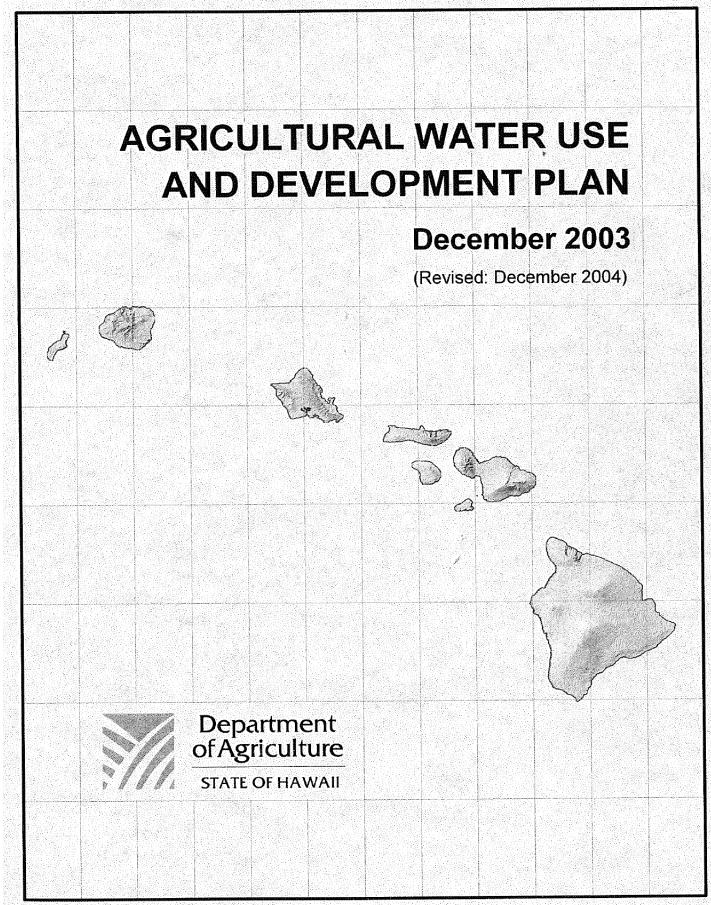
For the Commission on Water Resource Management  
Tuesday, July 21, 2020 (Zoom Meeting Presentation)

# Hawaii Water Plan Components





# 2004 AWUDP



# AWUDP 2019 Update



## AGRICULTURAL WATER USE AND DEVELOPMENT PLAN UPDATE



STATE OF HAWAII  
DEPARTMENT OF  
AGRICULTURE

December 2019

# Objectives

Address the following requirements of HRS, 174C-31e

- Inventory public and private irrigation water systems
- Identify the extent of rehabilitation needed for each system
- Identify source of water used by agricultural operations, especially IALs
- Identify current and future water needs for agricultural operations, especially IALs
- Develop a 5-year program to repair the systems
- Set up a long-range plan to manage the systems

