WEST MAUI
PLANNING FOR THE FUTURE

COUNTY OF MAUI
DEPARTMENT OF PLANNING

WEST MAUI COMMUNITY PLAN

Water Technical Resource Paper

October 15, 2018

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Introduction

Water serves many of our everyday needs from drinking water to agriculture. It is also an important part of a healthy ecosystem. An anticipated increase in the resident and visitor populations and uncertain climate conditions will place added pressure and demand on this critical resource. Balanced stewardship of water resources is essential for its preservation as well as meeting our daily needs, now and in the future. This will require a collective effort by water providers, land owners and managers, and users to plan and manage responsibly for the benefit of the community and the environment.

Countywide Policy Plan and Maui Island Plan

The Countywide Policy Plan identified the improvement of physical infrastructure as a key strategy to carry out the shared vision for the future of our communities. The Maui Island Plan (MIP) includes a goal of having an environmentally sustainable, reliable, safe, and efficient water system. It outlines objectives along with policies and actions to support that goal. The objectives include:

1. More comprehensive approach to water resources planning to effectively protect, recharge, and manage water resources including watersheds, groundwater, streams, and aquifers.
2. Increase the efficiency and capacity of the water systems in striving to meet the needs and balance the island's water needs.
3. Improve water quality and the monitoring of public and private water systems.

West Maui Community Plan

Water-related objectives and policies in the 1996 West Maui Community Plan (WMPC) span topics including the protection of the resource, its quality, availability, and use, and management of the water systems and services. The update of the WMCP will be consistent with the Countywide Policy Plan and MIP, and provide guidance for infrastructure development needs and priorities for West Maui.

Water Use and Development Plan

The Water Use and Development Plan (WUDP) carries out the General Plan's goals, policies, and objectives. It is used as a long-range planning guide for all uses of water in the county. It outlines strategies for management of water resources, including allocation of water to land uses. The County Department of Water Supply (DWS) has released the updated Draft Maui Island component of the WUDP, which used relevant information from the MIP. The WUDP must be approved by the Maui County Council and adopted by the State Commission of Water Resources Management (CWRM). Information and conclusions from the Draft WUDP are incorporated below.

Existing Conditions

Sources, Delivery, and Use

Water in West Maui comes from both ground and surface sources. Table 1 below outlines the reported groundwater pumpage, surface water diversion, and reclaimed or recycled wastewater by type of use for 2014.

Table 1 Reported Pumpage, Estimated Surface Water Use and Reclaimed Wastewater by Type, 2014 (mgd)*

	Domestic	Industrial	Agriculture	Irrigation	Municipal	Military	Total
Groundwater							
Total No. of Production Wells	4	0	6	32	40	0	82
Total Pumpage	0	0	0	0.271	5.936	0	6.208
Percent of Pumpage	0%	0%	0%	4%	96%	0%	100%
Surface Water							
Total Surface Water Diversions	--	--	4	13	3.3	--	20.3
Percent of Surface Water			20%	64%	16%		100%
Recycled Wastewater							
Recycled Wastewater Sold	--	--	--	0.63	--	--	0.63
Total			**4**	**13.901**	**9.236**		**27.138**

Source: County of Maui, Department of Water Supply, Draft WUDP, 2017. Based on Commission on Water Resource Management (CWRM) and DWS reports.
*mgd: million gallons per day

Groundwater is the primary source for drinking water. Municipal or public uses accounted for about 96% of reported pumpage with residential and commercial being the primary uses. The highest demand came from single family residential uses. Groundwater was also a source for some irrigation uses, which comprised about 4% of well pumpage. Total well pumpage reported for all uses was 6.2 million gallons per day (mgd).

Surface water is largely used for irrigation, agriculture, and other public or municipal uses. Irrigation comprises a significant portion of surface water use (64%). Primary irrigation needs include landscaping, golf courses, and parks. Water for agricultural uses comes primarily from surface water through the Maui Land & Pineapple and Pioneer Mill ditch systems (about 2 to 4 mgd). It is occasionally supplemented by groundwater. The County DWS system uses the majority of public or municipal surface water use (15% of total surface water use).

In 2014, an average of about 0.63 mgd out of 3.8 mgd of recycled water was sold by the County Department of Environmental Management (DEM) for irrigation uses. Today, the Lahaina Wastewater Reclamation Facility processes about 4.2 mgd of recycled water on average. Of that, approximately 1.0 to 1.8 mgd or about 40% is used for irrigation. (pers. comm. County DEM, 2018) See Wastewater Brief for more information on water reuse.