# Irrigation Systems Studied

AWUDP 2019 Update	2004 AWUDP
<p>Kaua'i</p> <ul style="list-style-type: none"> <li>- Kilauea Sugar (Kaloko, Pu'u Ka Ele, Morita, Stone Dam and Kalihiwai Irrigation Subsystems)</li> <li>- Anahola Ditch</li> <li>- Upper and Lower Lihu'e Ditches and portion of Waiahi-'Ili'ili'ula Ditch</li> <li>- Upper and Lower Ha'ikū Ditches</li> <li>- Wai'aha-Ku'ia Aqueduct, por. Waiahi-'Ili'ili'ula Ditch, and Kōloa-Wilcox Ditch</li> <li>- Olokele Ditch</li> </ul> <p>O'ahu</p> <ul style="list-style-type: none"> <li>- O'ahu Ditch (Wahiawā, Helemano, Tanaka, and Ito Ditches)</li> <li>- 'Ōpae'ula, and Kamananui Ditches</li> <li>- Kahuku Irrigation System</li> <li>- Galbraith Lands Irrigation System</li> </ul> <p>Hawai'i</p> <ul style="list-style-type: none"> <li>- Ka'ū Agribusiness Irrigation System</li> <li>- Kohala Ditch</li> <li>- Kehena Ditch</li> </ul>	<p>Kaua'i</p> <ul style="list-style-type: none"> <li>- East Kaua'i Irrigation System</li> <li>- Kekaha Ditch Irrigation System</li> <li>- Kōke'e Ditch Irrigation System</li> <li>- Kaua'i Coffee Irrigation System</li> </ul> <p>O'ahu</p> <ul style="list-style-type: none"> <li>- Waiāhole Ditch Irrigation System</li> <li>- Waimānalo Irrigation System</li> </ul> <p>Molokai</p> <ul style="list-style-type: none"> <li>- Moloka'i Irrigation System</li> </ul> <p>Maui</p> <ul style="list-style-type: none"> <li>- Maui Land and Pineapple/Pioneer Mill Irrigation System</li> <li>- East Maui Irrigation System</li> <li>- West Maui Irrigation System</li> <li>- Upcountry Maui Irrigation System</li> </ul> <p>Hawai'i</p> <ul style="list-style-type: none"> <li>- Lower Hāmākua Ditch Irrigation System</li> <li>- Waimea Irrigation System</li> </ul>

# Access Allowed

## Kauai

- Kalihiwai (Stone Dam portion)
- Kalihiwai (Porter portion)
- Anahola (DHHL Portion)
- Waiaha-Kula (A&B) (portion)

## Oahu

- Oahu Ditch
- Kahuku (ARMD)
- Galbraith Lands Irrigation System (ADC)

## Hawaii

- Kehena Ditch

# Not Allowed

## Kauai

- Kalihiwai (Kaloko portion)
- Upper and Lower Lihue Ditches
- Upper and Lower Haiku Ditches
- Waiaha-Kula (portions)
- Olokele Ditch

## Oahu

- Opaeula, Kamananui, and Ito Ditches

## Hawaii

- Kohala Ditch

# Kalihiwai Irrigation Subsystem

## System Ownership and Service Area

Description	Information
Owners	<p>Various owners</p> <p>Kalihiwai Reservoir – Kalihiwai Ridge Community Associations</p> <p>Porter Irrigation System (System Manager)</p>
Source	Pohakuhonu Stream
Estimated Current Water Use (annual average)	<p>100,000 gpd</p> <p>During plantation era – estimated at 10 MGD</p>
Estimated Service Area	794 acres
Farms Area Served	<p>200 acres – mahogany trees</p> <p>150 acres – community farms</p>
Potential Farming	Potential increase if water available
Important Agricultural Lands	None

# Kalihiwai Irrigation Subsystem

## General System Information

Description	Information	
System Length (feet) / status	17,380 (Active)	
Intake	Kalihiwai Intake 1	Kalihiwai Mauka Intake
Source	Pohakuhonu Stream	Pohakuhonu Stream
Hydrologic Unit	Kīlauea	Kīlauea
Intake Status	Active	Inactive
Reservoirs	Kalihiwai Reservoir	
Capacity (acre-feet / MG)	141 / 46	
Status	Active	
Visual inspection undertaken	Yes	
Irrigation system condition	Poor to Good – see Table 15	
Rehabilitation Potential	Good	
Rehabilitation Cost / CIP	See Table 16	