Majority of water for residential and commercial use is distributed through six regulated public water systems: two County's systems operated by the DWS and four privately owned systems. Table 2 outlines the water systems and source. The general location of the public water systems is displayed in Figure 1. Figure 2 shows a comparison of water consumption by public water system. The systems are not interconnected and are independently operated and maintained. The State of Hawaii, Department of Health, Drinking Water Branch has regulatory jurisdiction over all six systems.

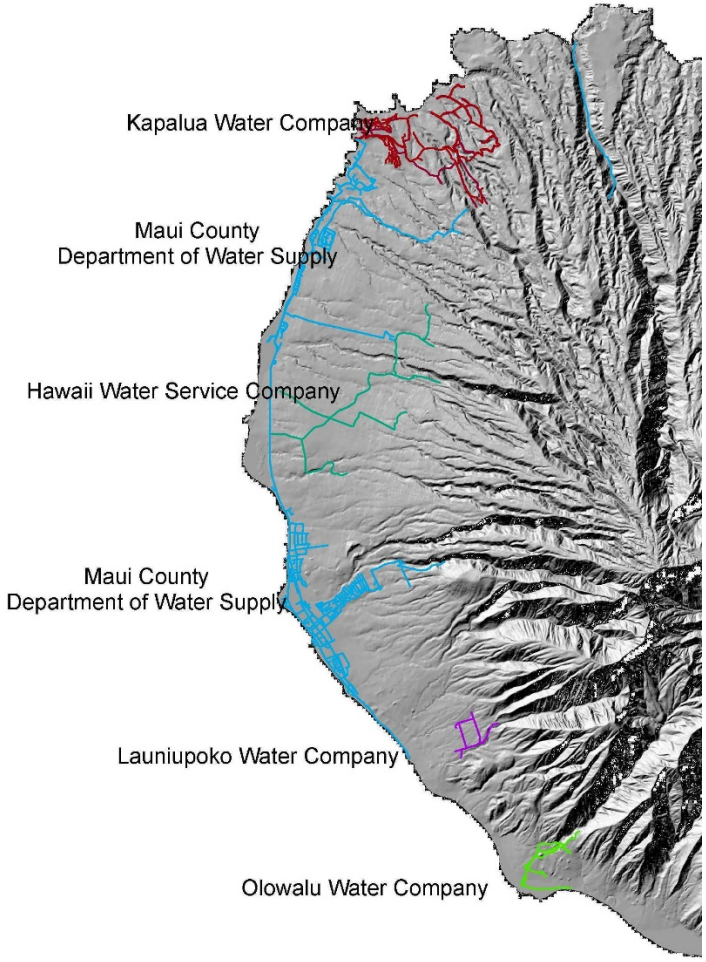
Table 2 Public Water Systems, Lahaina Aquifer Sector Area

System Name	Operator	Population Served	Service Connections	Average Daily Flow (gdp)	Source
Kapalua (PWS 204)	Kapalua Water Company, Ltd.	4,200	555	450,000	Ground
Kaanapali (PWS 205)	Hawaii Water Service Co.	8,000*	700	2,800,000	Ground
Honokohau (PWS 218)	DWS	42	15	13,000	Ground (Kapalua)
Lahaina (PWS 214)	DWS	18,122	3,236	5,522,000	54% Surface/ 46% Ground
Mahanalua Nui Subdivision (PWS 251)	Launiupoko Water Co., Inc.	587	275	100,000	Ground
Olowalu (PWS 209)	Olowalu Elua Associates	100	38	52,000	Ground

Source: County of Maui, Department of Water Supply, Draft WUDP, 2017

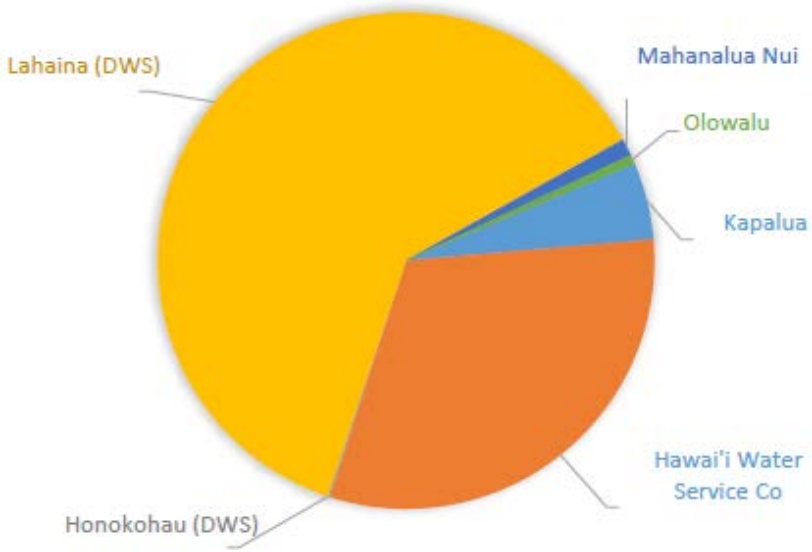
* The Kaanapali system services a large visitor population and 1,500 permanent residents, for a total equivalent of 8,000 persons.