# Kalihiwai Irrigation Subsystem Overgrowth

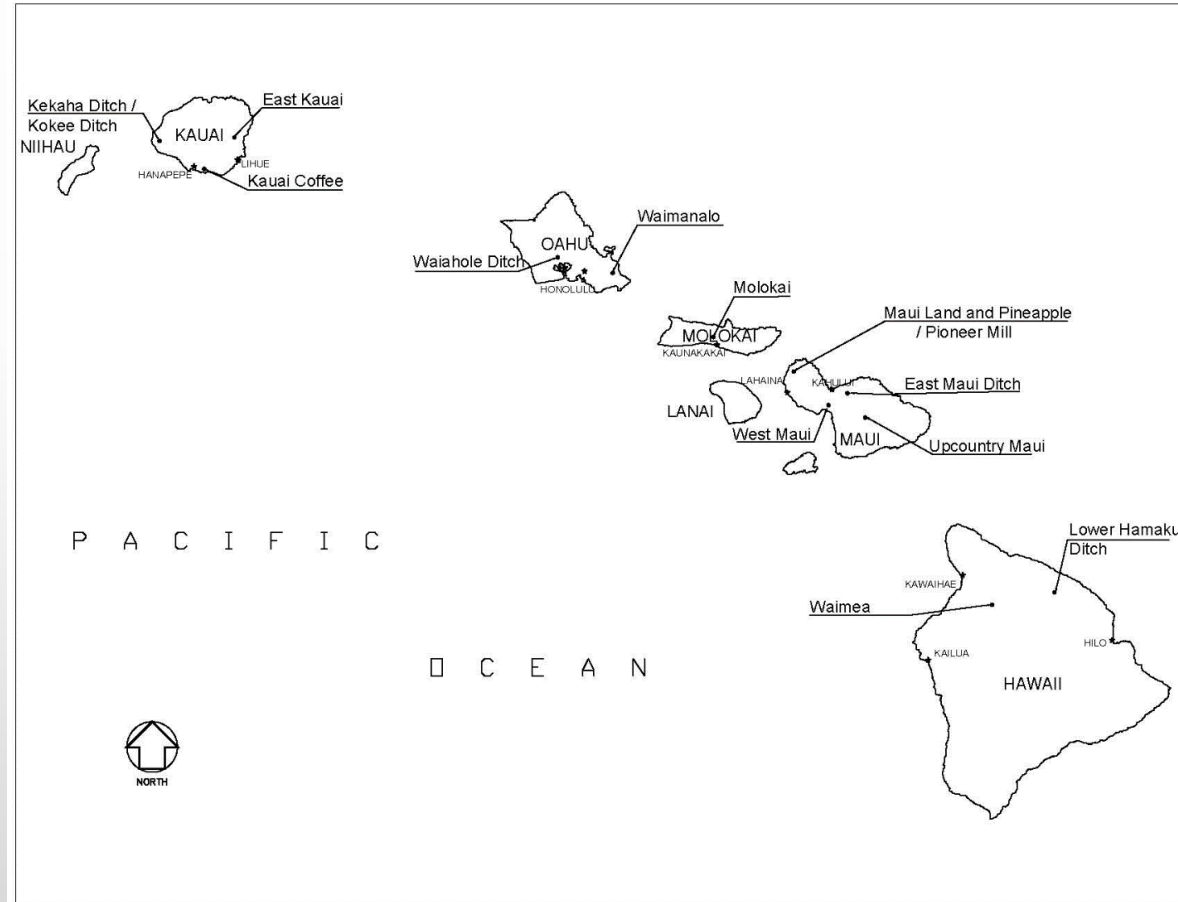


# Kalihiwai Irrigation Subsystem

## Proposed Capital Improvement Projects

<b>Project Description</b>	<b>ESTIMATED COST</b> (2018 dollars)
	<b>Short-term</b>
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

# Update to Systems Studied in the 2004 AWUDP



# Waimanalo Irrigation System

## 2004-2014 Capital Improvement Projects

No.	Item	Improvements	Status
1	Land	DLNR land transfer	Ongoing
2	Distribution	Pipeline stabilization	Completed
3	Distribution	Extend pipeline (Wong Ditch)	Completed
4	Safety	Miscellaneous safety improvements	Completed
5	Baseyard	Renovations at HDOA baseyard	Ongoing
6	Ditch	Miscellaneous ditch repairs	Completed
7	Source	Install Emergency Pump Well No. 1	Completed