Figure 1 General Location of Public Water Systems



Source: County of Maui, Department of Water Supply, Draft WUDP, 2017

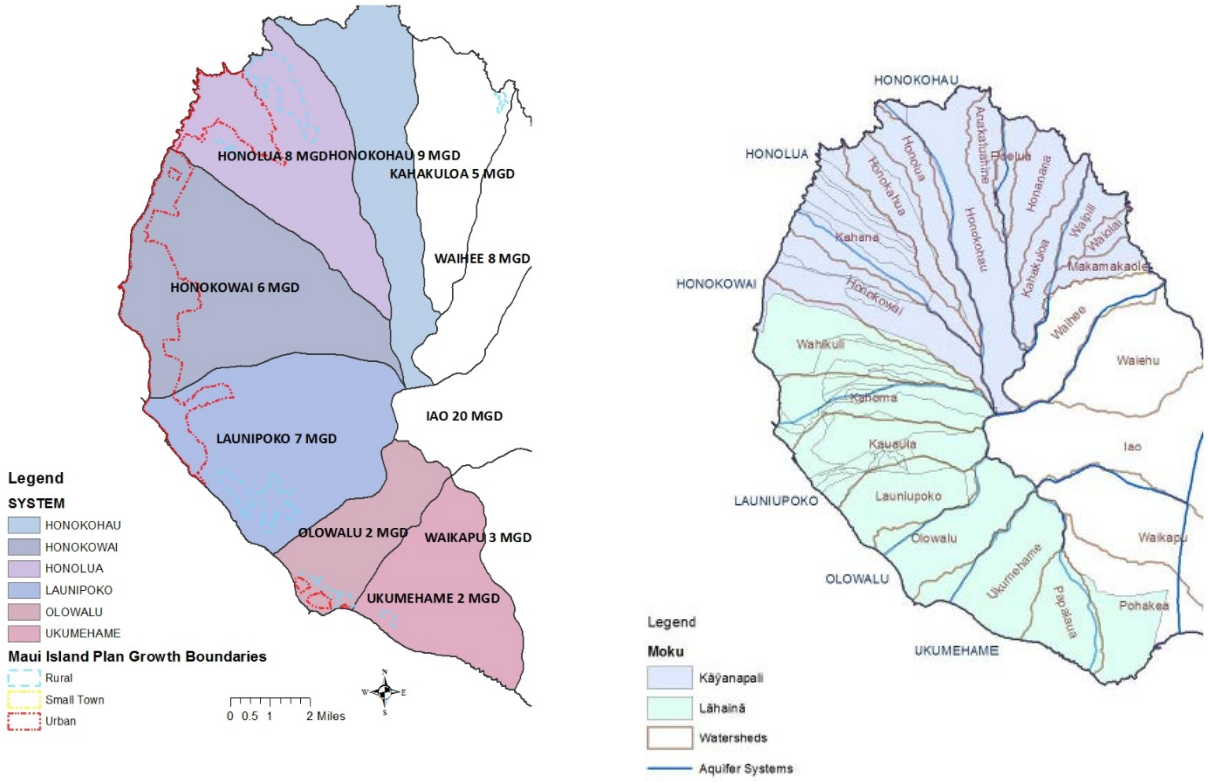
Figure 2 Comparison of Public Water System Consumption, 2014



Source: County of Maui, Department of Water Supply, Draft WUDP, 2017

The total sustainable yield (SY) for groundwater set by the State Commission on Water Resource Management is estimated to be 34 mgd across the 6 aquifer systems in West Maui. This is the amount of water that could be withdrawn from the aquifers without negatively impacting long-term sustainability of the resource. Figure 3 shows the location of the aquifers, SY and Maui Island Plan Growth Boundaries. A breakdown of the pumpage and SY by aquifer is provided in Table 3.

Figure 3 Relationship of Aquifer System Areas and Sustainable Yield to MIP Growth Boundaries, Development Projects, Watersheds and Moku



Source: County Department of Water Supply, Draft WUDP, 2017

Table 3 Pumpage and Pump Capacity of Wells Compared to Sustainable Yield, Lahaina Aquifer Sector Area (2014 mgd)

Aquifer System	MDWS Pumpage	Private Municipal Pumpage	Total Pumpage	Installed Pump Capacity*	SY	Pumpage as % of SY
Honokohau	0	0	0	0.012	9	0%
Honolua	1.966	0.601	2.601	7.682	8	33%
Honokowai	0	3.003	3.052	13.407	6	51%
Launiupoko	0.213	0.147	0.479	26.251	7	7%
Olowalu	0	0	0.069	0.36	2	3%
Ukumehame	0	0.007	0.007	5.469	2	0%
Total	**2.179**	**3.757**	**6.208**	**53.181**	**34**	**18%**

Source: County Department of Water Supply, Draft WUDP, 2017

* Installed Pump Capacity is not the permited pumpage, but the maximum capacity of the permitted well in gallons per minute multiplied by 24 hours.

Supply and Projected Demand

Based on the analysis described in the Draft WUDP, available water resources are sufficient to meet the estimated future demand.

With groundwater sources (SY 34 mgd), surface water flows (30.7 mgd) and available recycled water (3.8 mgd), total water supply is about 69 mgd. The County DWS assessed a hypothetical long term drought condition of 26 mgd, which factors in anticipated climate change and concerns from the community for an additional buffer to groundwater development. Under a hypothetical long term drought condition (SY 26 mgd), total water supply is about 61 mgd.

The Draft WUDP estimates the probable future water demand for West Maui will increase to about 16 mgd by 2035, not including demand for large scale irrigation or agriculture. This estimate is based on the most probable (mid-level) population growth projection from the Socio-Economic Forecast Report, 2014 (County of Maui 2014). When including estimated large scale irrigation (15 mgd) and agricultural water (4 mgd) demand, which is primarily supplied by surface water sources, the total 2035 demand is estimated to be about 35 mgd.

Groundwater is recommended for supplying water for municipal and potable needs, not including large scale irrigation and agriculture. The County DWS provides for about 60% of all water needs in West Maui. In estimating future demand, the County DWS anticipates it will continue to support a similar percentage of overall demand. To meet this demand, the County DWS anticipates the need to develop an additional 4.4 mgd, which equals about 4 to 5 wells. For water serviced by private purveyors, it is estimated that there is likely enough well pump capacity installed to meet the estimated source needs of 3.8 mgd.

In the analysis for the Draft WUDP, the County looked at proposed development projects, MIP growth areas, and existing infrastructure in the region to get a possible indication of the water purveyor most likely to service those projects and areas. While it is not certain, it is possible that the Kaanapali System

will service most of the proposed development projects and MIP planned growth areas within Kaanapali; the Kapalua System will service projects north of the County DWS Napili service area; the Launiupoko Water Company LLC and Launiupoko Irrigation Company LLC will service development south of the County DWS Lahaina service area; and, Ukumehame and Olowalu systems will service planned growth in their respective aquifer systems.

Key Challenges

There are many variables that affect the amount of available water and demand for it: the variability of climate conditions and rainfall amounts; existing land uses and practices; new development, and population growth, among others. There are many questions and concerns from the community on whether there is sufficient water to meet current demand, including maintaining a viable ecosystem and supporting Native Hawaiian rights and traditional and customary practices.

The County DWS estimates there is overall sufficient water resources under normal and drought conditions to meet future demand; however, there are a number of challenges. Assessing and managing water resources and its uses are necessary to ensure current needs are met while planning for the future.

Protection and Restoration

Water plays a key role in the context of ecosystem health and function, which in many ways affect us and our quality of life. Stream flows support habitat for plants, fish and other wildlife species, which many rely on for subsistence. Stream flows also support taro farming and other traditional and customary uses in a number of the region's valleys.

Threats to the resource exist at many levels, from its point of origin in the upper watersheds of the West Maui Mountains to the lower stream reaches and outlet at the shore. In the upper watersheds, continued threats include feral ungulates, invasive weeds, human disturbance and wildfires, which can result in direct impacts to water quality and lead to additional impacts downstream and in nearshore waters. During rain events pollutants and sediments are often washed into streams and carried out to the ocean, impairing water quality and impacting the marine environment. This occurrence is common place given the current landscape conditions and land use practices in the lower reaches of the watershed.