# Waimanalo Irrigation System 2018 Capital Improvement Projects

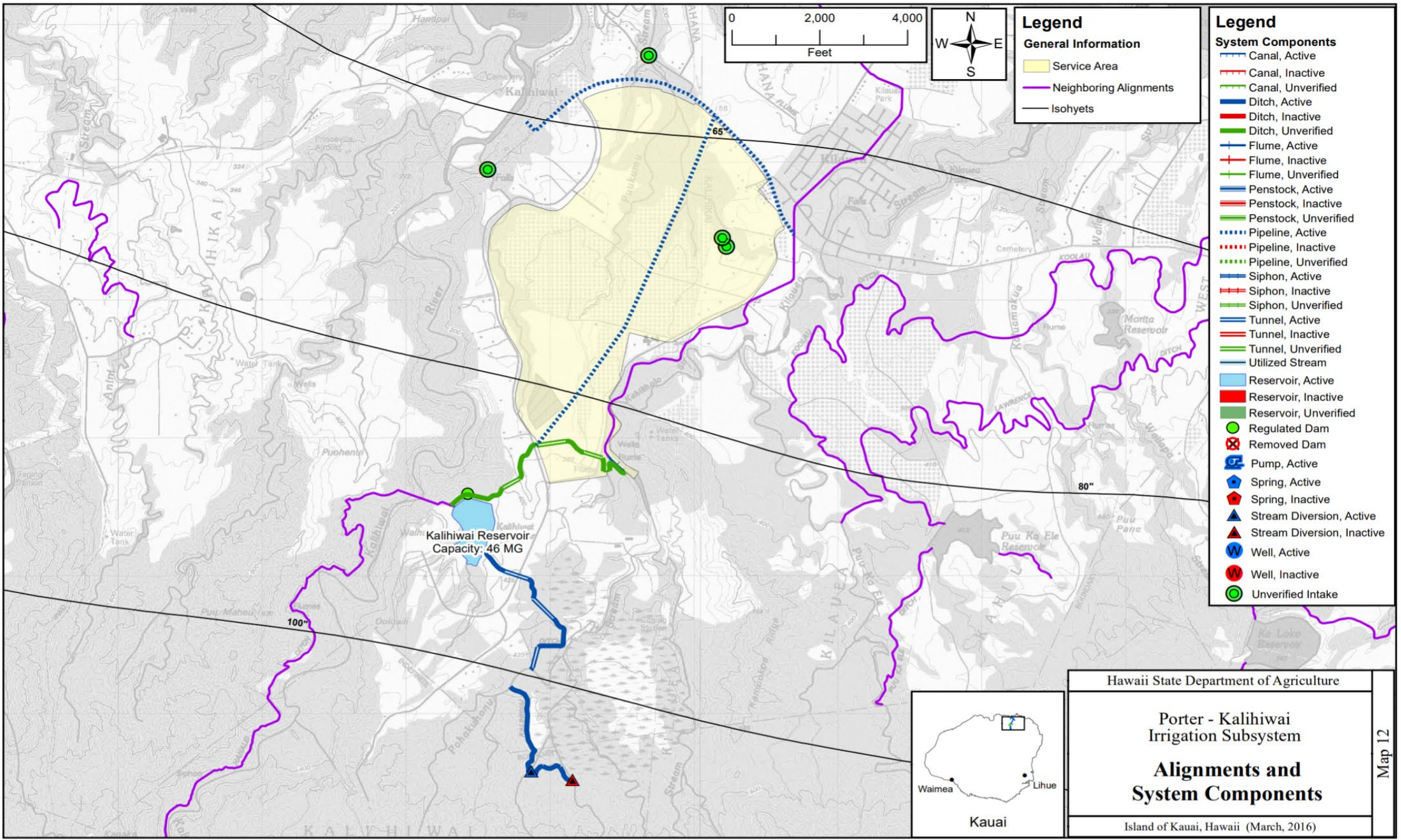
<b>Project Description</b>	<b>ESTIMATED COST</b> (2018 dollars)	
	<b>Phase I</b>	<b>Phase II</b>
Renovation of baseyard and miscellaneous improvements	\$3,500,000	
Replace remaining ditch portion with pipeline		
Design		\$1,000,000
Construction		To be determined
Tayli Reservoir Improvements	\$1,300,000	