Protection and restoration of the watersheds help to protect and restore water for the benefit of the ecosystem as well as our community.

Water Use

Based on the analysis of future population growth, projected water demand is expected to exceed the existing capacity of the water systems servicing the Honokowai, Launiupoko, and Olowalu aquifer systems. Projected demand within the Launiupoko and Olowalu aquifer systems is within the SY limits of those respective systems; however, projected demand in the Honokowai area would exceed the SY limit identified that aquifer system. There is a need to develop additional water source to meet the

future demand for municipal and other potable uses for those aquifer systems, and will require the transport of water from adjacent aquifers to the Honokowai aquifer.

Allocating the appropriate water source (groundwater vs. surface water) to the appropriate end use will be a key to maintaining reliability of the water sources and system. Balancing withdrawals of water across the different aquifers will also be important to maintain a buffer to sustainable yields. Alternative water sources such as recycled water and stormwater reuse will provide additional water sources and increase flexibility and reliability of the system.

Groundwater

There are several issues with development of groundwater sources. The process of finding, evaluating, and obtaining necessary approvals of a potential source is difficult with an uncertainty of success. Developing potential groundwater sources is also costly and take a significant amount of time to complete. There are also location and operational considerations. A 2012 U.S. Geological Survey study found that water salinity from wells increased with depth, proximity to the ocean, and withdrawal rate (Gingerich, S.B. and J.A. Engott, 2012). Higher modeled pumping rates had shown increases of salinity in water, which in some cases exceeded drinking water standards. Scenarios of drought conditions and elimination of wastewater injection were also found to increase salinities. The balancing or redistribution of withdrawals across different aquifers was found to help salinity levels. Increasing groundwater recharge also helped, but to a lesser degree.

Irrigation

A significant amount of all surface water use goes toward irrigation of landscaping, golf courses and parks in West Maui (65%). Larger percentages of water use for irrigation is typical within drier regions of the county, such as West Maui. Landscaping design and plant types also impact the amount of water required to maintain them. Many properties within West Maui have landscaping designs that include plants with high water requirements. There is an opportunity to reduce and conserve water through use of landscaping design and plant types that have lower water requirements and are more suitable to drier conditions.

Instream Flow Standards

Balancing instream and off-stream uses, including Native Hawaiian traditional and customary uses, is a challenging task. Diversion of surface water for agriculture and other uses over the years have resulted in less stream flow to support traditional and customary uses such as taro farming.

As discussed in the MIP and the Draft WUDP, the CWRM is responsible with establishing instream flow standards (IFS) to protect instream uses while allowing for reasonable and beneficial off-stream uses. Interim IFS that were set in 1988 kept the status quo with diversions supporting irrigation of sugarcane.

On March 21, 2018, the CWRM approved new interim IFS for four streams in West Maui: Ukumehame, Olowalu, Launiupoko, and Kauaula. As explained in the CWRM March 20, 2018 staff report, the new flow standards is intended to restore continuous stream flows from mauka to makai and support Native Hawaiian traditional and customary uses.

The Draft WUDP does account for anticipated IFS and the need to shift to alternative sources, such as groundwater and recycled water, to meet non-public trust needs. The Draft WUDP analysis and recommendations are generally consistent with the CWRM staff findings and recommendations (pers. comm. County DWS, 2018).

Agricultural Water Systems

The Draft WUDP reports that all water for agricultural use in West Maui is supplied by the Maui Land & Pineapple, former Pioneer Mill, and Lahainaluna ditch systems. The ditch systems have different owners and lack comprehensive management resulting in separated functions and use. Water loss also occurs through delivery and could be similar in scale to that of the East Maui Irrigation System at 22%. Through the process to update the Draft WUDP, the community has expressed support for maintaining the ditch and reservoir systems for agriculture.

Aging System and County DWS Budget Constraints

The County DWS Lahaina system infrastructure is aging: many transmission lines and pumps need to be repaired or replaced to maintain current operation. Additional improvements are also needed to help accommodate future demand. As highlighted in the MIP, the County DWS's current budget is not able to cover costs for repairs or replacements needed for all water systems.

Strategies

The MIP identified long-range water source development opportunities for the County DWS West Maui water system including source development, distribution improvements, alternative sources, and expansion and improvement of the Mahinahina Water Treatment Plant. There are also a number of policies and implementing actions related to conservation and resource protection, and other efficiency measures that address the needs of West Maui.

The County DWS refined strategies based on further studies and assessments as described in the Draft WUDP. The strategies cover four main areas: resource management, conservation, conventional water source, and alternative water source. An outline of the strategies are provided below. All strategies include recommended water conservation strategies. For a discussion of each, refer to Section 19.8 of the Draft WUDP.

WUDP Strategies for West Maui

Resource Management

Strategy 1. Continue Maui County financial support for watershed management partnerships' fencing and weed eradication efforts.

Strategy 2. Support local initiatives that seek mauka to makai/traditional ahupua'a management. Educate and raise public awareness of ahupua'a management to foster partnerships for use and management of stream waters.

Conservation

Strategy 3. Undertake comprehensive study of Maui Land & Pine, former Pioneer Mill and Lahainaluna ditches in Agricultural Water Use and Development Plan update.

Conventional Water Source Strategies

In line with conventional water source strategies, the County DWS plans to construct additional wells to access groundwater. The County DWS is also looking at a seasonal approach to surface water use. Use of surface water during the wet season when this source is more plentiful and use of groundwater and alternative sources during the dry season would help increase the reliability of the water sources and system. This flexible approach to resource use would help balance in-stream and off-stream needs.

Strategy 4. Develop basal groundwater wells to provide adequate water supply for planned population growth, maintaining a buffer to sustainable yield.

Strategy 5. Ensure "smart source development" guided by available data and modeling results to optimize pumpage, mitigate salt water intrusion and preserve regional sources with adequate distribution to Launiupoko and Honolua aquifers.

Strategy 6. Install a gage at Kanaha stream above existing intakes to collect stream flow data in order to initiate assessment of Instream Flow Standards (IFS). Priortize IFS for diverted streams.

Strategy 7. Seasonal use of surface water to take advantage of affordable supply in wet season and shift non-instream needs to groundwater and alternative supply when available in dry season to promote stream restoration.

Strategy 8. Interconnect County DWS subsystems and develop contingency agreements between purveyors in the region.

Alternative Water Source Strategies

Potable groundwater could meet most of the irrigation demand, however, there is a general desire to meet irrigation demand with non-potable and alternative sources in addition to conservation strategies. The County is working to increase the use of recycled water by expanding the County's distribution system in West Maui. Efforts to increase use of recycled water would reduce the use of surface and groundwater sources for irrigation needs.

Strategy 9. Support capital improvement funding for recycled water projects and needed infrastructure expansion in the Lahaina region to offset potable water to the maximum extent feasible.

Strategy 10. Explore Kahoma Stream flood control project to collect and convey stormwater for agricultural use.

Climate Adaptation

A changing climate is likely to affect rainfall and streamflow and directly impact available water resources. On February 22, 2018, Mayor Alan Arakawa signed a proclamation that accepts the results of the 2017 Hawaii Sea Level Rise Vulnerability and Adaptation Report. The proclamation also directs the County Departments to use the report in their plans, programs and capital improvement decisions.

The County DWS is considering potential effects from climate change in their planning. The County DWS has updated its Draft WUDP, which will serve as a guide for the County in approving or recommending the use and development of water resources. The comprehensive plan looks at all water resources and needs for public and private water systems and public trust purposes. It also incorporates the population growth projections as well as potential drought conditions in the analysis of future water needs.

Considerations for climate adaptation include: water purveyors increase resiliency and adaptability of water systems to changing conditions such as longer droughts and varying rainfall; planning and managing for future population growth and land uses based on available water resources; landscape design and irrigation adapted to more drought tolerant design and plants; continue to promote water conservation; and incorporate sea level rise into capital improvement planning and prioritization.

Capital Improvement Program

As outlined in the MIP Implementation Program (MIP Chapter 10), the County Capital Improvement Program (CIP) funding strategy identifies the County as responsible for funding operations and capital improvements to address existing needs of the County-owned and operated systems. For infrastructure expansion needs, developers are generally responsible for public facility and infrastructure expansion costs associated with their projects.

When addressing the current and future water systems needs, careful consideration of the community's priorities, including the need for affordable housing, is essential. The following are the short-term capital improvement projects identified by the County DWS (pers. comm.. County DWS, 2018):

- Construction of well in Honokowai aquifer. This new well would provide an additional water source to support future demands.
- Upgrade the Lower Honoapiilani Highway Waterline. The existing waterline is old and in need of replacement to support current and future needs.

References and Related Plans and Studies

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