# Waimanalo Irrigation System – Maunawili Valley Improvements







**Legend**

**General Information**

- Service Area
- Neighboring Alignments
- Isohyets

**Legend**

**System Components**

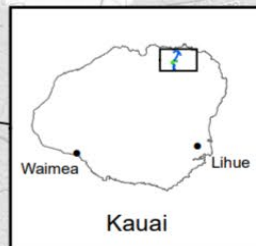
- Canal, Active
- Canal, Inactive
- Canal, Unverified
- Ditch, Active
- Ditch, Inactive
- Ditch, Unverified
- Flume, Active
- Flume, Inactive
- Flume, Unverified
- Penstock, Active
- Penstock, Inactive
- Penstock, Unverified
- Pipeline, Active
- Pipeline, Inactive
- Pipeline, Unverified
- Siphon, Active
- Siphon, Inactive
- Siphon, Unverified
- Tunnel, Active
- Tunnel, Inactive
- Tunnel, Unverified
- Utilized Stream
- Reservoir, Active
- Reservoir, Inactive
- Reservoir, Unverified
- Regulated Dam
- Removed Dam
- Pump, Active
- Spring, Active
- Spring, Inactive
- Stream Diversion, Active
- Stream Diversion, Inactive
- Well, Active
- Well, Inactive
- Unverified Intake

Hawaii State Department of Agriculture

Porter - Kalihiwai  
Irrigation Subsystem

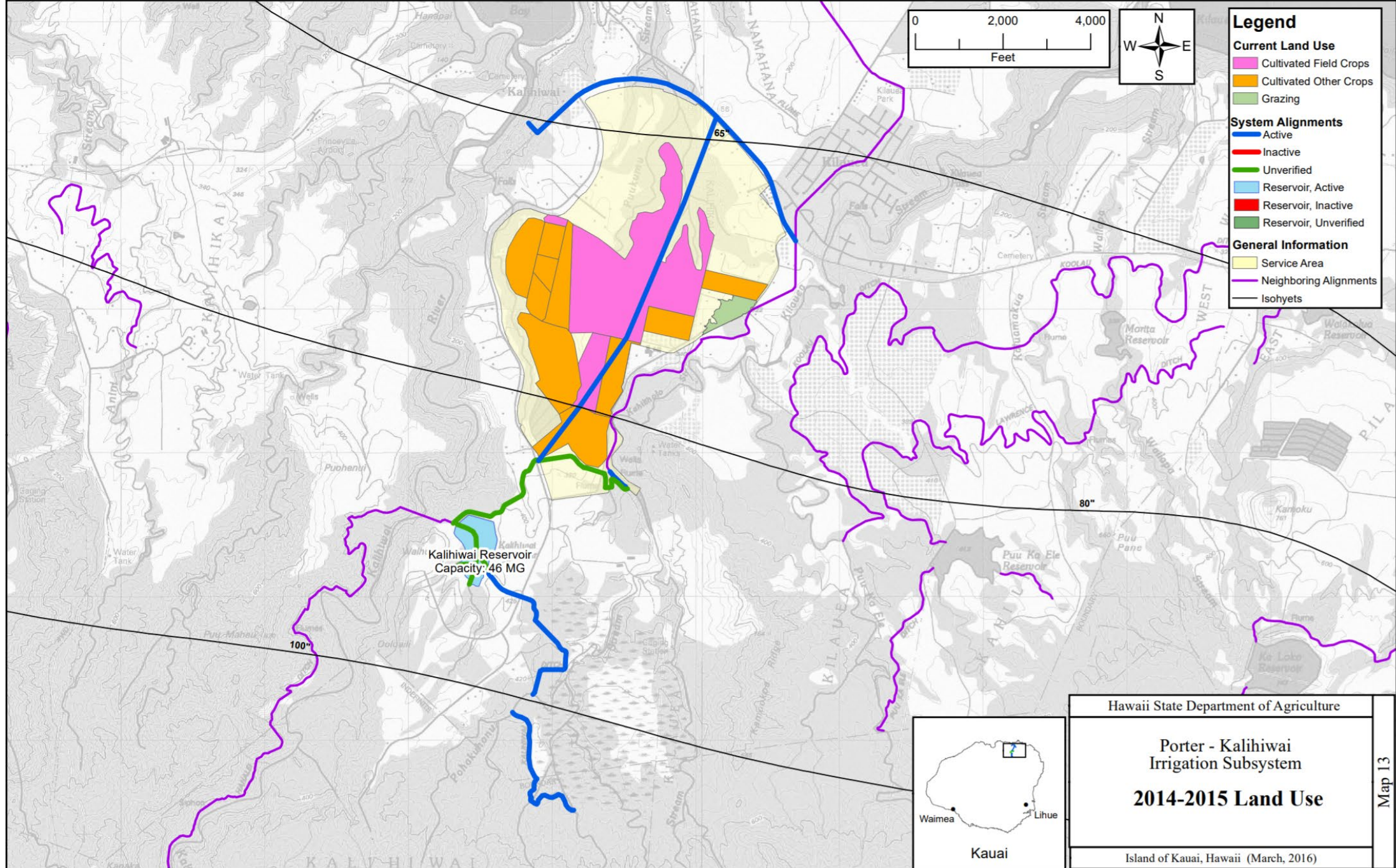
**Alignments and  
System Components**

Island of Kauai, Hawaii (March, 2016)



Map 12





**Legend**

**Current Land Use**

- Cultivated Field Crops
- Cultivated Other Crops
- Grazing

**System Alignments**

- Active
- Inactive
- Unverified
- Reservoir, Active
- Reservoir, Inactive
- Reservoir, Unverified

**General Information**

- Service Area
- Neighboring Alignments
- Isohyets

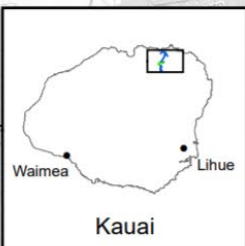
Kalihiwai Reservoir  
Capacity: 46 MG

Hawaii State Department of Agriculture

Porter - Kalihiwai  
Irrigation Subsystem

**2014-2015 Land Use**

Island of Kauai, Hawaii (March, 2016)







# Agricultural Water Demand

# 2004 AWUDP Water Demand

- Based on farm meter data in Lalamilo
- 3,461 (3,400) gpd/acre
- 2,500 gpd/acre in December/January – 4,600 gpd/acre in September

# Table 118 –Comparison of Agricultural Water Demand

Year	Water Demand (gpd/acre)	Comment
1953 (Reference 41)	5,325	Kailua and Kāne`ohe, O`ahu
1956 (Reference 15)	1,131	Waimānalo
	2,277	Waimānalo - dry
1959 (Reference 13)	7,140 to 8,035	Sugar cane
	1,000,000	Wet crops (rice, taro, etc.)
	1,340 to 4,465	Diversified agriculture (excluding sugar cane and pineapple)
1984 (Reference 64)	6,000	Kahuku - nursery
	4,000	Kahuku - truck orchard
1995 (Reference 46)	7,722	Sugar cane
1999 (Reference 51)	4,700	Reference Crop - normal rainfall for elevations under 500 feet
	5,300	Reference Crop - low rainfall for elevations under 500 feet
	3,500	Reference Crop - normal rainfall for elevations above 500 feet
	4,200	Reference Crop - low rainfall for elevations above 500 feet
2004 AWUDP	3,400	Lālānilo
2011 (Reference 34)	2,577	Upper Kula - average rainfall
	3,029	Upper Kula - drought
	3,221	Upper Kula - severe drought
	3,889	Lower Kula - average rainfall
	4,371	Lower Kula - drought
	4,577	Lower Kula - severe drought

# Sample Variations in Water Demand

(Table 124 – Summary of Average Daily Crop Water Demand, Lower Hamakua Ditch, Kukuihaele to Paauilo (gpd/acre), DOA 1999)

	<b>Crop Water Demand Below 500 feet</b>		<b>Crop Water Demand Above 500 feet</b>	
	50%	80%	50%	80%
Rainfall				
Banana	2,211	3,236	1,425	1,964
Coffee	1,471	2,079	852	1,296
Papaya	1,471	2,079	852	1,296
Macadamia nut	1,140	1,578	562	992
Foliage/flowers	1,808	2,655	1,140	1,600
Truck crops	1,140	1,578	562	992
Reference Crop	1,500	2,100	900	1,350
<i>Effective Daily Rainfall (inches)</i>	<i>0.11</i>	<i>0.09</i>	<i>0.13</i>	<i>0.10</i>
(gpd/acre)	2,986	2,443	3,530	2,715



# Reported Water Demand

- The Farm Survey Data from over 113 respondents
  - Waimanalo
  - Kahuku
  - Mililani
  - Kula
  - Pahoa
  - Panaewa
  - Hamakua
  - East Kauai
  - Molokai
- Lalamilo, Hawaii and Kunia, Oahu

# Monthly Average Farm Water Demand (based on survey responses)

<b>Location</b>	<b>Average Wet Season (gpd/acre)</b>	<b>Average Dry Season (gpd/acre)</b>
Hawai'i	4,164	5,298
Maui	3,304	10,139
Moloka'i	6,237	14,520
O'ahu	3,840	7,183
Kaua'i	87	905

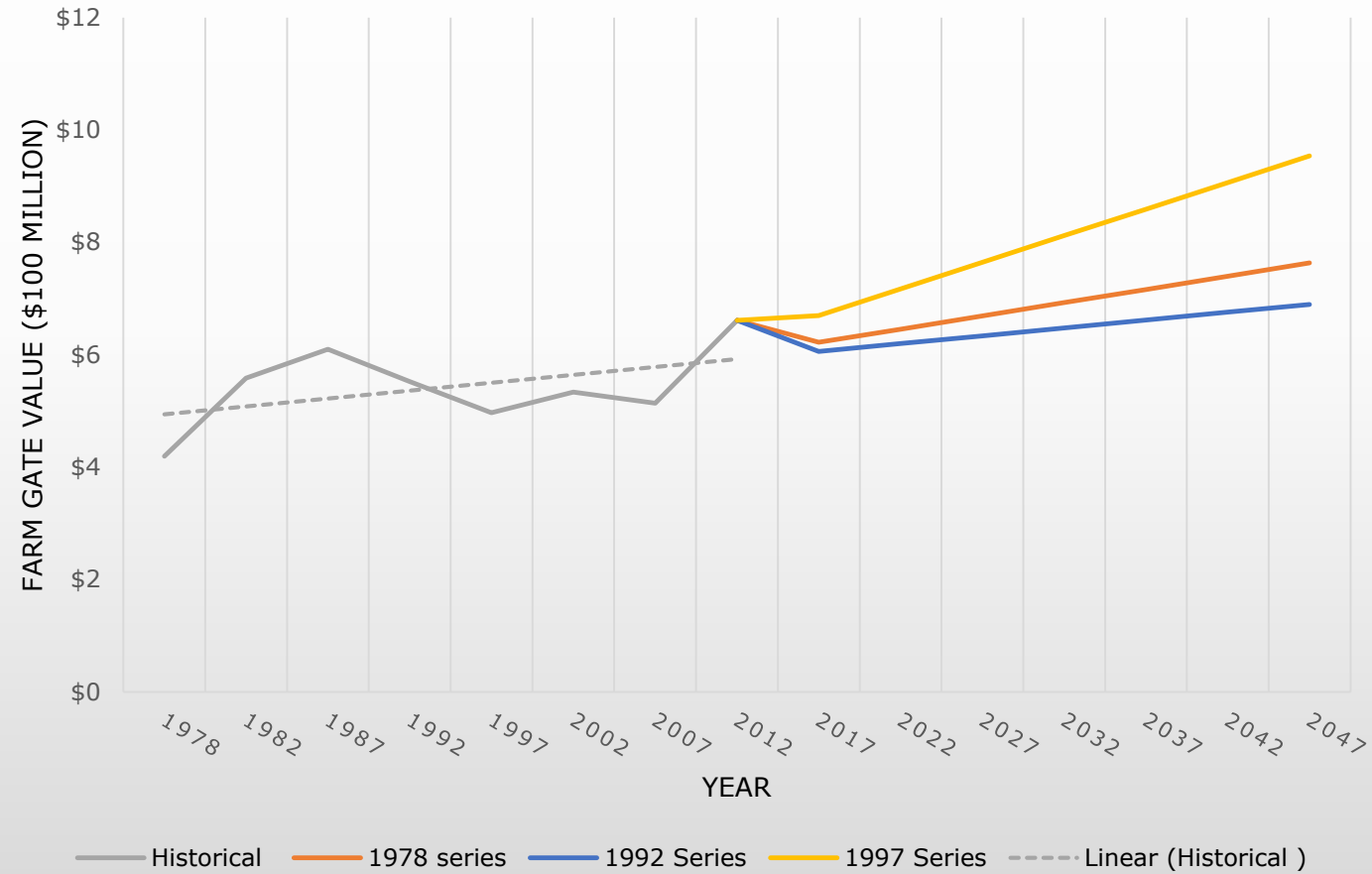
# Average Monthly Water Demand by Irrigation Type (based on survey responses)

<b>Irrigation Method</b>	<b>Number of Farms</b>	<b>Wet Season (gpd/acre)</b>	<b>Dry Season (gpd/acre)</b>
Drips	49	3,680	9,260
Sprinklers	29	5,910	7,578
Water Hose	12	4,507	5,367
Ponds	1	59	5
Aquaculture	1	4,662	4,662

# Agricultural Water Demand Planning Rates (at the farm meter)

<b>Description</b>	<b>Water Demand (gpd/acre)</b>
Diversified agriculture (for usable acreage that is 50 percent planted)(average condition) (e.g. leafy vegetables and truck crops)	3,900
Diversified agriculture (for usable acreage that is 100 percent planted) (e.g. nursery, feed, and forage crops)	7,800
Diversified agriculture (for usable acreage that is 50 percent planted) under drought conditions or in dry areas	8,100
Diversified agriculture (for usable acreage that is 100 percent planted) under drought conditions or in dry areas	16,200
Irrigated (managed) pastures (for usable acreage that is 100 percent planted)	8,000
Aquaculture, taro, and other wet crops	Dependent on crop and location

# Farm Forecast





# Irrigation Systems Forecast

- No action scenario
- Maintained water system scenario (status quo)
- Large capital investment scenario



# Development Plan

- Short term (5-years): CIP for existing infrastructure
- Long term

- Diversifying the economy
- Sustainability and self-sufficiency
- Support of diversified agriculture



***Mahalo!***

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